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swiss orthopaedics

SWISS ORTHOPAEDICS

ABSTRACTS OF THE 83TH ANNUAL MEETING

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ORALS: A01 SHOULDER/ELBOW I

FM001

Primary analysis and outcome of an evidence-based and patient-specific treatment algorithm for midshaft clavicle fractures (MSCF) – a Swiss multicentre study

Christian Spross[1]; Thomas Schöfl[1]; Beat Moor[2]; Aline Suter[3]; Christoph Meier[3]; Michael Schär[4]; Alex Schallberger[5]; Vilijam Zdravkovic[1]; Bernhard Jost[1]

[1] Kantonsspital St. Gallen KSSG; [2] Hôpital du Valais - Spital Wallis; [3] KSW-Kantonssiptal Winterthur; [4] Insel Spital Bern; [5] Kantonsspital Nidwalden

ORIF of displaced MSCF is preferred as recent RCTs have shown better healing rates and faster recovery. The influence of patient's demands have not been investigated. We created an evidence-based treatment algorithm (EBTA) for all MSCF including patient's demands and treatment wishes. The aim of this patient-specific stratification was a selection of highly motivated patients in all treatment groups.

In January 2021, 5 Swiss centres introduced the EBTA for MSCF and took part in this on-going study. At the time of injury, patients were grouped in high and low-demand and the fractures were classified according to Robinson. All patients with Type A fractures (minimal displacement) and low-demand patients with Type B (displaced) fractures were primarily treated conservatively. High-demand patients with Typ B fractures could choose their treatment after being informed about the actual evidence. Clinical and radiographic follow-up took place at 6 and 12 weeks. Functional outcome, return to work/sport (%), crossovers, complications and revisions within 3 months of were analysed.

Within 2 years, 358 patients fulfilled the inclusion criteria. 60 patients (17%) were lost to follow-up, leaving 298 patients (80% men) with a mean age of 44yrs. (18–85) for this analysis. Overall, after 3 months: the mean qDASH was 11.7 (0–61), mean SSV 82.1 (15–100), mean elevation was 160° (45–180), VAS pain 0.9 (0-9), back to work/sport 73%/46% (0–100). 45 (15%) complications and 21 (7%) unplanned surgeries were recorded. Only 4 (1.3%) patients were classified low-demand. Of the high-demand patients (n = 294), 36 (12%) had a Type A fracture with conservative treatment. Of the 250 patients with Type B fractures, 74 (30%) chose conservative and 176 (70%) ORIF. In these patients, the crossover rate to ORIF was 15% (n = 11) mainly due to pain. ORIF had 19 (11%) complications with 2 (1%) revisions. The complication ($p = 0.03$) and revision ($p < 0.01$) rate were significantly lower after ORIF. There was no significant difference in the clinical outcome or in return to work/sport between the two groups after 6 and after 12 weeks.

Involving the patient into the treatment decision may lead up to 15% of crossovers to ORIF, mainly due to pain within the first weeks. However, with this treatment stratification, there was finally no difference in the early functional outcome and the return to work/sport in patients with displaced MSCFs and the general early outcome was successful.

FM002*

DETACHMENT OF DELTOTRAPEZIAL COMPLEX IS A KEY DETERMINANT OF JOINT DISLOCATION IN ACROMIOCALVICUAL INJURY

Margaux Feltrin; Florent Moissenet; Pablo Rodriguez; Jean-Yves Beaulieu; Nicolas Holzer

HÔPITAUX UNIVERSITAIRES GENEVE

Background: Detachment of the deltotrapezial complex is described as highly probabale in radiologic staging of Rockwood stages III to V. Previous cadaveric studies have analysed the contribution of the AC and CC ligaments to joint stability. Data on deltotrapezial complex contribution remains scarce. Aim of this pilot study was to assess the contribution of each of these structures during abduction.

Methods: Five fresh-frozen (9 shoulders) were obtained for this study. Abduction was applied by a robotic manipulator attached to the humerus. Clavicule and scapula were instrumented with reflective markers mounted on bone pins, and their 3D kinematics was recorded using a 11-camera optoelectronic system. Coupled with CT-scan images, these records allowed to compute joint kinematics. This procedure was applied to 4 conditions: 1) native (N), 2) AC ligaments and capsule (AC) disruption, 3) AC with deltotrapezial complex detachment (AC-DT), C4) AC-DT with an induced CC ligament lesion. Joint dislocation (i.e. articular junction point displacement at minimal abduction) and range of motion were computed for each degree of freedom.

Results: The Friedman's test revealed a significant difference for superior-inferior ($p < 0.001$), anterior-posterior ($p < 0.01$), and medial-lateral ($p < 0.001$) dislocations. Post-hoc analysis (Fisher's LSD) revealed non significant difference between N and AC, but significant differences between N and AC-DT ($p < 0.01$), and between N and AC-DT-CC ($p < 0.001$), whatever the dislocation direction. The Friedman's test revealed a significant difference for medial/lateral rotation ($p < 0.001$), as well as for inferior/superior ($p < 0.001$), anterior/posterior ($p < 0.001$), and medial/lateral ($p < 0.001$) displacements. Post-hoc analysis revealed non significant difference between N and AC (except for medial-lateral displacement, $p < 0.05$), but significant differences between N and AC-DT ($p < 0.05$, except for anterior-posterior displacement), and between N and AC-DT-CC ($p < 0.001$), both for rotations and displacements

Conclusions: Our study shows the importance of the deltotrapezial complex in AC joint stabilisation. The detachment of this complex appears as critical, even without a CC ligament lesion, and may be a reason for the failure and recurrence of dislocation following surgical management. Furthermore, deltotrapezial complex detachment may be used for evaluation of surgical indication in stage III acromioclavicular injury.

FM003*

Anterior Shoulder Dislocation With Avulsion Fracture Of The Greater Tuberosity Results In Reliable Good Outcomes After Closed Reduction

Gabriele Cirigliano; Franziska Altorfer; Michel Meisterhans; Paul Borbas; Karl Wieser ; Florian Grubhofer

Balgrist University Hospital: Universitatsklinik Balgrist

Introduction: The avulsion of the greater tuberosity (GT) after a traumatic anterior shoulder dislocation (ASD) is a common observed fracture pattern. After closed reduction of the dislocated humerus, the greater tuberosity typically reduces itself into anatomic position and conservative treatment of the fracture and the instability is a valid treatment option. In this study, a series of cases with conservative treated avulsion fractures of the GT after ASD was retrospectively analyzed regarding complications, clinical and radiological outcomes.

Material and methods: All patients with a GT avulsion fracture after an ASD who were treated conservatively at our institution between 2014 and 2022 with a minimum clinical and radiological follow up of 3 months were included. Primary endpoint was Subjective Shoulder Value (SSV), American Shoulder and Elbow Surgeons (ASES) score and complications assessed at last follow up. Secondary endpoint was radiologically assessment of the impingement - and greater tuberosity index (II, GTI) after closed reduction and at last follow up. Good responders (GR) were defined as SSV >80%.

Results: A total of 23 patients (mean age 41 years, 22% female) with a mean follow-up of 18 months (3-78) were enrolled. The SSV improved from 9.6%±10.3 to 84.9±18.2 ($p < 0.05$). The ASES at last follow up was 89.4±19.1. One (female, age 46, SSV 60, ASES 55) developed a subacromial impingement (initial II 0.56, at last follow-up II 1.03), one (male, age 58, SSV 40, ASES 28) suffered from a brachial plexus injury after initial dislocation and showed a moderate outcome. The mean GTI decreased from 1.17 (SD 0.11) after ASD to 1.09 (SD 0.08) at the last follow-up ($p < 0.05$). GR showed lower GTI ($p < 0.05$) but no statistical difference in fragmentary pattern.

Conclusion: The greater tuberosity avulsion fragment after anterior shoulder dislocation reduces into a close to anatomic position after closed reduction and results in reliably good clinical outcomes. Radiologically the impingement index and the greater tuberosity index normalizes during the course of conservative treatment.

FM004

Long-Term Outcome of Achilles Tendon Interposition Arthroplasty of the Elbow: A Retrospective Case Series

Alberto G. Schneeberger

Introduction: Few options exist in the treatment of arthritis or destruction of the elbow in the young patient. The aim of this study is to report the long-term outcome of Achilles tendon interposition arthroplasty of the elbow.

Methods: Nine patients (4 males, 5 females) with the average age of 27 years (16 to 44) had been treated with Achilles tendon interposition arthroplasty for posttraumatic arthritis (7 cases), juvenile rheumatoid arthritis (1 case) and pterygium syndrome (1 case). Before surgery, 7 elbows were stiff with an arc of flexion of 60° or less, and 2 were unstable. Seven out of 9 patients had 2 to 6 prior procedures. After Achilles tendon interposition, the elbows were protected with a mobile articular external fixator for 2 to 6 weeks. Follow-up assessment consisted of a clinical exam including determination of the Mayo Elbow Performance score (MEPS) and radiographs. A satisfactory outcome was defined as a MEPS of at least 75 out of 100 points (good or excellent results). Failure was defined as an unsatisfactory MEPS outcome (fair or poor result) or revision to a TEA. Follow-up was available after a mean of 11 years (1-17).

Results: At 1 year after surgery, only 5 out of 9 patients had a satisfactory outcome. One of these 5 patients was lost to follow-up at 1 year after surgery. At 10 years after surgery, 4 had a satisfactory outcome. Three out of these 4 cases deteriorated after 10, 13 and 16 years to an unsatisfactory outcome. At 17 years, only 1 patient had a satisfactory outcome. Four patients had been converted to a TEA 1 to 3 years after the index procedure. Risk factors for failure seems to be preoperative instability, deformity and bone deficiency.

Conclusions: Achilles tendon interposition arthroplasty can be considered a temporary salvage procedure for the treatment of arthritis of the elbow in young patients. However, at 10 years after surgery, only half of the patients had a satisfactory outcome, and longevity of this procedure seems to be very limited.

FM005

Stability of novel coracoid bone graft fixation in Latarjet procedures: a biomechanical study

Michel Meisterhans[1]; Farah Selman[1]; Esteban Ongini [2]; Paul Borbas[1]; Karl Wieser[1]

[1] Department of Orthopaedics, Balgrist University Hospital, Zurich, Switzerland; [2] Department of Orthopedics, Balgrist Hospital, University of Zurich; Institute for Biomechanics, ETH Zurich

Introduction: The Latarjet procedure is widely used to address anterior shoulder instability, especially in case of glenoid bone loss. Recently, cortical suture button fixation for coracoid transfer has been used to mitigate complications seen with screw placement. However, this technique is dependent on an arthroscopic application, and not suitable for a standard open procedure. The aim of this biomechanical study was to evaluate the stability of a novel and cost-effective cow-hitch suture button technique, designed to be performed through a standard open deltopectoral approach, and compare this to a well-established double suture button technique.

Material and Methods: We randomly assigned 12 fresh-frozen cadaveric shoulders to undergo the Latarjet procedure with either four suture button (S&N Endobutton) fixations (Group SB; n = 6, age 72±9.8 years) or cow-hitch suture button technique using a 1.7 mm FiberTape looped sequentially in two cortical buttons (Arthrex Pectoralis Button) placed from anterior on the posterior glenoid (Group CH-SB; n = 6, age 73±9.3 years). After fixation, all shoulders underwent biomechanical testing with direct loading on the graft vas a material testing system. Cyclic loading was performed for 100 cycles (0-100N) to determine axial displacement with time; each graft was then monotonically loaded to failure.

Results: The maximum cyclic displacement was 4.3±1.6 mm for the cow-hitch suture button technique and 5.0±1.7 mm for the standard double suture button technique ($p = 0.46$). Ultimate load to failure and stiffness were 189.9±82.3 N respectively 220.9±124.3 N/mm for the CH-SB technique and 172.4±48.1 N respectively 172.7±34.2 N/mm for the standard double SB technique ($p = 0.66$ and 0.43). The most common failure mode was suture cut through at the anteroinferior aspect of the glenoid for both fixation groups.

Conclusions: The novel cow-hitch suture button technique resulted in a similar elongation, stiffness and failure load compared to an established double suture button technique. Therefore, this cost-effective fixation may be an alternative, eligible for open approaches, to the established arthroscopic suture button techniques.

FM006*

In vivo Analysis of Translational Motion of the Proximal Radioulnar Joint in Forearm Rotation

Andreas Weber; Bastian Sigrist; Andreas Schweizer
Universitätsklinik Balgrist

INTRODUCTION: It is well known that pronation and supination of the forearm leads to a physiological anterior-posterior translation in the distal radioulnar joint. However, little is known about the translational movement in the proximal radioulnar joint during pronation and supination.

Therefore, the primary objectives of this study are to demonstrate the existence of an anterior-posterior translation in the proximal radioulnar joint, its degree, and directionality during forearm rotation based on an in vivo motion analysis.

METHODS: In this observational study, 15 healthy adult volunteers underwent an ultra-low dose computed tomography of both forearms in a neutral position, pronation, and supination. Bilateral 3-dimensional models of the radius and ulna were generated and superimposed. The axis of rotation was determined as well as the degree of anteroposterior translation of the radial head center was measured.

RESULTS: All subjects showed an anterior translation of the radial head during supination and a posterior shift during pronation. The mean anterior-posterior shift was 2.5 mm (Range: 0.4 mm – 4.4 mm) on the right side and 2.6 mm (Range: 0.9 mm – 5.5 mm) on the left side.

CONCLUSIONS: Overall, our results indicate that an anterior-posterior translation during forearm rotation exists in the proximal radioulnar joint with a posterior shift of the radial head in pronation and an anterior shift in supination.

These in vivo analyzed findings contradict the previous studies describing translational motion in the proximal radioulnar joint. This finding re-defines specific aspects of the complex spatial relationship between the radius and ulna during forearm rotation.

FM007

Contact pressure analysis in posterior glenohumeral instability associated with increasing retroversion and glenoid bone loss before and after iliac crest bone grafting

Paul Borbas[1]; Alexander Paszicsnyek[1]; Lukas Ernstbrunner [2]; Simon Hofstede[3]; Karl Wieser [1]; Samy Bouaicha[1]
[1] Balgrist University Hospital, University of Zurich; [2] Royal Melbourne Hospital, Parkville, Australia; [3] Balgrist University Hospital, University of Zurich / Institute for Biomechanics, ETH Zurich

Introduction: The optimal treatment for posterior shoulder instability with increased retroversion and osseous glenoid defect has been unclear. Treatment options range from posterior labral repair to glenoid corrective osteotomies to posterior bone block augmentation or a combination of these methods.

The purpose of this study was to evaluate the intraarticular pressure distribution in posterior Bankart lesion, posterior glenoid bone defect, increased glenoid retroversion, and after posterior bone block surgery compared with a native joint with neutral glenoid version.

Methods: In 6 cadaveric shoulders, analysis of intraarticular pressure distribution (by Tekscan sensors) was performed with a previously published biomechanical set-up and the ability to adjust glenoid version, in the following constellations and glenoid retroversion of 0°, 10°, and 20°:

(1) intact joint

(2) posterior Bankart lesion

(3) posterior glenoid defect (20%)

(4) posterior bone block (from iliac crest)

Results: At 20° retroversion, all tested constellations showed a significantly decreased contact area compared to the native joint (Bankart lesion p = 0.025; osseous glenoid defect p <0.01, iliac crest bone block p = 0.036). At 0° and 10° retroversion, in contrast to posterior Bankart lesion and osseous defect, there was no significant difference after iliac crest bone block compared to the intact joint (p = 0.445). Similar results were seen when analyzing glenohumeral contact pressure ratios, which again were significantly increased at 20° retroversion in Bankart lesion (p = 0.027), glenoid defect (p <0.01) and after iliac crest bone block (p = 0.042). Again, a posterior bone block at 0° and 10° retroversion was able to show similar contact pressure as a native joint (p = 0.498).

Discussion: Posterior glenohumeral stabilization with an iliac crest bone block restores the native joint contact pattern in a simulated posterior instability situation at 0° and 10° retroversion. However, at a glenoid retroversion of 20°, unfavorable contact patterns become apparent, which is why, from a biomechanical point of view, this surgical procedure does not appear to be effective in posterior instability with glenoid retroversion above 10°.

FM008*

Compound Osteosynthesis in Metastasis Affected Pathological Humeral Fractures

Valérie Fischer; Vilijam Zdravkovic; Bernhard Jost
Kantonsspital St. Gallen

Background: Due to demographic aging and progress in cancer treatment, the number of advanced cancers where bone metastases should be treated is increasing over time. A functional upper limb is important for independence in everyday life, so an intact humerus enables autonomy and improves the life quality. In the present study, the surgical procedure in the form of compound osteosynthesis is tested for its remaining lifetime success or failure.

Methods: We studied a monocentric consecutive cohort of cancer patients who have had a pathologic mestastatic humeral fracture treated with primary compound osteosynthesis from September 2007 to March 2020 at our institution. Apart from demographic data and data about the surgical procedure, the history of all patients has been traced until present or, if deceased, until the date of death. The primary endpoint was the survival curve using competing risk analysis, contrasting the events of failure and death. Failure was defined as periprosthetic fractures, screw loosening or revision for any reason.

Results: In the included patient cohort of 36 patients (64% male, mean age 71.6 years) bronchus carcinoma was the most common cause of bone metastases. In 58% of the cases the left humerus was fractured. Half of the fractures occurred within 12 months after cancer diagnosis. Surgical repair was performed at a median of 5 days after (complete or imminent) fracture was diagnosed. Complications were radial paresis (3 patients), postoperative hematoma (n = 2), re-fracture (n = 2), and screw loosening (n = 1). Competing risk analysis with death as alternative censoring event showed a clear tendency toward intact osteosynthesis survival for the remaining period of life. Conclusion: The aim of compound osteosynthesis is rapid recovery of patient autonomy. This analysis shows that compound osteosynthesis of the humerus is a suitable therapeutic option for patients with metastatic pathologic humeral fractures. It can be expected to last until the end of life and to increase the quality of life in this specific patient group.

FM009

Free bone graft transfer versus Latarjet procedure for treatment of anterior shoulder instability with glenoid bone loss: 5 years outcome of a prospective randomized trial

Philipp Moroder; Eva Schulz; Julian Diepold; Guido Wierer; Alexander Auffarth; Peter Habermeyer; Herbert Resch; Mark Tauber
Schulthess Clinic

Background: Free bone graft transfers (FBGT) and the Latarjet procedure are competing techniques to treat patients with anterior shoulder instability and critical glenoid bone loss. No mid- or long-term outcomes of prospective randomized comparative trials of the two procedures are currently available.

Methods: This prospective bi-centric randomized study included 60 patients with anterior shoulder instability and glenoid bone loss of at least 15% surface area. Patients were randomly assigned in a 1:1 ratio to either open Latarjet procedure or open FBGT (J-bone graft). Clinical and radiological evaluation was performed before, 6, 12, 24 and 60 months after surgery and included the Western Ontario Shoulder Index (WOSI), Rowe Score, Subjective Shoulder Value, satisfaction, pain level, work and sports impairment as well as range of motion and strength. Longitudinal radiographic assessment of instability arthropathy was obtained preoperatively, as well as at 6, 12, 24 and 60 months follow-up. The 5 years follow-up rate was of 63.3% for FBGT patients and 66.6% for Latarjet patients.

Results: The main outcome measurement (WOSI) showed no statistically significant difference at the 5 year follow-up time point (FBGT 221±186 Latarjet: 201±239; p = 0.529) or any other time point. Similarly, none of the other clinical outcome scores showed a statistically significant difference (p>0.05). Both groups were also comparable in terms of postoperative range of motion and strength except for a significantly better internal rotation in the FBGT group during the entire follow-up time period including the 5 year follow-up (p = 0.004). A single traumatic recurrent instability event was recorded in 3 patients of the FBGT group (2 subluxations 1 dislocation) and 1 patient of the Latarjet group (1 subluxation) (p = 0.342) during the follow-up period. Sensory nerve disturbances at the iliac crest in the FBGT group decreased to 5% over time. None of the groups showed additional complications between short and mid-term follow-up. The grade of instability arthropathy showed a comparable increase in both groups over time (p>0.05).

Conclusion: No differences in clinical outcome were observed for FBGT and the Latarjet procedure at mid-term follow-up except for persistent significantly better internal rotation after FBGT. Both, procedures showed a comparable stabilization success rate but were not able to stop the progression of instability arthropathy over time.

FM010*

Complications following arthroscopic-assisted coracoclavicular stabilization in patients with unstable lateral clavicle fractures

Alexander Pieringer; JoEllen Welter; Janic Fischer; Florian Hess
Kantonsspital Frauenfeld

Purpose: Lateral clavicle fractures are unstable and prone to nonunions, which is why they are often treated surgically rather than conservatively. Despite the variety of surgical techniques found in the literature, the best method for treating this rare fracture type has not yet been determined. Our case series aimed to describe a coracoclavicular (CC) reconstruction technique and to assess complications and patient outcomes 1 year postoperatively.

Methods: Nineteen patients who underwent surgery for an unstable lateral clavicle fracture (IIB, IIC, IID) with a suture button device (Dog Bone, Arthrex, Inc., Naples, FL, USA) were available for clinical and radiological follow-up. The assessments included the American Shoulder and Elbow Surgeons Standardized Shoulder Assessment (ASES) score, the Constant Score (CS), the Subjective Shoulder Value (SSV), as well as the ipsilateral and contralateral coracoclavicular distance.

Results: The median age was 50 years (IQR 28–59), 13 (68.4%) were male and the delay to surgery was 5 days (IQR 2–9). The median clinical scores were 100 (ASES), 91 (CS), and 95 (SSV). The CC distance improved postoperatively (p = 0.003). However, nonunion occurred in 3 (15.8%) patients, 5 (26.3%) had other complications, and 5 (26.3%) needed revision surgery (4 plate removals and 1 pseudoarthrosis). The overall complication rate was 36.8%.

Conclusion: Restoring the CC ligaments alone could not reliably achieve fracture stability, with more than one-third of cases in this series experiencing major complications. Given the high revision and nonunion rates, we do not recommend this type of surgical technique.

FM011

DETAILED SHOULDER BIOMECHANICS DURING HUMERAL ABDUCTION WITH WEIGHT-BEARING: AN EX-VIVO STUDY USING AN ADVANCED SHOULDER SIMULATOR

Jeremy Genter[1]; Eleonora Croci[2]; Franziska Eckers [3]; Birgit Obereiter [3]; Dominik Bühler [3]; Annegret Mündermann [3]; Daniel Baumgartner [1]; Andreas Marc Müller [3]
[1] ZHAW School of Engineering; [2] University of Basel; [3] Universitätsspital Basel (USB)

Introduction

Measuring shoulder joint kinematics and forces in vivo is difficult and not always accurate. Therefore, researchers often opt for an ex vivo approach to study the biomechanics of the shoulder, particularly when examining the role of individual muscles in both active and passive movements. Various glenohumeral (GH) simulators have been developed. However, few simulators can imitate dynamic GH motion by applying active muscle forces and mimicking rotator cuff tears (RCT). Furthermore, secondary osteoarthritis is a possible consequence of RCT, making it a critical area of research. In this study, we investigated the GH joint biomechanics using a custom simulator mimicking RCT with additional weights simulating in vivo load-bearing situations.

Methods: Ten fresh-frozen human shoulders were securely fixed in a state-of-the-art shoulder simulator designed to control and measure muscle force. The simulator was attached to a motorized pulley system that was used to apply force to ten periarticular tendons, including the supraspinatus (SSP), infraspinatus (ISP), teres minor, the superior and inferior portion of subscapularis (SSCsup and SSCinf), three deltoid parts (anterior, middle, posterior), pectoralis major, and latissimus dorsi. A shoulder abduction-adduction cycle was conducted to a 30° scapular plane angle, simulating movement with an intact rotator cuff and different RCTs, including SSP, ISP, SSCsup, SSP&ISP, SSP&SSCsup, and SSP&ISP&SSCsup, at four varying levels of load (0,1,2,3 kg). The position of the GH joint center was determined using the instantaneous helical axis method, and the GH contact point was identified. A linear mixed-effect model was conducted on the GH translations and contact points.

Results: The weight-bearing significantly affected superior GH translations (p <0.001) but not the GH contact points. None of

the tear types affected the GH translations, but multi-RCTs significantly shifted the GH contact point superiorly (p <0.021).

Conclusion: Careful monitoring of joint overload, particularly during physiotherapy, is critical to avoid joint instability. Therefore, in vivo validation of these findings would be highly valuable from a clinical perspective. Additionally, it is possible that multi-tear RCTs could potentially shift the risk of GH osteoarthritis towards the superior area of the glenoid.

Acknowledgments: Funding: Swiss National Science Foundation (SNSF#320030_189082)

FM012

Die "Circle"-Methode detektiert schlechtere klinische Resultate nach arthroskopisch-assistierter Akromioklavikulargelenks-Rekonstruktion

Philipp Vetter[1]; Larissa Eckl[2]; Frederik Bellmann[2]; Laurent Audigé[2]; Markus Scheibel[2]

[1] UniSpital Zürich; [2] Schulthess Clinic Zuerich

Introduction: Der Schweregrad einer Akromioklavikulargelenks-(ACG) Sprengung wird primär anhand der vertikalen Instabilität beurteilt, obwohl die horizontale Instabilität klinisch relevanter sein könnte.

Die "Circle"-Methode ist eine validierte neue Messmethode, welche beide Komponenten berücksichtigt. aber klinisch bisher nicht untersucht wurde.

Das Ziel unserer Studie war, den Zusammenhang zwischen postoperativer "Circle"-Distanz und den klinischen Ergebnissen von Patienten mit arthroskopisch-assistierter ACG-Stabilisation zu untersuchen.

Methods: 26 männliche Patienten (Alter 39,4 Jahre) mit akuter Rockwood Typ V Verletzung und bilateralen anteroposterioren Stress-Aufnahmen sowie Alexander-Aufnahmen vor und nach operativer Behandlung (1-2 Jahre Follow-Up) mittels Low-Profile TightRope plus perkutane Akromioklavikular-Cerclage wurden eingeschlossen.

Radiologisch wurden die bilaterale korakoklavikuläre Distanz (CCD), der Grad der dynamisch horizontalen Translation (DPT) sowie die "Circle"-Distanz zu beiden Zeitpunkten evaluiert. Klinisch wurden der Constant Score, der Acromioclavicular Joint Instability Score (ACJI), der Taft Score (TF) und der Subjektive Schulterwert (SSV) erfasst.

Results: Nach 21,0 Monaten zeigte sich die CCD reduziert [21,4mm mit 95% CI 19,7-23,0mm vs. 11,4mm (10,0–12,7mm); p <0,001]; ebenso die "Circle"-Distanz [25,7mm (22,8–28,6mm) vs. 4,0mm (1,4-6,7mm); p <0,001]. Die Reposition beider Methoden zeigte eine Korrelation (r = 0,462, p = 0,017).

Eine größere postoperative "Circle"-Distanz ging mit vermehrter DPT einher (r = 0,870, p <0,001) und unterschied zwischen Fällen mit keiner [-0,6mm (-2.2-0.9mm)] und partieller DPT [6,9mm (4,5–9,4mm); p = 0 <0,001] sowie partieller und kompletter DPT [17,0mm (11,8–22,2mm); p = 0,009].

Die "Circle"-Distanz korrelierte mit dem ACJI (r = -0,557; p = 0,003), dem TF (r = -0,356; p = 0,044) sowie dem SSV (r = -0,483; p = 0,031). Die Trennwerte für schlechtere klinische Resultate lagen bei 5,7mm (ACJI) [81,1 (73,8–88,5) Punkte vs. 89,7 (84,7-94.6) Punkte; p = 0,026]; 2,5 mm (TF) [10,5 (10,0–11,1) Punkte vs. 11,3 (10,5–12,0) Punkte; p = 0,02] und -1,2 mm (SSV) [95,1 (91,4-98,9) vs. 91,3 (88,6–94,0); p = 0.031].

Conclusion: Die postoperative "Circle"-Distanz scheint eine wertvolle Methode zur Erfassung von schlechteren klinischen Resultaten nach arthroskopisch-assistierter ACG-Stabilisation darzustellen.

Bei operativen Behandlungen sollte darauf abgezielt werden, die "Circle"-Distanz der gesunden Seite wiederherzustellen.

FM013

The Latarjet procedure in patients with minimal glenoid bone loss: Long-term clinical outcome and CT-morphometric analysis of graft resorption

Lukas Ernstbrunner [1]; Fraser W. Francis-Pester[2]; Dale L. Robinson [2]; Manuel Waltenspül; David C Ackland [2]; Karl Wieser [1]

[1] Balgrist Hospital, University of Zurich; [2] The University of Melbourne

Background: There are concerns that the Latarjet procedure can result in significant coracoid graft resorption and certain studies reported that coracoid graft resorption is more pronounced in the setting of minimal preoperative glenoid bone loss.

Purpose: To analyze the long-term outcome of the open Latarjet procedure in patients without significant glenoid bone loss (<15%).

Methods: A total of 58 shoulders that underwent open Latarjet procedure at a mean age of 26 (range, 18-36) years for recurrent anterior shoulder instability without significant glenoid bone loss were reviewed after a mean of 8 (range, 5-12) years.

Virtual osteotomy was performed and the coracoid graft was positioned on the pre-operative glenoid to create an equivalent to the immediate post-operative glenoid. Comparison of the coracoid graft immediate post-operative and the final follow-up allowed for evaluation of resorption over time in eight defined graft segments.

Results: Three patients (5%) had recurrent dislocations. One of these underwent revision with a reverse shoulder arthroplasty for multidirectional instability. Another patient underwent screw removal prior to the recurrent dislocation. A total of three patients (5%) underwent screw removal. The relative constant score and subjective shoulder value of the remaining patients averaged 90%+/-7% and 82%+/-18%. The final total WOSI score averaged 20%+/-18% and ASES Score 91+/-9 points. CT analysis demonstrated an overall coracoid graft resorption of mean 24%, (p <0.001). Patients with 0-5%, 5-10% and 10-15% preoperative glenoid bone loss demonstrated graft resorption of 28% (p = 0.002), 27% (p <0.001) and 14% (p = 0.067) respectively. The largest volume of resorption was observed in the anterior-superior-medial segment, with 75% graft resorption (p <0.001), the anterior-superior-lateral segment, with 48% graft resorption (p <0.001), and the posterior-superior-medial subsegment, with 41% resorption (p <0.001). Only the the inferior segment was stable over the duration of the study, with no significant difference in volume at timepoint zero and at final follow-up (p = 0.720).

Conclusions: The open Latarjet procedure for recurrent anterior shoulder instability in patients without significant glenoid bone loss results in high rate of stability and leads to high patient satisfaction. Coracoid graft resorption is substantial with resorption found mostly around the superior segment and was at the inferior screw segment.

FM014*

Complex proximal ulna fracture dislocations – a retrospective analysis of a structured treatment approach

Michael Strässle; Vilijam Zdravkovic; Med Roger Van Riet; Bernhard Jost; Christian Spross

Kantonsspital St. Gallen

Complex proximal ulna fracture dislocations include Monteggia(-like) fractures (MLF) as well as trans-olecranon fractures dislocations (TOFD). Whilst the injury mechanism may be different, the treatment approach for MLF and TOFD can be similar. It was the aim of this retrospective study to evaluate the clinical outcomes of these injuries after a standardized surgical treatment approach.

All patients treated for a complex proximal ulna fracture dislocation between 2011 and 2022 were included. The fractures were classified according to Bado and Jupiter as well as the Mayo classification and further analyzed concerning: involvement of radial head, coronoid, and ligament avulsions. The surgical treatment strategy focused on: anatomic reduction of the joint (coronoid and olecranon), restoration of the ulnar axis (with the anatomic plate), and finally stabilization of the joint (fixation of ligament avulsions and addressing the radial head). Final follow-up included: range of motion, EQ5D5L, qDASH, the Mayo Elbow Performance Score (MEPS), and a radiological examination.

43 adult patients, with a mean age of 57 years (19-89), suffered such an injury between 2011 and 2022. 33 of them had a MLF fracture (Bado type-1: n = 4; type-2: n = 28; type-4: n = 1). 10 patients sustained a TOFD (Mayo 3A: 8 or 3B: 2). A coronoid fracture was present in 26 (60%) cases, whereof 16 (62%) were unstable and were addressed either with plate screws or free screws. Totally, 28 patients had a radial head fracture (65%), whereof 19 (68%) were surgically addressed (ORIF, prosthesis or resection). Medial and/or lateral ligament avulsion was addressed in 28 (65%) cases. 35 of 43 patients (81%) were available for final clinical and radiographic follow-up after a mean time of 4.9 years (1-10). The mean MEPS was 93.5 (70-100) and the mean qDASH score was 18.5 (0–82). According to the MEPS, 15 patients (75%) had excellent, three (15%) good, two (10%) fair results. A total of 23 patients (66%) required a revision after an average of 357 days (7-883), of which 20 (87%) underwent hardware removal only.

A structured approach and a structured reduction technique were helpful for the treatment of complex proximal ulna fracture dislocations. The often-difficult differentiation of MLF and TOFD is not mandatory as both can be treated with the same technique. Despite the high rate of subsequent surgeries, the clinical outcome after a mean of 5 years showed good to excellent results in 90% of the cases.

FM015

The Influence of Posture on the Clinical Outcome after Reverse Total Shoulder Arthroplasty

Philipp Moroder; Katja Rüttershoff; Giovanni Spagna; Ismael Coifman; Paul Siegert; Alessandra Scaini; Markus Scheibel; Beatrice Weber; Tim Schneller; Laurent Audigé , DVM

Schulthess Clinic

Introduction: A study with preoperative planning software has shown that scapulothoracic orientation and posture have a significant effect on the simulated range of motion after implantation of a reverse total shoulder arthroplasty (RTSA). However, we currently do not know how these findings translate to clinical practice. Goal of this study was to analyze the effect of scapulothoracic orientation and posture on the clinical outcome after RTSA implantation.

Methods: Patients with a minimum clinical and radiological follow-up of 2 years after RTSA implantation were extracted from our institutional shoulder arthroplasty registry. Patients with revision surgery and without available preoperative cross-sectional imaging were excluded. Posture Types (A, B, and C) were determined by two independent raters on preoperative cross-sectional imaging. Differences in clinical outcome between Posture Types were analyzed including range of motion, strength, clinical outcome scores (Subjective Shoulder Value, Constant Score, SPADI, EQ5D5L), pain and notching.

Results: Of the included 681 patients 225 showed a Posture Type A, 326 Type B, and 130 Type C. The 3 groups showed no relevant differences including patient characteristics, diagnosis, implants used, preoperative range of motion, and clinical scores except for a higher percentage of female patients and lower abduction strength in Group C. The Posture Types showed a significant gender-adjusted difference in terms of active flexion (A: 137±21°; B: 136±20°; C: 131±19°; p = 0.035), passive flexion (A: 140±19°; B: 138±19°; C: 134±18°; p = 0.038), active abduction (A: 127±26°; B: 125±26°; C: 117±27°; p = 0.005), passive abduction (A: 129±24°; B: 128±25°; C: 121±25°; p = 0.016), SPADI (A: 81±18; B: 79±20; C: 73±23; p = 0.005) and pain level (A: 1±2; B: 2±2; C: 2±2; p = 0.023) at 2 year follow-up. No significant gender-adjusted difference was found regarding abduction strength, active external rotation, passive external rotation, active internal rotation, Subjective Shoulder Value, Constant Score, EQ5D5L utilities, and Notching.

Conclusion: The theoretical concept of the influence of scapulothoracic orientation and posture on the achievable outcome after RTSA implantation has been confirmed in this large-scale clinical study. Patients with Posture Type C experience a worse flexion, abduction, SPADI, and pain two years after RTSA implantation despite similar starting condition.

FM016*

The role of bone morphology of the greater tuberosity and lateral acromion on subacromial space during scaption: a three-dimensional dynamic simulation analysis

L. Alejandro Culebras Almeida[1]; Rodrigo Brandariz[2]; Alexandre Lädermann[3]; Caecilia Charbonnier[4]; Gregory Cunningham[5]

[1] Department of Orthopaedic Surgery, Balgrist University Hospital, University of Zürich, Zürich, Switzerland; [2] Shoulder and Elbow Center, Clinique La Colline, Geneva, Switzerland; [3] Division of Orthopaedics and Trauma Surgery, La Tour Hospital, Meyrin

Background: The bone morphology of the greater tuberosity and lateral acromion plays a central role in subacromial impingement syndrome. The critical shoulder angle (CSA) and greater tuberosity angle (GTA) are two-dimensional measurement parameters that have been validated to evaluate it radiologically. These markers are however static and don't take into account the dynamic effect of glenohumeral motion.

Objectives: The aim of this study was to propose a better understanding of the biomechanics in subacromial impingement with a dynamic simulation based on a validated 3D biomechanical model coupling joint kinematics and 3D reconstructed computed tomography.

Study design & Methods: Sixty-one patients were included in this study: 44 with degenerative rotator cuff tears, 17 with glenohumeral instability. Patients with previous surgeries, traumatic cuff tears, and cuff tear arthropathy were excluded. CSA, GTA, and impingement-free range of motion of the glenohumeral joint in scaption (ROM) were calculated. Pearson (r) was used to determine the correlation between CSA and GTA,

while Spearman (R) was used to determine the relationship between ROM and CSA, GTA, and combined CSA and GTA values. A T-test was used to compare group means.

Results: CSA and GTA were significantly higher in the rotator cuff tear group (P = 0.001 and <0.001), while ROM was significantly higher in the instability group (P = 0.001). There was no overall correlation between CSA and GTA (R = 0.02, P = 0.8). Individual correlation between both angles with ROM was negatively weak for CSA and (R = -0.4, P <0.001) and negatively moderate for GTA and ROM (R = -0.5, P <0.001). However, combining both angles resulted in negatively high correlation with ROM (R = -0.7, P <0.001).

Conclusion: Subacromial space narrowing during scaption is highly correlated to the cumulative value of GTA and CSA. These findings suggest that the bony morphology of the lateral acromion and greater tuberosity are equally implicated in subacromial impingement.

FM017

Arthroscopic reconstruction of anteroinferior glenoid rim fractures: Mean 10-year clinical and radiologic results

Elisab Böhm[1]; Andreas Keck[2]; Nina Maziak[2]; Markus Scheibel[1]

[1] Schulthess Klinik Zürich; [2] Charité - Universitätsmedizin Berlin

Introduction: To date, long-term results of arthroscopic reconstruction of glenoid rim fractures are missing. The aim of this study was, to evaluate clinical and radiographic results following arthroscopic reconstruction of anteroinferior glenoid fractures using anchors or bioabsorbable compression screws after a mean follow-up period of 10 years.

Methods: 23 patients (7 female, 16 male, mean age 48 (range, 20-74) years at surgery) with an acute substantial solitary (n = 13) or multifragmented (n = 10) anteroinferior glenoid rim fracture, were enrolled. Clinical outcome measures included evaluation of recurrent instability, Constant Score (CS), Subjective Shoulder Value (SSV), Rowe Score (RS), Western Ontario Shoulder Instability Score (WOSI) and Melbourne Instability Shoulder Score (MISS). X-ray images were obtained for assessment of an instability arthropathy (IA).

Results: After a mean follow-up period of 10 (range, 6-13) years, patients reached a mean CS of 92 (range, 59-100) points, SSV of 93 (range, 50-100)%, RS of 84 (range, 25-100) points, WOSI of 98 (range, 91-99)% and MISS of 91 (range, 69-100) points. No patient suffered recurrent dislocation. Radiographic results were obtained of 18 patients. Signs of IA were noted in nine patients with a progression of IA in all cases in comparison to the preoperative status according to the Samilson and Prieto classification modified by Buscayret. Patients with IA were older than patients without (52 versus 38 years, p = 0.06), however, the difference was not significant. Clinical score results did not show a significant difference in patients with versus without IA except for the RS (74 versus 94 points, p = 0.02). No intra- or postoperative complications were observed, and no patient required revision endoprosthetic surgery.

Conclusion: Arthroscopic reconstruction of acute anteroinferior glenoid rim fractures shows good clinical long-term results. High rates of IA were especially observed in older patients. However, the presence of IA did not seem to influence the subjective shoulder score outcomes.

FM018

Computer-Assisted Planning and Patient-Specific Guides Versus Free-Hand Open Reduction Internal Fixation or Corrective Osteotomy for the Treatment of Symptomatic Midshaft Clavicular Nonunion and Malunion

Bettina Hochreiter; Laura Victoria Saager; Christoph Zindel; Anna-Katharina Calek; Christoph Stern; Karl Wieser ; Christian Gerber

[1]Universitätsklinik Balgrist

BACKGROUND: The aim of this study was to compare the clinical and radiographic outcome of treatment of symptomatic mal- and/or nonunion of midshaft clavicle fractures using radiographically based free-hand ORIF or computer-assisted 3D planned, personalized corrective osteotomies (OT) performed using patient-specific instrumentation (PSI) and/or ORIF. The hypotheses were that (1) patients treated with computer-assisted planning and PSI would have a better clinical outcome and (2) computer-assisted surgical planning would achieve a more accurate restoration of anatomy compared to the free-hand technique.

METHODS: Between 1998 and 2020 13 patients underwent PSI and 34 patients underwent freehand ORIF and/or corrective OT. After application of exclusion criteria 12/13 and 11/34 patients were included. Clinical examination included assessment of the absolute and relative Constant Scores (aCS and rCS), Subjective Shoulder Value (SSV) and Subjective Aesthetic Value (SAV). 11/13 and 6/11 patients underwent postoperative CT evaluation of both clavicles. CT scans were segmented to generate 3D surface models. After projection onto the mirrored contralateral side displacement analysis was performed. Finally, bony union was documented. The average follow-up time was 43 months in the PSI and 50 months in the free-hand cohort.

RESULTS: The clinical outcome of both groups did not differ significantly. Median SSV was 97.5% (70;100) in the PSI group versus 90% (0;100) in the free-hand group; SAV was 86,4% (±10.7) versus 75% (±18.7); CSa was 82.3 (± 10.3) points versus 74.9 (±26) points; and CSr was 86.7 (±11.3) points versus 81.9 (±28.1) points. In the free-hand group 2/11 patients had a postoperative neurological complication. In the PSI cohort, the 3D angle deviation was significantly smaller (PSI/planned vs. free-hand/contralateral: 10.8° (3.1; 23.8) vs. 17.4° (11.6; 42.4); p = 0.020)). There was also a trend towards a smaller 3D shift, which was not statistically significant (PSI/planned vs. free-hand/contralateral: 6mm (3.4; 18.3) vs. 9.3mm (5.1; 18.1); p = 0.342). Bony union was achieved in all cases.

CONCLUSION: Surgical treatment of non- and malunions of the clavicle was associated with very good clinical results and a 100% union rate. This study, in albeit a relatively small cohort, could not document any clinically relevant advantage of 3D planning and personalized operative templating over conventional radiographic planning and freehand surgical fixation.

FM019

2-Year Outcomes after Arthroscopic Biceps Transfer to the Glenoid With Bankart Repair for Recurrent Anteroinferior Glenohumeral Instability in Subcritical Bone Loss

Tiago Martinho[1]; Philippe Collin[2]; Alexandre Lädermann[1]

[1] Hôpital La Tour; [2] Hôpital Américain de Paris

Purpose: To evaluate the short-term outcomes of the arthroscopic dynamic anterior stabilization (DAS), which is a transfer of the intra-articular portion of the long head biceps through the subscapularis split and fixation on the anterior glenoid, combined with a Bankart repair.

Methods: A retrospective evaluation was performed of DAS and a minimum of 2-year follow-up. Inclusion criteria were the presence of anteroinferior instability, a positive apprehension test at 90° of abduction and external rotation, and subcritical glenoid bone loss (less than 20%). Exclusion criteria were severe (≥20%) glenoid bone loss, presence of biceps lesions or rupture (spontaneous or biceps tenotomy), pre-existing glenohumeral osteoarthritis, multidirectional or voluntary instability, previous arthroscopic stabilization procedure, and epilepsy. Outcomes included the Rowe score, range of motion (ROM), and recurrence.

Results: 68 patients were treated with DAS and arthroscopic Bankart repair during the study period. One person was lost to follow-up, leaving 67 patients available at last follow-up. Those 67 patients had an average age of 31.9 ± 12.3 years (range, 18-68) and were evaluated at an average follow-up of 3.2 ± 0.7 years (range, 1.2-4.2). The Rowe score increased from 36.1 ± 16.2 (range, 10-70) preoperatively to 89.8 ± 20.1 (range, 30-100) postoperatively (P <.001) with almost all patients (90.9%) improving their score beyond the minimal clinically important difference of 9.7 points. Postoperatively, ROM was maintained. Three patients (2%) analyzed at final follow-up demonstrated recurrence, one was successfully treated conservatively, but two revised with a Latarjet. No postoperative Popeye deformity, biceps cramping, or other complication were reported.

Conclusions: The DAS procedure may be an option for augmentation of a Bankart repair in patients with anterior shoulder instability and subcritical bone loss. ROM is maintained without evidence of postoperative Popeye deformity or biceps cramping.

FM020

Popeye Sign frequency in patients with tenodesis and tenotomy of the biceps tendon

Farah Selman[1]; Laurent Audigé[2]; Andreas Marc Müller[3]; Annabel Hayoz[4]; ARCR_Pred Study Group[5]; Karl Wieser[1]; Florian Grubhofer[1]

[1] Balgrist Hospital, University of Zurich, Department of Orthopaedics; [2] Schulthess Clinic, Zurich, Switzerland; [3] Basel University Hospital; [4] Orthopädie Sonnenhof - Bern; [5] ARCR_Pred Study Group, Switzerland

Introduction: Significant differences in the incidence of Popeye's sign are found in the literature in patients treated with biceps tenotomy or tenodesis. The purpose of this study was to determine the frequency of Popeye sign and associated outcome in a large multicenter cohort.

Methods: A cohort of 970 primary arthroscopic rotator cuff repair (ARCR) patients were prospectively documented from several Swiss and German orthopaedic clinics up to 24 months postoperatively. All patients who received biceps tendon treatment were included in this study. Patients with previous rupture or treatment of the biceps tendon were excluded. The rate of Popeye sign was assessed in both groups, with and without tenodesis, 1 year postoperatively.

Results: A total of 800 patients were included. 55% (n = 442) were treated with tenodesis and 45% (n = 358) with tenotomy of the long head of the biceps tendon. 20% of patients with tenotomy developed a Popeye sign, whereas only 6.3% of the tenodesis group showed a visible dislocated muscle belly. Patients with tenotomy were 3-times as likely to report a Popeye sign (95% CI 1.9 to 4.8) than if a tenodesis was performed. Regarding shoulder function, there were no significant differences in both groups. The subjective shoulder value (SSV) was affected by an average of 5% in the Popeye group (86 ± 15% vs. 82 ± 19%, p = 0.010).

Conclusion: The risk of Popeye sign is more than 3 times as high following tenotomy compared to tenodesis of the long head of the biceps tendon. The cosmetic result may have a relevant effect on the SSV.

ORALS: A08 BASIC RESEARCH AND QUALITY ASSURANCE

FM021*

Academic involvement of female orthopaedic and trauma surgeons in Switzerland

Ferda Gronki[1]; Corinne Andrea Zurmühle[2]; Frances Weidermann[3]; Mazda Farshad[4]; Ines Unterfrauner[4]

[1] Rennbahnklinik; [2] HFR - Hôpital Cantonal Fribourg; [3] ALTIUS Swiss Sportmed Center; [4] Balgrist University Hospital, University of Zurich

Introduction: As the number of female medical students and trainees increases, the number of female surgeons, especially in the field of orthopaedics and trauma, remains disproportionate. In Switzerland, recent evidence has shown that only around 22% of orthopaedic and trauma surgeons are female. Research on gender distribution among orthopaedic surgeons in leadership and research roles, however, is limited and was the aim of this study.

Methods: A nation-wide analysis was performed to determine the gender distribution of congress chair positions and presenters at the national Swiss orthopaedics annual congress. Furthermore, we examined the ratio between female and male recipients of national orthopaedic awards and fellowships. Finally, the gender distribution of Swiss National Science Foundation (SNSF) research grant winners was assessed for disciplines including orthopaedic and trauma, gynaecology and internal medicine.

Results: In 2022, 24% of all 107 free paper presentations at the national annual congress of the Swiss society for orthopaedics and traumatology were conducted by females as first authors and the rate of female congress chairs was 13%, compared to 18% of female presentations and 4% of female chair positions in 2017. 25% of the five national orthopaedic awards were won by females in 2022, a reduction compared to 38% in 2017. From the 19 national orthopaedic fellowships between 2010 and 2021, only one (5%) was occupied by a female applicant. In the field of research related to orthopaedics, the percentage of females receiving SNSF grants doubled from 29% in 2012 to 64% in 2022. An increased trend was also observed for internal medicine with 31% in 2012 to 42% in 2022, but not in other surgical specialties, such as gynaecology, with 66% in 2012 to 0% in 2022.

Conclusion: In scientific presentations and awards, the gender distribution reflects the overall ratio of females to males in orthopaedic surgery. Exceptions are chair positions at the national Swiss orthopaedics annual congress and national orthopaedic fellowships, where females are underrepresented.

FM022

Biomechanical limitations of partial pediculectomy in endoscopic spine surgery

Anna-Katharina Calek; Christos Tsagkaris; Marie-Rosa Fasser; Jonas Widmer; Vincent Hagel; Mazda Farshad

Universitätsklinik Balgrist

Background: Context Transforaminal endoscopic decompression is an emerging minimally invasive surgical technique in spine surgery. The biomechanical effects and limitations of resections associated with this technique are scarce.

Purpose: The objective of this study was to analyze the effects of three different extents of reduction at the craniomedial pedicle (10%, 25%, and 5 0%) and to compare them with the intact native side. In addition, the influence of bone quality on the resistance of the pedicle after reduction was investigated.

Study Design: Biomechanical cadaveric study.

Methods: Thirty lumbar vertebrae originating from six fresh frozen cadavers were tested under uniaxial compression load in a ramp-to-failure test: (1) the reduced pedicle on one side, and (2) the native pedicle on the other side. Of the 30 lumbar vertebrae, ten were assigned to each reduction group (10%, 25% and 50%).

Results: On the intact side, the median axial compression force to failure was 593 N (442.4 - 785.8). A reduction of the pedicle by 10% of the cross-sectional area resulted in a decrease of the axial load resistance by 4 - 66% compared to the intact opposite side ($p = 0.046$). The median compression force to failure was 381.89 N (range: 336 - 662.1). A reduction by 25% resulted in a decrease of 7 - 71% ($p = 0.001$). The median compression force to failure was 333 N (265.1 - 397.3). A reduction by 50% resulted in a decrease of 39 - 90% ($p < 0.001$). The median compression force to failure was 200.9 N (192.3 - 283.9). At 10% pedicle reduction, the Hounsfield units (HU) value and the absolute force required to generate a pedicle fracture showed significant correlations ($\rho = 0.872$; $p = 0.001$). At 25%, a positive correlation between the two variables could still be identified ($\rho = 0.603$; $p = 0.065$). At 50%, no correlation was found ($\rho = -0.122$; $p = 0.738$).

Conclusion: Resection of the inner, upper part of the pedicle significantly reduces the axial resistance force of the pedicle until a fracture occurs.

Clinical significance: The extent of pedicle reduction itself plays only a limited role: once the cortical bone in the pedicle region is compromised, significant loss of resistance to loading must be anticipated.

FM023

The relation between surgeon volume and early revision rate in total hip arthroplasty: Simulation of minimal volume standards on data from the Swiss National Joint Registry

Andreas Ladurner; Karlmeinrad Giesinger; Vilijam Zdravkovic

Kantonsspital St. Gallen

Introduction: The correlation between surgeon volume and health outcomes have been a matter of debate in recent years. The aim of this study was to assess the influence of the annual surgeon volume on short-term revision rates (within two years from index procedure) in patients undergoing primary total hip arthroplasty (THA) for primary hip osteoarthritis. In addition, the potential for reduction of overall revision rates through implementation of minimal volume standards should be simulated.

Methods: All primary THA for hip osteoarthritis registered in the Swiss National Joint Registry (SIRIS) between 2015 and 2021 were considered (86423 THA implanted by 923 surgeons, patients' and surgeons' names anonymised). The records were aggregated according to the lead surgeon's individual code. Only surgeons that recorded at least five years of uninterrupted and consistent practice were included. By stepwise removing low volume surgeons from lowest up, the effects on overall revision rates have been plotted and tested for significance. For each threshold level the proportional reduction of the revision burden and the number of patients potentially in need for redirection towards a high-volume surgeon were calculated.

Results: In total, 74790 THAs performed by 384 surgeons were used for the analysis and simulation. The mean case load per surgeon was 28.8 THA/year (min/max: 1.8/269.3; median: 18.2). The overall two-year revision rate in the observation period was 2.45%. Higher surgeon volume was associated with lower revision rate. The overall revision rates of surgeons with a minimal

case load of 5 / 10 / 20 / 50 THA/year were 2.45% / 2.38% / 2.21% and 1.88%, respectively. Implementation of a minimal case load of 5 / 10 / 20 / 50 THA/year would reduce the overall two-year revision rates by 0.1% / 3.0% / 9.9% and 23.6%, but also require re-allocating 1% / 5.2% / 18.2% and 53.6% of patients, respectively. All relations were linear without an inflection point that could indicate the best threshold.

Conclusion: Higher surgeon volume is associated with lower overall two-year revision rate in patients undergoing primary THA for hip osteoarthritis in Switzerland. The potential implementation of a minimal case load per surgeon could reduce two-year revision rates, however to the cost of a large number of patients in need for treatment re-allocation towards high-volume surgeons.

FM024*

Repair of Intervertebral Disc Herniations with Surgical-FiberlockTM Technology

Esteban Ongini[1]; Brianna S. Orozco[2]; Andrea Moehl[3]; Ana Peredo[2]; Sonal Mahindroo[4]; Rachel Hillard[2]; Thomas P. Schaer[2]; Robert L. Mauck [2]; Harvey E. Smith[2]; Mazda Farshad[1]; Jess G. Snedeker[1]; Sarah E. Gullbrand[2]

[1] Balgrist University Hospital; [2] University of Pennsylvania; [3] Zurimed Technologies AG; [4] St. Bonaventure University

Introduction: Discectomy is the surgical standard of care to treat symptomatic herniation, however, due to the poor capacity of the annulus fibrosus (AF) to heal, 10-30% of patients with large defects experience recurrent disc herniations. At present, there is no reliable method to heal the AF and prevent recurrent herniations following discectomy. Here we evaluated the potential of Surgical-FiberlockTM technology for rapid attachment of a PET scaffold to over the injury site to repair the AF and prevent re-herniation.

Methods: In vitro a bovine coccygeal model for experimentally induced severe herniation was developed. 28 spine segments were randomly allocated into untreated injury groups, large 6mm annular defect with nucleotomy (discectomy) and without (worst-case), and groups repaired via fiberlocking. All specimens were subjected to stepwise increasing compressive loads to 5 kN. In vivo, four female goats underwent an annular repair surgery of the cervical intervertebral discs. Each animal received either annular injury or injury and repair at either C2-3 or C3-4. C4-5 was utilized as the healthy control. At 4 weeks, all animals were euthanatized and were subjected to MRI at 3T for T2 imaging, compressive mechanical testing (0 to -100N), and histological analysis (H&E stain or trichrome stain).

Results: In vitro, the repair demonstrated substantially increased ultimate failure strength compared to the unrepaired injury in both worst-case ($p = 0.011$; 1.9 ± 1.4 MPa vs 6.6 ± 2.9 MPa) & discectomy scenarios ($p < 0.001$; 1.9 ± 1.3 MPa vs 9.0 ± 4.5 MPa). In vivo, the PET scaffold was successfully implanted. The repair showed trend of increased stiffness and greater T2 nucleolus pulposus signal compared to injured discs. Histology revealed that annular injury resulted in increased fibrous tissue deposition. The fiberlocked PET scaffold was retained at the repair site, with fibers penetrating several lamellae into the AF and Infiltrating cells present throughout the PET scaffold.

Conclusions: Our in vitro and pilot in vivo studies demonstrated the feasibility of annular repair via the Surgical-FiberlockTM technology. Repair of the annulus with the fiberlocked PET scaffold appears to offer substantial mechanical and biological support of robust collagenous matrix formation at the repair site. Evaluation of fiberlocked repairs over longer time periods in vivo will be necessary to further translate this technology to clinical use.

FM025*

Gender distribution of Swiss orthopaedic surgeons

Jessica Stypinski[1]; Corinne Andrea Zurmühle[2]; Frances Weidermann[3]; Mazda Farshad[4]; Ines Unterfrauner[4]

[1] Kantonsspital St. Gallen; [2] HFR - Hôpital Cantonal Fribourg; [3] ALTIUS Swiss Sportmed Center; [4] Balgrist University Hospital, University of Zurich

Introduction: To date, women are widely underrepresented in trauma and orthopaedics, even though more women are currently studying medicine. We aimed to analyse the status quo of the gender distribution in trauma and orthopaedics in Switzerland and analyse the evolution of such during the career path of becoming an orthopaedic surgeon over the past ten years.

Methods: A nation-wide survey was conducted to investigate the gender distribution over the time period of the last ten years up to now. First, the gender distribution in all six years of medical school was assessed at the main Swiss medical universities Zurich, Basel, Berne, Lausanne, Fribourg and Geneva. Further, we examined the distribution between female and male orthopaedic surgeons with hospital-intern data.

Results: The female participation rate of the medical entrance exam increased from 60% in 2013 to 64% in 2022, with a success rate of 56% in 2013 compared to 62% in 2022. The mean percentage of female students increased from 58% in 2012 to 63% in 2022. Among all orthopaedic surgeons in Switzerland, 22% were females in 2022 compared to 18% in 2017. Regarding the gender representation on the various levels at orthopaedic departments, the percentage of both female residents and junior consultants increased from 27% and 18% in 2017 to 36% and 25% in 2022, respectively. However, the percentage of female senior consultants and chief of departments remained stable with approximately 13% and 8%, respectively.

Conclusion: Over the last years, the number of female medical students increased up to more than 60%. However, the overall percentage of female orthopaedic surgeons is with 22% - albeit with rising tendency- still low. Whereas the number of female residents and junior consultants increased over the last years in orthopaedic training, females are still in minority for advanced positions.

FM026*

Multilevel contribution of passive structures in the spine – a cadaveric stepwise reduction study on the torso

Moritz Jokeit[1]; Frédéric Cornaz[2]; Anna-Katharina Calek[2]; Cooper L. Harshbarger[3]; Jess G. Snedeker [4]; Mazda Farshad[2]; Jonas Widmer[1]

[1] Spine Biomechanics, Department of Orthopedics, Balgrist University Hospital Zurich, University of Zurich, Switzerland; Institute for Biomechanics, ETH Zurich, Zurich, Switzerland; [2] Department of Orthopedics, Balgrist University Hospital Zurich

Introduction: Although many stabilizing structures act in a multi-level fashion, most studies have investigated the passive structures of the spine in isolated, single-level specimens ("functional units"). Little is known about how the upper body is stabilized on a global scale and how forces are distributed between ligaments, muscles, and fasciae. The aim of this study was to quantify the contribution of multilevel passive structures in the load case of full flexion.

Methods: A stepwise reduction study was performed on a cadaveric torso (n = 1*) using a custom-built setup with rigid 6-screw fixation of the pelvis. An external fixator at Th11, Th9, and Th7 was used to mount the torso on a mobile frame that allowed only sagittal plane motion. Preloading (dead load of trunk and frame, relaxation time: >30 min) was followed by locking of the

mobile frame and gradual resection of the posterior lumbar structures in full flexion. Load cells between base and frame measured the force on the frame for each resection step: skin, latissimus dorsi muscle, serratus posterior inferior muscle, lateral abdominal muscles (obliquus internus/externus and transversus abdominis muscle), thoracolumbar fascia, sacrospinal musculature, interspinal and transversospinal musculature, spinous processes L2-L5 incl. supraspinous and interspinous ligaments, laminae L2-L5 incl. ligamentum flavum, facet joints and pedicles L2-L5, posterior longitudinal ligaments L1/2-L5/S1. The contribution of each structure was derived from the change in force.

Results: Skin, latissimus dorsi muscle, serratus posterior inferior muscle, and lateral abdominal muscles contributed <5% to flexion resistance. Thoracolumbar fascia, sacrospinal musculature, interspinal/transversospinal musculature shared 9%, 15%, and 9% of loading, respectively. The spinal processes with SSL & ISL contributed 41% to passive loading resistance. The laminae incl. LF withstood 7%, and facet joints/pedicles sustained 11% of loading. PLLs showed no contribution.

Conclusion: The posterior ligamentous complex (SSL, ISL) plays an important role in full flexion and may have been underestimated in studies investigating "functional units".

* Experiments are ongoing, and the number of specimens tested will increase from n = 1 to n = 3.

FM027

Vertebropexy as a semi-rigid ligamentous alternative to lumbar spinal fusion

Mazda Farshad ; Christos Tsagkaris; Jonas Widmer; Marie-Rosa Fasser; Frédéric Cornaz; Anna-Katharina Calek

Universitätsklinik Balgrist

Purpose: To develop ligamentous vertebral stabilization techniques ("vertebropexy") that can be used after microsurgical decompression (intact posterior structures) and midline decompression (removed posterior structures) and to elaborate their biomechanical characteristics.

Methods: Fifteen spinal segments were biomechanically tested in a stepwise surgical decompression and ligamentous stabilization study. Stabilization was achieved with a gracilis or semitendinosus tendon allograft, which was attached to the spinous process (interspinous vertebropexy) or the laminae (interlaminar vertebropexy) in form of a loop. The specimens were tested (1) in the native state, after (2) microsurgical decompression, (3) interspinous vertebropexy, (4) midline decompression, and (5) interlaminar vertebropexy. In the intact state and after every surgical step, the segments were loaded in flexion-extension (FE), lateral shear (LS), lateral bending (LB), anterior shear (AS) and axial rotation (AR).

Results: Interspinous vertebropexy significantly reduced the range of motion (ROM) in all loading scenarios compared to microsurgical decompression: in FE by 70% ($p < 0.001$), in LS by 22% ($p < 0.001$), in LB by 8% ($p < 0.001$) in AS by 12% ($p < 0.01$) and in AR by 9% ($p < 0.001$). Interlaminar vertebropexy decreased ROM compared to midline decompression by 70% ($p < 0.001$) in FE, 18% ($p < 0.001$) in LS, 11% ($p < 0.01$) in LB, 7% ($p < 0.01$) in AS, and 4% ($p < 0.01$) in AR. Vertebral segment ROM was significantly smaller with the interspinous vertebropexy compared to the interlaminar vertebropexy for all loading scenarios except FE. Both techniques were able to reduce vertebral body segment ROM in FE, LS and LB beyond the native state.

Conclusion: Vertebropexy is a new concept of semi-rigid spinal stabilization based on ligamentous reinforcement of the spinal segment. It is able to reduce motion, especially in flexion-extension. Studies are needed to evaluate its clinical application.

FM028

Effects of the type of bearing and cup inclination on bone / cup interfacial stress after total hip arthroplasty

Julien Wegrzyn [1]; Alexander Antoniadis[1]; Amirsiavosh Bashardoust[2]; Lore Hoffmann[2]; Alexandre Terrier[2]

[1] CHUV; [2] EPFL

Introduction: Higher risk of 2-year revision for cup aseptic loosening has been recently reported with ceramic-on-ceramic bearing compared to ceramic-on-polyethylene bearing in total hip arthroplasty (THA). Besides, assuming that stiffness of the acetabular construct has a role in occurrence of aseptic loosening, the single mobility (i.e.: conventional) versus dual mobility bearings could also affect the bone-cup mechanical state and interfacial stress as well as the type of polyethylene. The study aimed to evaluate whether the type of bearing and mechanical properties of the acetabular construct can affect the interfacial stress at the bone-cup interface. In addition, a variation in cup inclination relative to the pelvis was considered and evaluated.

Methods: A numerical model was developed to evaluate the effect of the type of bearing and cup inclination on the interfacial stress between the acetabular bone and the metal-back. Five acetabular constructs were compared: single mobility ceramic-on-ceramic (SCC), single mobility ceramic-on-XLPE (SCX), dual mobility ceramic-on-XLPE (DCX), single mobility ceramic-on-PE (SCP), dual mobility ceramic-on-PE (DCP). The cup inclination was varied from -15 (downward) to +15° (upwards) relative to the acetabulum (45°). A force of 2000 N was applied on the femoral head with an angle of 30°, while the pelvis was fixed on the sides. The following results were evaluated at the bone-metal interface: maximal contact shear stress (MPa), shear stress above 10 MPa (%), and bone (maximal principal) strain above 1% (%).

Results: Maximal shear stress was 34.9 for SCC, 34.2 for SCX, 34.1 for DCX, 33.5 for SCP, 33.3 for DCP. It was rather stable (32-35) from -15 to 5° of cup inclination, followed by a decrease for all cases (25-28). Percentage of shear stress >10 MPa was 51.3 for SCC, 49.6 for SCX, 49.6 for SDX, 47.8 for SCP, 47.8 for and DCP. It increased slightly from -15 to -5° of cup inclination, was stable between -5 and 7.5°, and then decreased to the values at -15°. Percentage of bone strain was 27.6 for SCC, 27.3 for SCX, 26.3 for DCX, 26.3 for SCP, 24.5 for DCP. It was stable from -15 to 7.5° of cup inclination, and then decreased.

Conclusion: This preliminary study confirmed that mechanical properties of the bearing surfaces and cup inclination affect the bone-cup interfacial stress, and potentially aseptic loosening after THA. Highest interfacial stress and strain observed with SCC might explain its higher loosening rate.

FM029

Isometric Points in Cerclage for Patellar Tendon Repair: A 3-Dimensional, Weightbearing Computed Tomography Kinematic Simulation

Christoph Zindel; Sandro Hodel; Cand. Yichao Luo; Michel Meisterhans; Sandro F. Fucentese; Lazaros Vlachopoulos

Universitätsklinik Balgrist

Background: Rupture of the patellar tendon is a rare pathology. The gold standard for its management is the surgical repair with nonabsorbable sutures and additional reinforcement e.g. cerclage wires as described by McLaughlin in 1947. Despite the early description, the exact placement of such cerclage wires remains unclear.

Purpose: The aim of the study was (1) to analyze the elongation of the medial and lateral bracket of the McLaughlin cerclage during knee flexion and (2) to define the most isometric insertion points at the patella and tibial tuberosity (TT) and report quantitative radiographic landmarks.

Methods: 3D simulations of 10 healthy knees in the range from 0° to 120° of flexion using weightbearing computed tomography scans were generated. 12 insertion points were defined at the patella in equal distances along the lateral and medial border from the base to the apex. 42 insertion points were defined at the TT in a 3.5 x 4.0 cm large grid around its center. A string simulation algorithm was used to calculate the length variation for all possible combinations of the cerclage wires from 0° to 120° flexion. Relative length changes were reported as% of the initial string length and the isometry was found using the isometric score (0 indicating perfect isometry). Two-tailed paired t-test was applied for subgroup analysis. The most isometric location was reported using quantitative radiographic landmarks in a true lateral view.

Results: The mean elongation of the medial and lateral bracket was 2.3 mm ± 1.8mm (2.2% ± 1.4%) and 1.1 mm ± 0.1mm (1.0% ± 0.1%) for the most isometric point starting mainly at 90° of flexion. There was no significant difference between the medial and lateral bracket ($p = 0.09$). The most isometric insertion at the TT is distally ($p < 0.01$) and towards the center of the TT ($p < 0.01$). The insertion on the patella is insensible, as long as the patella is not bypassed proximally ($p < 0.01$). No significant difference in elongation was shown for reduced ROM in flexion. The most isometric points at the TT is located 61 mm distal to the joint line and 5mm from the anterior border of the TT in a true lateral view.

Conclusion: Elongation of the McLaughlin wire cerclage can be reduced when choosing a most distal and central insertion on the TT. Using this isometric points there is no relevant elongation up to 90° flexion and therefore a limitation of the flexion up to 90° of flexion might not be necessary.

FM030*

Patellofemoral arthroplasty with onlay prosthesis leads to higher rates of osteoarthritis progression than inlay design implants: A systematic review

Manuel-Paul Sava; Giorgos Neopoulos; Alexandra Leica; Michael T. Hirschmann

Kantonsspital Baseland Bruderholz, Liestal, Laufen

Purpose: The aim was to report the clinical and functional outcomes, complication rates, implant survivorship and the progression of tibiofemoral osteoarthritis (OA), after new inlay or onlay patellofemoral arthroplasty (PFA), for isolated patellofemoral OA. Comparison of different implant types and models, where it was possible, also represented one of the objectives.

Materials and Methods: A systematic literature search following PRISMA guidelines was conducted on PubMed, Scopus, Embase and Cochrane databases, to identify possible relevant studies, published from the inception of these databases until 11.11.2022. Randomized control trials (RCTs), case series, case control studies and cohort studies, written in English or German, and published in peer-reviewed journals after 2010, were included. Additionally, only articles that assessed functional and/or clinical outcomes, patient-reported outcomes (PROMs), radiographic progression of OA, complication rates, implant survival rates, pain, as well as conversion to TKA rates in patients treated with PFA, using inlay or onlay trochlea designs, were included. For quality assessment, the Methodological Index for Non-Randomized Studies (MINORS) for non-comparative and comparative clinical intervention studies was used.

Results: The literature search identified 404 articles. 29 of them met all the inclusion criteria following the selection process. Median MINORS for non-comparative studies value was 12.5 (range 11-14), and for comparative studies 20.1 (range 17-24). In terms of clinical and functional outcomes, no difference between onlay and inlay PFA has been described. Both designs yielded satisfactory results at short, medium and long-term follow-ups. Both designs improved pain postoperatively and no difference between them in terms of postoperative VAS has been noted, although the onlay groups presented a higher preoperative VAS. When comparing the inlay to onlay trochlea designs, the inlay group displayed a lower progression of OA rate.

Conclusion: There is no difference in functional or clinical outcomes after PFA between the new inlay and the onlay designs, with both presenting an improvement in most of the scores that were used. A higher rate of OA progression was observed in the onlay design group.

FM031*

Open wedge high tibial osteotomy shows relevant impact on tibiofemoral and patellofemoral joint kinematics of the knee in a multibody simulation model

Maximilian Jörgens[1]; Lennart Schröder[1]; Sonja Grothues[2]; Josef Brunner[1]; Klaus Radermacher[2]; Boris Michael Holzapfel[1]; Julian Fürmetz[1]

[1] Ludwig Maximilians Universität München; [2] RWTH Aachen University

Introduction: Observations of the effect of medial open-wedge high tibial osteotomy (owHTO) on knee joint kinematics are lacking and further research is needed tp predict surgical outcome. Therefore, the aim of this study was to investigate the relationship between owHTO, morphology and biomechanics of the knee joint using a multibody simulation model.

Methods: owHTO with an open tibial wedge of 6mm to 12mm (1mm intervals) was virtually performed on each of eight three-dimensional (3D) computer-aided-design-models (CAD models) derived from computer tomography scans of full-leg cadaver specimens. By using a multibody simulation model of the native knee, for each owHTO version an individual biomechanical simulation model was built and knee flexion from 10° to 90° was simulated. Morphologic and alignment parameters as well as tibiofemoral and patellofemoral kinematic parameters were evaluated.

Results: Almost linear changes of tibial tuberosity to trochlear groove distance (TT-TG) as well as medial proximal tibial angle (MPTA) were observed. The greatest biomechanical effect was seen with tibiofemoral internal-external rotation. A decrease in the degree of tibial internal rotation during knee flexion of approximately 0.5° was observed for each 1-mm increase in coronal correction. Furthermore, the osteotomy resulted in abnormal medial translation of the tibia, as well as lateral translation and tilting of the patella.

Conclusion: The simulation of different owHTO showed a manifold impact on morphological parameters and on the kinematics of the knee joint. The effects on the patellofemoral joint, especially with a biplanar cut towards proximal, should be considered when performing owHTO. The increase in TT-TG and tibial internal rotation leads to lateralisation of the patella and increased retropatellar pressure, which could be a reason for anterior knee pain in owHTO.

FM032

Cyclic loading of a stand-alone ALIF device with integrated screws in osteopenic and osteoporotic cadavers at level L5/S1: an in vitro cadaveric biomechanical study

Alina Jacob[1]; Maximilian Heumann[1]; Ivan Zderic[1]; Sascha Lauterborn[1]; Peter Varga[1]; Daniel Haschtmann[2]; Tamas Fekete[2]; Boyko Gueorguiev[1]; Markus Loibl[2]

[1] AO Research Institute Davos, Switzerland; [2] Schulthess Clinic, Zurich, Switzerland

Introduction: Anterior lumbar interbody fusion (ALIF) devices with integrated screws might alleviate the need of supplemental fixation via an additional posterior approach. At present, most manufacturers do not recommend the use in osteoporotic patients. Initial stability may be impaired by repeated movements of the spine during everyday activity with potential implant loosening and failure. The purpose of this study was to evaluate the extended biomechanical stability under cyclic loading of a PEEK cage with an integrated angular-stable locking plate at the lumbosacral junction in osteopenic and osteoporotic specimens.

Methods: For specimen selection quantitative computed tomography was performed and BMD of L5 vertebra was measured using AMIRA. BMD threshold value of ≤ 120mgCaHA/cm3 equivalent of Osteopenia (T Score <-1) was used. Six osteopenic human cadaveric spines (L4-sacrum) were instrumented with SynFix-LR™ (DePuy Synthes) at L5/S1. The range of motion (ROM) was determined in flexion-extension, lateral bending, and axial rotation. Subsequently, sinusoidal axial compression loading between 100 N and 1100 N for 2000cycles was performed. The ranges of motion (ROM) of the index level and cranial adjacent segment were assessed using an optoelectronic system. Implant loosening was quantified as increase of ROM. A radiograph was taken every 100th cycle to identify potential cage subsidence or displacement during repetitive loading.

Results: BMD ranged from 58–112 mgCaHA/cm3. In all specimens, range of motion increased during cyclic loading, representing significant screw loosening after 2000 cycles. Greatest increase was detected in flexion-extension up to (165%) followed by axial rotation (159%) and lateral bending up (157%). Most of the constructs settled in after initial subsidence during the initial 500 cycles. However, all cages subsided.

Conclusion: The biomechanical stability of an ALIF device with integrated screws in osteopenic and osteoporotic cadavers at level L5/S1 is impaired by repetitive axial loading, causing an increase especially in flexion-extension motion and subsidence into adjacent vertebrae. The early postoperative phase seems to be vulnerable to implant loosening and subsidence for patients of low lumbar BMD. For additional stability, supplemental posterior instrumentation might be required in patients with reduced BMD to maintain primary stability.

FM033*

Ex vivo model for optimization of pre-conditioned human nasal chondrocytes for nucleus pulposus repair

Raphael Schmid[1]; Jesil Kasamkattil[1]; Anna Gryadunova[1]; Karoliina Pelttari[1]; Ivan Martin[1]; Stefan Schären[2]; Andrea Barbero[1]; Olga Krupkova[1]; Arne Mehrkens[2]

[1] Departement Biomedizin, Universität Basel und Universitätsspital Basel; [2] Unispital Basel

Background: The success of cell-based intervertebral disc (IVD) therapies is still limited, also because of degenerative environment that restricts the survival and function of therapeutic cells. Spheroids generated from human nasal chondrocytes (NCS) can survive in microenvironment simulating degenerative disc disease (DDD). However, the function of NCS for therapeutic use should still be enhanced. In order to optimize the therapeutic function of NCS, we have developed an ex-vivo pre-clinical model that closely recapitulate early-stage DDD.

Methods: Our ex vivo model is based on bovine IVD cultured under dynamic physiological loading in a bioreactor for 7 days. To mimic early-stage DDD, nucleus pulposus (NP) was digested with chondroitinase ABC (ChABC). Additionally, the IVDs were cultured in hypoxia, low glucose, acidity, and low-grade inflammation (DDD condition), recapitulating the low nutrient inflammatory environment of DDD. Pre-conditioned NCS were formed for 3 days together with Iron Oxide nanoparticles and injected into the ChABC-DDD model for additional 7 days.

Results: Culturing bovine IVD under dynamic physiological loading in a bioreactor in DDD condition for 7 days is causing degradation of proteoglycan (PG) and the consequent loss of water content important for weight bearing capacity, as shown by MRI T2. Histological analyses revealed significantly higher number of apoptotic cells (Caspase-3) and a shift towards catabolic/pro-inflammatory state (MMP-13, IL-8) compared to control IVDs.

Localization of Pre-conditioned NCS with Iron oxide inside the NP and retention in harsh DDD environment were determined by T2 MRI, showing no leakage of cells after 7 days of culture. Pre-conditioning NCS lead to increased survival in DDD environment (Caspase-3) and increased anti-inflammatory activity.

Conclusion: The ChABC-DDD ex vivo model recapitulates early-stage IVD disease. We demonstrated that NCS can be injected into the model without leakage of cells while retaining in the harsh DDD environment. Pre-conditioning increases NCS cell survival as well as anti-inflammatory activity.

FM034

A novel Z-plasty lengthenging augmentation approach using the Surgical-Fiberlock technology

Arend-Jan Christiaan Nieuwland[1]; Jess G. Snedeker[2]; Andrea Moehl[3]; Elias Bachmann[3]; Thomas Dreher[4]

[1] Universitätsklinik Balgrist; [2] Laboratory for Orthopaedic Biomechanics, Institute for Biomechanics, ETH Zürich; [3] ZuriMED Technologies AG; [4] Universitäts-Kinderspital Zürich, Zürich

Introduction: Tendon lengthening and tendon shortening are common lower limb surgical procedures in pediatric orthopaedics. Healing of the tendons is typically supported by casting and unloading the operated limb. Tendon rupture or overcorrection may result as an adverse effect. Little is known on the stability of Z-plasty tendon lengthening and whether an augmentation may increase stability and alter postoperative treatment.

Methods: In a randomized in-vitro study, 18 bovine flexor tendons were lengthened or shortened using standard Z-plasty

approach. After randomization, a conventional surgical technique by suturing the Z-plasty was used as a control. In experimental group 1 (E1), an additional augmentation on top of the existing suture approach with a Fiberlock patch was performed. In experimental group 2 (E2), tendon fixation was done only with a reinforced patch not using any sutures on top of a Pulvertaft repair. A universal material testing machine Z010 (ZwickRoell GmbH, Ulm, Germany) was used for testing and data was recorded with its dedicated software (testXpert III ZwickRoell, Ulm, Germany).

Results: The Fiberlock patch augmented suture repair (E1) showed significant increases compared to the control in ultimate failure force (481.7 ± 106.9 N vs. 205.8 ± 36.9 N, p = 0.0004) and linear stiffness (40.8 ± 6.9 N/mm vs. 26.2 ± 8.8 N/mm, p = 0.0052). Sutureless treatment (E2 group) did not show any significant differences in ultimate failure force or linear stiffness compared the control group.

Conclusion: The augmentation using the Surgical-Fiberlock technology indicates biomechanical superiority regarding ultimate failure force and is therefore a promising new approach for strengthening a Z-plasty tendon lengthening. This may enable early mobilization with or even without casting after tendon lengthening or tendon shortening. Similarly, stability of tendon sutures reducing the risk of overcorrection or undercorrection may be improved. In-vivo testing in future studies are planned to proof advantages of such augmentation techniques for clinical routine and patient related outcomes.

FM035

Nanoghosts: towards IVD repair by cell membrane-based gene delivery

Anna Gryadunova; Boris Dasen; Stefan Schären; Ivan Martin; Andrea Barbero; Olga Krupkova; Arne Mehrkens

Departement Biomedizin, Universität Basel und Universitätsspital Basel

INTRODUCTION: Cell-based therapy for intervertebral disc (IVD) repair is still limited by the harsh cellular microenvironment found in degenerated discs. At the same time, gene therapy in primary nucleus pulposus (NP) cells remains challenging due to their incompatibility with clinically safe nonviral methods such as liposome-based transfection or electroporation. The present study explores nanoghosts (NG), nanosized vesicles derived from cellular membranes, as a gene delivery tool for IVD repair.

METHODS: NG were produced from mesenchymal stem cells (MSCs) as described before (Kaneti et al., 2016) and their morphology, yield, size, colloidal stability, and loading capacity were analyzed by nanoparticle tracking analysis (NTA) and scanning electron microscopy (SEM). CRISPR dCas9-SAM upregulating endogenous GDF-5 was constructed and validated with RT-qPCR in various cell types in vitro.

RESULTS: We provided a proof of concept that generated CRISPR dCas9-SAM can activate GDF-5 gene expression (from 103 to 104-fold) in HEK293 and immortalized human chondrocytes with transfection efficiency of 55.4±0.9%. As expected, transfection of NP cells using conventional methods didn't lead to upregulation of the target gene. As a potential gene delivery tool, NG were successfully generated and thoroughly characterized. Notably, treatment with empty NGs had no impact on inflammation and catabolism in NP cells and did not cause any cytotoxic effects at a concentration of up to 400 NGs/cell. Imaging of NP cells targeted by NG loaded with chitosan-488 suggested nanoparticle distribution in the cytoplasm.

CONCLUSION: Our data support the functionality of NG produced from MSCs and their biocompatibility with NP cells, thereby implying NG suitability for potential IVD repair. Future studies will address the capacity of CRISPR SAM GDF-5 loaded into NG to upregulate endogenous gene expression in degenerated IVD.

FM036*

The effect of bone cement augmentation depends on the quality of the cement flow in spines with poor bone quality

Christos Tsagkaris[1]; Frédéric Cornaz[1]; Mazda Farshad[2]; Jonas Widmer[1]

[1] Spine Biomechanics, Balgrist University Hospital, University of Zurich / Institute for Biomechanics, ETH Zurich; [2] University Spine Center Zürich, Balgrist University Hospital, University of Zurich

Introduction: Cement augmentation of pedicle screws generally increases the global mechanical resilience of the instrumented vertebrae. However, literature shows that bone cement flow can be poor in spines with bad bone quality and the cement can flow away from the screw. The effect of cement augmentation in such cases is however largely unknown. This study therefore analyzes the local support of cemented and non – cemented low bone quality vertebral bodies in dependence of cement flow quality.

Methods: 22 pedicle screws were inserted into 11 cadaveric lumbar vertebrae with low bone quality. Radiopaque bone cement was injected into the corpus region through the screws' lumen in alternate sides. The specimens were subsequently split in cemented and non – cemented halves in the midsagittal plane and horizontally along the screw axis. They were potted into CT transparent boxes using Polymethyl methacrylate. Imprint tests with a 6 mm long pedicle screw section in a caudal direction perpendicular to the screw surface were performed in the corpus region. Micro-CTs were acquired before and after testing to analyze the screw location and trajectory, and the flow of the cement. Good cement flow was defined as cement deposition in a length of at least three pedicle screw threads and a depth of at least one pedicle screw thread under the pedicle screw. Reconstructed micro-CT data were used to evaluate the pressures at the screw piece surface at 0.5, 1.0 and 1.5 mm displacement. Statistical analysis including descriptive statistics and Wilcoxon signed-rank test was performed on Matlab.

Results: One specimen was excluded due to a fracture detected after the instrumentation. Good cement flow was achieved in 3 out of the remaining 10 specimens (27%), which exhibited 12 (p = 0.1) times higher resilience compared to the non-cemented controls, while in vertebrae with bad cement flow, the local bone support was 1.8 (p = 0.3) times higher. At 0.5, 1.0 and 1.5 mm displacement, the median of local mechanical resilience was respectively 2.6 (p = 0.07), 3.9 (p = 0.03) and 3.0 (p = 0.03) times higher for the cemented corpus regions.

Conclusion: In patients with low bone quality, pedicle screw augmentation with cement can increase the local mechanical resistance of the vertebral body to loads in axial direction. Good cement flow maximizes the improvement in bone quality; whereas the effect with bad cement flow is markedly smaller. Cement flow needs to be monitored in this demographic

FM037*

Artificial Intelligence Accurately Detects Traumatic Thoracolumbar Fractures on Sagittal Radiographs

Guillermo Sanchez Rosenberg[1]; Andrea Cina[2]; Giuseppe Rosario Schiró[3]; Pietro Domenico Giorgi[3]; Boyko Gueorguiev[4]; Mauro Alini[4]; Peter Varga[4]; Fabio Galbusera[2]; Enrico Gallazzi[5]

[1] Universitätsspital Basel (USB); [2] Schulthess Clinic, Zurich, Switzerland; [3] ASST GOM Niguarda; [4] AO Research Institute Davos, Switzerland; [5] ASST Gaetano Pini-CTO

Background and Objectives: Commonly being the first step in trauma routine imaging, up to 67% fractures are missed on plain radiographs of the thoracolumbar (TL) spine. The aim of this study was to develop a deep learning model that detects traumatic fractures on sagittal radiographs of the TL spine. Identifying vertebral fractures in simple radiographic projections would have a significant clinical and financial impact, especially for low- and middle-income countries where computed tomography (CT) and magnetic resonance imaging (MRI) are not readily available and could help select patients that need second level imaging, thus improving the cost-effectiveness.

Materials and Methods: Imaging studies (radiographs, CT, and/or MRI) of 151 patients were used. An expert group of three spinal surgeons reviewed all available images to confirm presence and type of fractures. In total, 630 single vertebra images were extracted from the sagittal radiographs of the 151 patients—302 exhibiting a vertebral body fracture, and 328 exhibiting no fracture. Following augmentation, these single vertebra images were used to train, validate, and comparatively test two deep learning convolutional neural network models, namely ResNet18 and VGG16. A heatmap analysis was then conducted to better understand the predictions of each model. Results: ResNet18 demonstrated a better performance, achieving higher sensitivity (91%), specificity (89%), and accuracy (88%) compared to VGG16 (90%, 83%, 86%). In 81% of the cases, the "warm zone" in the heatmaps correlated with the findings, suggestive of fracture within the vertebral body seen in the imaging studies. Vertebras T12 to L2 were the most frequently involved, accounting for 48% of the fractures. A4, A3, and A1 were the most frequent fracture types according to the AO Spine Classification.

Conclusions: ResNet18 could accurately identify the traumatic vertebral fractures on the TL sagittal radiographs. In most cases, the model based its prediction on the same areas that human expert classifiers used to determine the presence of a fracture.

ORALS: MAURICE E. MUELLER BEST PAPER NOMINEES

FM038

Shoulder Pacemaker versus conventional physiotherapy for treatment of functional posterior shoulder instability- a multicentric, prospective, randomized controlled trial

Philipp Moroder; Mark Tauber; Markus Scheibel; Christian Gerhardt; Thilo Patzer; Mathias Wellmann; Laurent Audigé

Schulthess Clinic

Introduction: Functional posterior shoulder instability (FPSI) is a severe type of instability mostly affecting teenagers and young adults that leads to loss of function, pain, and stigmatization among peers. An experimental non-surgical treatment protocol based on motion-activated functional electrical stimulation called the Shoulder Pacemaker concept (SPM) showed very promising early results in the treatment of FPSI.

The hypothesis of this study was that SPM-enhanced physiotherapy (SPM-PT) leads to better outcome than physiotherapy (PT) alone as current gold standard of treatment in patients suffering from FPSI.

Methods: In this multicentric randomized controlled trial with independent data storage and analysis, as well as independent study advisory board patients with FPSI (Type B1 according to the ABC classification) were randomly allocated in a 1:1 ratio either to 6-weeks PT including exercises determined in prior Delphi survey or PT with simultaneous Shoulder Pacemaker stimulation (SPM-PT). Baseline scores, as well as outcome scores at 6 weeks, 3 months, 6 months, and 12 months after the intervention were obtained. Prior to the beginning of the trial, the study design along with the 3-months Western Ontario Shoulder Instability Index (WOSI) as main outcome measurement was registered online, a power- analysis was performed, and ethical committee approval was obtained.

Results: Forty-nine patients were randomized and eligible for the trial. The SPM-PT group showed a significantly better main outcome measurement in terms of the 3-month WOSI Score (64±16% vs. 51±24%; p = 0.047). Two thirds of the patients from the PT group crossed over to the SPM-PT group due to dissatisfaction after the 3-month follow-up and showed a significant increase in their WOSI Score from 49±8% to 67±24% (p = 0.023). The frequency of instability episodes showed a significant improvement in the SPM-PT group at 3 months follow-up (p = 0.001) and beyond (6 months: p = 0.001, 12 months: 0.004), while in the PT group no significant difference was observed (p = 0.481).

Conclusion: The current study shows that SPM-enhanced physiotherapy leads to statistically significant and clinically relevant improvement of outcomes in the treatment of functional posterior shoulder instability compared to conventional physiotherapy alone from which even patients with prior unsatisfactory results after conventional physiotherapy can benefit.

FM039*

Robotic-assisted total knee arthroplasty does not provide relevant clinical and radiological improvements in mechanically aligned implants: a systematic review and meta-analysis

Alessandro Bensa[1]; Alessandro Sangiorgio[1]; Luca Deabate[1]; Andrea Illuminati[2]; Benedetta Pompa[1]; Giuseppe Filardo[1]

[1] EOC (Ente Ospadaliero Cantonale) - Ospedale Regionale di Lugano; [2] Ospedale San Raffaele, Università Vita-Salute San Raffaele

Introduction: Robotic-assisted total knee arthroplasty (R-TKA) has emerged as an alternative to improve the results of the conventional manual TKA (C-TKA). The aim of this study was to analyze the high-level studies comparing R-TKA and C-TKA in terms of clinical outcomes, radiological results, perioperative parameters, and complications.

Methods: The literature search was conducted on three databases (PubMed, Cochrane and Web of Science) on February 1, 2023 according to the guidelines for Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). Inclusion criteria were: randomized controlled trials (RCTs), written in English language, published in the last 15 years, focusing on the comparison of C-TKA and R-TKA results. The quality of each article was assessed using the Cochrane risk-of-bias tool for randomized trials Version 2 (RoB 2).

Results: Among the 2905 articles retrieved, 14 RCTs on 12 series of patients treated with mechanically aligned implants were included. A total of 2255 patients (25.1% males and 74.9% females; mean age 62.9 ± 3.0; mean BMI 28.1 ± 1.3) was analyzed. The results of this systematic review and meta-analysis showed that R-TKA did not provide overall superior results compared to C-TKA in mechanically aligned implants in terms of clinical and radiological outcomes. R-TKA showed longer operative time (mean difference (MD) = 15.3 minutes, p = 0.004), a tendency towards inferior blood loss, and similar complication rates compared to C-TKA. A statistically significant difference in favor of R-TKA was found in the PS subgroup in terms of radiological outcomes (hip-knee-ankle angle MD = 1.7, p <0.001) compared to C-TKA, although without resulting in appreciable difference of clinical outcomes.

Conclusion: R-TKA did not provide overall superior results compared to C-TKA in terms of clinical and radiological outcomes, showing longer operative time, a tendency towards inferior blood loss, and similar complication rates. While experienced surgeons seem not to benefit from the current approaches, future studies should investigate if further technical improvements will translate in clinically relevant benefits for patients undergoing TKA.

FM040

Sex-specific implant fixation can reduce revision rates in total hip arthroplasty: Evidence from the Swiss National Joint Registry

Andreas Ladurner; Vilijam Zdravkovic; Karlmeinrad Giesinger

Kantonsspital St. Gallen

Aims: To assess the sex-specificity of risk factors for periprosthetic femoral fractures (PFF) or aseptic stem loosening (ALF) following total hip arthroplasty (THA) in a nationwide cohort study.

Methods: A sex-specific assessment of patients registered in the Swiss National Joint Registry (nationwide coverage:

94.9%), who received uncemented or hybrid THA for hip osteoarthritis, was performed. Uncemented and hybrid THA subsets for both sexes were obtained using propensity score matching (1:1). The primary outcome parameter was revision for PFF or ALF (2-year follow-up). Recursive partitioning analysis was performed to analyze factors that influenced the primary outcome parameter.

Results: In total, 86,423 THAs were analyzed. A trend toward fewer revisions (2.4% vs 2.7%, p = 0.055) was observed in female patients 2 years after index surgery. The propensity-score-matched female cohort consisted of 13,167 patients (mean age: 77.5 years). PFFs were most significantly associated with uncemented THA fixation (p <0.0001) and age (p <0.01, calculated threshold: 70.5 years). ALF was solely associated with patient age of <65 years (p = 0.023). The male cohort included 5,684 participants (mean age: 76.2 years). PFFs were associated exclusively with an American Society of Anesthesiologists (ASA) score >2 (p = 0.026). The risk for ALF was not correlated to the mode of THA fixation or patient age, body mass index (BMI), or ASA score. A mathematical simulation indicated that avoiding uncemented THA fixation in female patients >70.5 years of age decreased the number of revisions within the observational period by 21% in this subset and by 4.9% in the entire patient population.

Conclusion: A sex-specific approach to THA fixation is encouraged. Uncemented THA fixation is the most important risk factor for early PFF in female patients, especially those >70.5 years of age. The mode of fixation did not influence early revisions in male patients. In Switzerland, avoiding uncemented THA fixation in female patients aged >70.5 years alone can prevent 4.9% of all revision THAs within the first 2 years of index surgery.

FM041*

Augmented Reality in Foot and Ankle Surgery: Evaluating the Benefits of AR-Guided Lateral Calcaneal Lengthening Osteotomy

Maksym Polt[1]; Arnd Viehöfer[2]; Stephan Wirth[2]; Stefan M. Zimmermann[2]

[1] Kantonsspital Graubünden; [2] Balgrist Universitätsklinik

Background: Acquired adult flatfoot deformity (AAFD) is a common foot and ankle disorder that results in a loss of the medial longitudinal arch of the foot and dysfunction of the posteromedial soft tissues. Hintermann-Osteotomy (HO) is often utilized to treat Stage II AAFD. The procedure is challenging due to variations in the subtalar facets and limited intraoperative visibility. To address these limitations, the feasibility and precision of AR-guided lateral lengthening calcaneal osteotomy utilizing the Microsoft HoloLens headset was investigated.

Our study aimed to assess the impact of AR guidance on surgical accuracy and the facet violation rate, and to determine the influence of surgical experience on the results of AR-assisted surgery.

Methods: 60 AR-guided and 60 conventional osteotomies were performed on foot bone dummies. For AR osteotomies, the ideal osteotomy plane was planned, uploaded to a Microsoft HoloLens 1 headset and carried out in strict accordance with the superimposed holographic plane. The conventional osteotomies were performed relying solely on the anatomy of the calcaneal lateral column. The rate and severity of facet joint violation was measured, as well as precision of entry and exit points. The results were compared across AR-guided and conventional osteotomies, and between experienced and inexperienced surgeons.

Results: Experienced surgeons showed significantly greater precision for the osteotomy entry point using AR guidance (P = 0.0035), while the inexperienced surgeons had improved accuracy, although not statistically significant (P = 0.064). AR guidance helped the experienced surgeons avoid full violation of the posterior facet (P = 0.011). Inexperienced surgeons had a higher rate of middle and posterior facet injury with both methods (P = 0.005 and 0.021).

Conclusion: The study suggests that using augmented reality (AR) guidance during Hintermann osteotomy procedures may lead to improved precision for experienced surgeons compared to conventional methods, as AR guidance helped experienced surgeons prevent full violations of the posterior facet. Further research is needed to address limitations and challenges associated with AR technology, such as individualized planning and improved alignment. Ultimately, the use of AR in surgery has the potential to improve patient and surgeon safety while minimizing radiation exposure.

FM042

Rapid overlay and interpenetration of a nonwoven patch for mechanical and biological augmentation of rotator cuff tendon repair – evaluation in an ovine model

Dominik C. Meyer[1]; Elias Bachmann[2]; Salim Darwiche[3]; Andrea Moehl[2]; Brigitte von Rechenberg[3]; Christian Gerber[1]; Jess G. Snedeker[4]

[1] Balgrist University Hospital; [2] ZuriMED Technologies AG; [3] Musculoskeletal Research Unit (MSRU) / University of Zurich; [4] Balgrist University Hospital, University of Zurich / Institute for Biomechanics, ETH Zurich

Introduction: Arthroscopic repair of rotator cuff tears is associated with re-tear rates of 25 to 35% of medium sized tears, and even higher failure rates for large and massive tears. Construct failure most often occurs at the suture-tendon interface. Patch augmentation is often used to improve mechanical and biologic strength, but is technically demanding with current techniques, particularly on the medial aspect when sutures are used for fixation. We evaluate the biomechanical strength and biologic characteristics of a poly(ethylene terephthalate) (PET) patch which is secured into the medial rotator cuff with a novel interpenetration technique.

Methods: An in-vivo and biomechanical ex-vivo study was performed using an established ovine model of acute infraspinatus tendon repair. A PET augmentation patch was employed and its microfibers interlocked into the underlying tendon using a barbed microblade. Macroscopic observations and histological analysis were performed at 6- and 13-weeks post implantation. Additional ex-vivo biomechanical investigations of a Mason-Allen suture configuration was performed to demonstrate the added value of interlocked patch augmention.

Results: The in-vivo study revealed no macroscopic evidence of adverse reactions at any implant site for all sheep at both time points. Histology indicated a normal host healing response with minimal fibrosis at both time points. The interlocked patch showed robust and aligned tendon fiber tissue ingrowth at the patch interfaces to both, the infraspinatus tendon and the bony insertion. In-vitro, interlocked patch augmentation increased Mason-Allen repair strength by 88% (417 ± 86 N vs. 221 ± 43 N, p <0.01) with no difference in repair stiffness.

Conclusion: Surgical interlocking of a non-woven PET patch to an underlying tendon repair substantially augments biomechanical performance of the repair construct. This configuration also elicits a healing response with no necrosis and minimal fibrosis while supporting directed tissue ingrowth at the tendon-patch and bone-patch interfaces.

FM043

Smart Fusion Spine: A novel technique to in-vivo measure spinal implant loads for the assessment of posterolateral fusion – proof of concept in an in-vivo sheep model

Maximilian Heumann[1]; Lorin M. Benneker[2]; Caroline Constant[1]; Manuela Ernst[1]; Geoff Richards[1]; Hans Joachim Wilke[3]; Markus Windolf[1]

[1] AO Research Institute; [2] Orthopädie Sonnenhof Bern; [3] Ulm University

Introduction: Reliable and timely assessment of bone union between vertebrae is considered one of the key challenges after spinal fusion surgery. In a single-case ovine feasibility study a novel sensor concept demonstrated the ability to objectively assess posterolateral fusion based on continuous implant load monitoring. In this follow-up study, the influence of mono-segmental fusion on the measured implant loads was systematically investigated in a larger sample size using an updated sensor system.

Methods: Three Swiss white alpine sheep underwent bilateral facetectomy at level L2-L3 and L4-L5. The segments were stabilized using two pedicle-screw-rod constructs per level. Between each pedicle screw-pair a sensing device was attached to the rod resulting in four implanted sensors per animal. Rod loads were continuously monitored over 16 weeks through wireless data transmission. After euthanasia, the spines were tested for range of motion about the three major axes of loading. A high-resolution CT scan was performed to confirm the fusion success.

Results: After an initial increase in implant load until reaching a maximum at approximately week 4, eleven out of twelve sensors measured a constant decrease in implant load over 16 weeks to on average 52% (SD ±9%) of the maximum. One sensor measurement was compromised by newly forming bone growing against the sensor housing. In agreement, in vitro residual motion of all segments was less than 1°. Bridging bone at each facet as visible on CT confirmed the fusion of all motion segments.

Conclusion: Data obtained by continuous measurement of implant loading of spinal screw-rod constructs may enable objective and radiation-free monitoring of spinal fusion progression as well as real-time load on implants which would, apart from it's applications in implant development, allow for an individually tailored rehabilitation program. However, the sensitivity along with the design of the current sensor concept needs to be tailored to and validated at the human spine.

ORALS: A02 HAND

FM044*

Stability of the distal radioulnar joint with and without activation of forearm muscles

Andreas Weber; Lisa Reissner; Susanne Friedl; Andreas Schweizer
Universitätsklinik Balgrist

INTRODUCTION: The distal radioulnar joint (DRUJ) is not only crucial for the rotational movement in the forearm but also for power and load transfer. Torque movements and other activities that stress the wrist lead to a physiological anteroposterior ulnar head translation in the DRUJ complex.

Several studies have investigated this shift, and typical values (utilizing ultrasonography) were previously described. The primary aim of the present study was to examine the effect of the ulnar forearm muscle(s) activation on DRUJ stability in healthy individuals. The primary outcome, therefore, was to measure the difference in anteroposterior ulna head translation in relation to the distal radius with and without activation of the ulnar forearm muscles (Flexor Carpi Ulnaris (FCU) and Extensor Carpi Ulnaris (ECU)).

METHODS: This study is a single-center, transversal study of otherwise healthy individuals (≥ 18 years, without history (or evidence) of pathology related to the DRUJ complex) who underwent a single examination and testing at our Institution.

The anteroposterior ulnar head translation in relation to the radius was sonographically measured while the forearm was in a neutral resting position and while the hand was actively pressed onto a surface, with and without intentional ECU/FCU activation, while being monitored by an electromyogram.

RESULTS: Data on 40 subjects indicates a mean anteroposterior translation in the DRUJ of 4.1 mm (SD 1.08) without and 1.2 mm (SD 0.54) with ECU/FCU muscle activation. Muscle activation was monitored electrophysiologically, while the proportion of muscle activity (ECU vs. FCU) was 231 mV vs. 177 mV (root mean square).

CONCLUSIONS: Our results indicate that intentional ulnar forearm muscle activation results in 70% less anteroposterior ulnar head translation and greater DRUJ stability. As such, the ECU and FCU serve as dynamic stabilizers of the DRUJ complex. This finding may be clinically significant since ECU/FCU strengthening may increase DRUJ stability.

FM045

Cat bite injuries to the hand and forearm: correlation of surgery and bacteria verification

Sebastian Wangler[1]; Miriam Elias[1]; Linus Schoepke[2]; Dominique Merky[1]; Rahel Meier[3]; Esther Vögelin[1]
[1] Department of Plastic and Hand Surgery, Inselspital, Bern University Hospital, University of Bern, Switzerland; [2] Handchirurgie Kantonsspital Olten; [3] Berner Handzentrum, Bern, Switzerland

Introduction: Patients and physicians often underestimate cat bite injuries due to small puncture wounds. The deep and narrow wound seals quickly and provides an anaerobic environment for the inoculated saliva and bacteria. However, in up to 43%, there is no bacterial growth in the microbiological workup of wound swaps following cat bite injuries. A potential explanation might be starting an antibiotic treatment before tissue collection. The current project examines the association between antibiotic treatment and intraoperative microbiological findings.

Methods: This single-center retrospective study analyzed data from 102 adult patients (>18 years) with cat bite injuries. Demographic data, time from bite incident to surgery (delay to surgery), time from bite incident to initiation of antibiotic treatment, the start of antibiotic treatment before surgery, the total length of antibiotic treatment, complications, duration of hospital stay, incapacity for work, total time of treatment, treatment costs, and microbiological outcome (neg/positive), were assessed. Multilinear regression models were fitted to evaluate the impact of antibiotic treatment and delay to surgery on the microbiological outcome (neg/positive).

Results: Median age 50±16 years, 72% female. All included patients received antibiotic treatment. Mean time from bite incident until antibiotics was 1.2±1.9 days. Total length of antibiotic treatment was 11.7±8.7 days. Mean time from bite incident to surgery was 3.0±3.7 days. 39% without bacterial verification required surgery. Nine (4.5%) patients required revision surgery. Fourteen patients (14%) suffered from at least one complication. In total, 37 (72%) patients had to be hospitalized. Mean duration of hospital stay 3.0±3.7 days. Time from bite incident to antibiotics, time from bite incident to surgery, and delay in presentation were not associated with microbiological result. Delay in presentation was significantly associated with later onset of antibiotics, longer hospital stays, higher total treatment costs.

Conclusions: Bacterial growth was found in 61% of the analyzed tissue samples. All reported cases received antibiotic treatment. Our data do not suggest that early antibiotic administration or delayed surgical treatment affects the outcome of the microbiological workup following cat bite injuries to the hand and forearm. Keeping the time from bite incidence to first clinical presentation as short as possible is essential.

FM046

Key factors in corrective surgery of spastic deformities in the upper limb – a retrospective analysis of >10 years surgical experience

Armin Pallaver; Jan Fridén ; Silvia Schibli
SPZ Nottwil

Introduction: Spasticity of the upper limb due to cerebral palsy, stroke, traumatic brain injury or spinal cord injury affects quality of life in many ways. Long-standing spasticity can lead to joint contractures that may no longer respond to conservative treatment and surgical correction can become necessary. Based on our experience in spasticity-correcting surgery of the upper limb of more than 10 years, this study intends to point out key factors that have to be respected when treating these conditions surgically.

Methods: This is a single-center retrospective cohort study of all patients who had undergone spasticity-reducing surgery of the upper limb since 2011, investigating outcome (minimum follow up 1 year), complications and reoperations. Till 2018, outcome was rated as good, fair or poor according to the medical records. From 2018 on, we used the arm activity measure (ArmA) as a validated tool for patient reported outcome measurement: by dividing the preoperative score by the postoperative score we rated the outcome according to the quotient (≥ 2: good; ≤ 2 and ≥ 1: neutral; <1: poor). Complications were graded according to the Clavien-Dindo Classification. Reoperation was defined as repeat surgery due to recurrence of spasticity at the same level.

Results: Since 2011, we performed 116 surgeries in 81 patients with upper limb spasticity. 17% of all procedures were multilevel corrections addressing at least two areas of the arm (shoulder, elbow, forearm, wrist and hand). The most common

procedures were tendon lengthening, muscle release and tendon transfers. Hyperselective neurectomy was done in 6 arms. Outcome assessment was available in 63 patients: 4 were considered poor (6.3%), 9 neutral (14,2%) and 50 good (79,3%). Among 16 complications, there were 13 reoperations due to recurrence of spasticity within 5 years after prior surgery.

Conclusion: Surgical correction of spastic deformities of the upper limb is reliable and shows satisfactory results even after repeat surgery. Tendon lengthening procedures are safe and time proven and may reveal hidden functions. Tendon transfer of Extensor carpi ulnaris (ECU) to Extensor carpi radialis brevis (ECRB) offers a good opportunity to avoid wrist arthrodesis. When considering pronator release, careful assessment of biceps spasticity is crucial to prevent supination deformity. Hyperselective neurectomy is a promising technique in spastic thumb and intrinsic deformities.

FM047

Preliminary results using the Distal Radius IntraMedullary nail (DRIM-nail) for the treatment of distal extra-articular radius fractures

Andreas Schweizer; Lisa Reissner; Ladislav Nagy
Uniklinik Balgrist

Introduction: For fixation of displaced distal radius fractures nowadays almost exclusively volar locking plates are used.

Herefore a considerable additional soft tissue trauma by the large exposure is taken in account. Moreover, the implant can often lead to soft tissue irritation and tendon rupture thus often necessitates its removal. As many distal radius fractures would do with a less excessive procedure, we have developed a minimally invasive intramedullary implant, the DRIM-Nail (= Distal Radius IntraMedullary-Nail) for the treatment of displaced, unstable extra-articular distal radius fractures. We present the results of our first ten cases and compare them to a matched group of patients treated with volar locking plates.

Patients and Methods: The DRIM nail is inserted through a 2-3 cm incision just proximal to the radial styloid and a 6mm drill hole between the 1st & 2nd extensor tendon compartment. Through the same exposure the nail is locked with 4 screws, 2 in the distal and other 2 in the proximal fragment.

Our first 10 patients treated with the DRIM nail were assessed 2 and 6 weeks, 3 and 6 months postoperatively for pain level, range of motion and grip strength. On x-rays palmar tilt, radial inclination and ulnar variance were measured. For comparison 10 patients treated with volar locking plates matched for age, fracture pattern and follow-up were used.

Results: At six months in the DRIM-group the mean pain level was 0.5 (scale 0-5) active flexion/extension was 68° (91% of the opposite side) / 74° (100%); radial/ulnar deviation 15°(89%) / 31°(86%) and pro/supination 80°(99%) / 83° (99%) and grip strength 24kg (90%). The palmar tilt was 8° and the radial inclination 26° and the ulnar variance +0.5mm. This didn't change since postoperatively.

In the control group the mean pain level was 1.3, active flexion/extension was 64° (82%) / 57° (74%) ; radial/ulnar deviation 18°(61%) / 33°(71%) and pro/supination 81°(97%) / 76° (89%) and grip strength 26kg (78%).

During the postoperative course DRIM patients had less pain, faster recovery of strength and better final motion. Moreover none of the DRIM nails had to be removed compared to 7 plates.

Conclusion: The DRIM nail proved to maintain the reduced position during the functional postop. treatment until uneventful consolidation. The final clinical results were at least as good as after volar plating, but the postoperative rehabilitation was more rapid and less painful.

FM048*

La prothèse Motec pour l'arthrose du poignet et les fractures complexes du radius distal chez le patient âgée

Ivan Tami; Fabrizio Fiumedinisi; Francesco Costa; Thomas Giesen
Clinica Ars Medica, Gravesano-Lugano

Objectif: Nous présentons notre série d'arthroplasties du poignet avec l'implant total Motec (Swemac Orthopaedics AB, Linköping, Suède) chez 17 patients. Cette série comprend 7 patients âgés atteints d'une fracture aiguë du radius distal comminutive et déplacée traités avec l'implant.

Méthodes: D'août 2020 à mai 2022, nous avons effectué 17 arthroplasties du poignet avec l'implant total du poignet Motec chez 17 patients. Il y avait 9 hommes et 8 femmes avec une moyenne d'âge de 64 (40-90) ans. Le côté opéré a été dominant dans 11 cas.

Sept patients présentaient une fracture aiguë complexe du radius distal et avaient un âge moyen de 78 ans (intervalle 70-90).

Les autres patients souffraient d'arthrose du poignet à la suite d'une lésion ligamentaire scapho-lunaire négligée dans 5 cas, d'une arthrose àla suitede une pseudoarthrose du scaphoïde dans 1 cas, d'arthrose du poignet après une fusion partielle du carpus dans 2 cas. Ce sous-groupe de patients avait un âge moyen de 56 ans (intervalle 40-73).

Nous avons suivi les patients pendant 14 mois (intervalle 6-18). Nous avons enregistré l'amplitude des mouvements, la force et la douleur, au repos et avec des activités légères et lourdes de la main. Nous avons également enregistré la satisfaction personnelle et le taux et les complications aiguës ou chroniques comme les échecs d'implants.

Résultats: Tous les patients étaient satisfaits du résultat final. Nous n'avons pas observé des complications majeure ou d'échec implantaire. Un patient a eu un syndrome du canal carpien subséquent qui a nécessité une chirurgie secondaire. Tous les patients sauf un ont repris leurs activités quotidiennes normales. La force finale moyenne était de 45% par rapport au poignet controlatéral, avec une amélioration de 25% de la force préopératoire chez les patients atteints d'arthrose.

La flexion moyenne finale du poignet était de 36° (plage de 10°-50) et l'extension moyenne du poignet de 41° (plage de 20°-60°). L'amplitude de mouvement finale (ROM) en flexion-extension était de 77° par rapport à une ROM moyenne de 121° des poignets controlatéraux (63%). Dans les cas électifs, la ROM finale en flexion-extension était de 97% de l'amplitude de mouvement initiale. La douleur globale s'est améliorée de 6 points, passant de 7.1 à 1.2.

Conclusion: L'implant total du poignet Motec semble être une solution prometteuse pour l'arthrite du poignet et pour les fractures du radius distal difficiles chez le patient âgée.

ORALS: A06 FOOT

FM049

Ankle muscle strength and gait symmetry after dorsal closing wedge calcaneal osteotomy for Haglund exostosis

Bernd Friesenbichler[1]; Thomas Rutishauser[1]; Samara Monn[1]; Renate List[1]; Jens Mainzer[2]; Nicola A. Maffiuletti[1]; Pascal Rippstein[1]

[1] Schulthess Klinik; [2] In Motion

Introduction: Haglund exostosis related heel pain may be surgically treated with dorsal closing wedge calcaneal osteotomy (DCWCO). Recent reports on this technique show good clinical and self-reported results. However, uncertainty about functional consequences related to ankle muscle strength and gait function due to a shortened Achilles tendon lever arm exists.

Methods: Sixteen patients (16 feet) with Haglund exostosis related heel pain were surgically treated with DCWCO. Isometric plantar flexion and dorsiflexion strength was compared between the involved and uninvolved limb before and one year after surgery. Gait function at a self-selected walking speed was evaluated using a 3D motion capture system and self-reported outcomes (Foot Function Index and Global Treatment Outcome) were also assessed.

Results: Before surgery, plantar flexion strength of the involved limb was 11% and 16% lower compared to the uninvolved limb at two different ankle positions. One year after surgery, a moderate asymmetry of 10% and 7% persisted for plantar flexion strength, while dorsiflexion strength was symmetric at both time points. Time-distance gait parameters, ankle flexion angles and power generation during gait were symmetric both before and after surgery, except for a remaining 10% lower unloading rate of the involved limb's vertical ground reaction force. Total Foot Function Index improved by 48% after surgery, and 80% of patients rated their surgery as "helped" or "helped a lot" (Global Treatment Outcome).

Conclusion: Patients treated for Haglund exostosis related heel pain with DCWCO presented symmetric gait and ankle kinematics with improved self-reported function one year after surgery. The moderate asymmetry of plantar flexion strength after surgery did not seem to have functional consequences on gait function.

FM050

Correlating Ankle Osteoarthritis Severity with Patient Specific Shape Scores

Doria Juric[1]; Zachary Eatough[2]; Rich Lisonbee[2]; Amy Lenz[2]; Nicola Krähenbühl[1]

[1] Universitätsspital Basel; [2] Department of Orthopaedics, Orthopaedic Research Laboratory, University of Utah, Salt Lake City, UT, USA

Introduction: The objective of this study was to evaluate ankle and peritalar bone morphology and alignment between two groups of patients with varus ankle osteoarthritis (OA) classified by hindfoot alignment. We hypothesized that morphology and alignment would significantly differ between groups and that these differences would be apparent in ankle OA severity.

Methods: 20 patients with advanced varus ankle OA underwent WBCT scans. Based on hindfoot alignment, patients were subdivided into two groups: compensated and non-compensated. An orthopaedic surgeon and a musculoskeletal radiologist rated the tibiotalar joint of the WBCT scans according to the published Takakura, Kellgren-Lawrence and Richter scales. Bone reconstructions of the tibia, fibula, talus, calcaneus, navicular, and cuboid were generated. A multi-domain statistical shape model was created using bone reconstructions. A linear discriminant analysis (LDA) classified bone alignment and morphologic variation into patient-specific shape scores. Pearson correlation analysis calculated the correlation of ankle OA severity with patient specific shape scores.

Results: Inter-observer agreement for OA severity classification was: Tanaka: K = 0.51; Kellgren-Lawrence: K = 0.54; Richter: K = 0.56. Morphologic and alignment differences between the two cohorts include the orientation of the Chopart joint complex, distance between the medial malleolus and sustentaculum tali, and talofibular relationship. Standard deviations of LDA shape scores for compensated and non-compensated patients was 0.23 and 0.65, respectively. Tibiotalar OA severity correlation to patient specific shape scores were found to be: Tanaka = 0.57; Richter = 0.38, Kellgren-Lawrence scale = undefined.

Conclusion: Dissimilarities in Chopart joint complex morphology and alignment in compensated vs. non-compensated ankles highlight the impact of peritalar bones and joints on the evolution of varus ankle OA. Additionally, medial malleolus to sustentaculum tali distance variation may suggest differences in deltoid ligament complex integrity. Assessing patient specific shape scores allow for precise subgroup formation, possibly improving decision making in the treatment of those challenging cases. Nevertheless, our work demonstrates low correlation between ankle OA severity and patient specific shape scores. Therefore, a novel reliable ankle OA scale is needed quantifying OA severity with relation to peritalar morphology and alignment.

FM051*

The Rising Sun Procedure – preliminary results of a new technique for minimally-invasive calcaneal osteotomy

Philippe Siegenthaler; Michael Strässle; Primoz Potocnik; Andreas Toepfer

Kantonsspital St. Gallen KSSG

Introduction: Calcaneal slide osteotomy is a joint-preserving procedure for the surgical treatment of various hind foot deformities. As previously demonstrated, minimally-invasive calcaneal osteotomy (MICO) has the potential to minimize the surgical morbidity and maximize surgical efficiency without compromising safety. Since its first descriptions, MICO has traditionally been performed in 4 steps, corresponding to the 4 quarters of the cross-section of the tuberosity in the frontal plane.

Since 2016, the senior author has been performing a modification of the MICO procedure that can help to reduce the number of surgical steps and is dubbed the Rising Sun procedure for its characteristic cross-sectional appearance.

We aim to present a safe, easy and fast alternative to the traditional "4-quadrants" technique by sharing our experience with the new technique.

Methods: Between June 2018 and December 2022, a total of 54 MICO procedures were performed using the Rising Sun technique. A retrospective analysis obtained demographic data, duration of the procedure and number of fluoroscopies as well as surgery-related complications. Complications were classified according to the modified Clavien-Dindo-Sink Classification.

Results: From June 2018 to December 2022 two surgeons (S1 / S2) performed 54 MICOs with the Rising Sun technique (S1 = 36, S2 = 18). 3 cases were excluded due to a follow-up <6 months. The mean follow-up of the 51 remaining patients was 31 months (6-55 months). There were 30 female and 21 male

patients, with an average age of 45 years (17–77 years). In 32 cases the underlying deformity was a Pes planovalgus (medial shift) and in 19 a Pes cavovarus (lateral shift). In total, there were 3 surgery-related complications: 2 patients required superficial surgical wound revision for disturbed wound healing (Dindo III) & 1 patient asked for screw removal due to discomfort related to the hardware after 15 months (Dindo III), although X-rays and intraoperative findings showed correct screw placement without prominent hardware. Mean surgery duration for the Rising Sun technique was 20,3min (S1 19,3 / S2 22,3min), the average number of fluoroscopies was 29,5 (S1 23,5 / S2 40,0).

Conclusion: Compared to traditional open calcaneal slide osteotomies, MICO shows reduced soft-tissue morbidity and less surgery-related complications. The Rising Sun modification of MICO represents a safe and easy to perform procedure in percutaneous correction of hindfoot malalignment.

FM052

Quantification of instability of the tibiofibular syndesmosis by bilateral external torque CT. An experimental study

Silvan Beeler; Esteban Ongini; Bettina Hochreiter; Reto Sutter; Arnd Viehöfer; Stephan Wirth; Anna-Katharina Calek

Universitätsklinik Balgrist

Background: If injury of the distal tibiofibular syndesmosis is missed, chronic instability may lead to persistent pain and osteoarthritis of the ankle. Large interindividual differences in normal stability and the multiplanar nature of potential instability render diagnosis difficult so that there is so far no reliable diagnostic modality. It was the purpose of this study, to test whether defined lesions of the syndesmosis can be correlated with specific displacements of the distal tibiofibular joint caused by defined experimental lesions of the syndesmosis.

Methods: Seven pairs of normal lower legs were biomechanically tested in the intact state. Each ankle was then destabilized in three surgical steps reproducing the lesional pattern produced by the two most frequent clinical injury mechanisms. In the intact state and after each surgical step, an arthroscopy of the ankle including a lateral hook test and three CT scans were performed. During the scans, the specimens were placed in an external torque device with predefined external rotation torques of 2.5 Nm, 5 Nm and 7.5 Nm.

Results: The arthroscopic and radiological parameters showed significant correlations in all pairwise comparisons. The ROC curve analyses yielded best prediction of syndesmotic instability with the anterior tibiofibular distance (AD) in CT with a sensitivity of 84.1% and a specificity of 95.2% (area under the curve (AUC) 94.8%, CI 0.916 to 0.979, p <0.0001) and middle tibiofibular distance in arthroscopy with a sensitivity of 76.2% and specificity of 92.3% (AUC 91.2%, CI 0.837 to 0.987, p <0.0001). Higher torques increased the rate of true positive results.

Conclusion: The non-invasive bilateral external torque CT can reliably detect experimental syndesmotic injuries with better sensitivity and similar specificity than the arthroscopic lateral hook test. The translation of these experimental findings into clinical practice remains to be established.

Level of Evidence: V

FM053

Early Radiological Outcome Of Minimally Invasive Bunion Correction Using A Guided Trajectory System

Theenesh Balakrishnan; Antoine Acker; Laura Peurière; Nils Reymond; Lisca Drittenbass; Elisab Schauer; Mathieu Assal; Victor Dubois-Ferrière

Centre Assal de Médecine et de Chirurgie du Pied

Introduction: Hallux Valgus correction with Minimally Invasive Surgery (MIS) is an increasingly popular procedure due to its potential advantages such as shorter operative time, quicker recovery and reduced hospital stays compared to open surgery. Third-generation Minimally Invasive Chevron Akin (MICA) osteotomy has shown excellent clinical and radiological outcomes. However, this technique requires a steep learning curve as it is performed freehand. To address this issue, we describe a new guided trajectory system for third-generation MICA to increases precision and reduce the risk of suboptimal K-wire or screw placement. Early radiological outcomes and complication were reported.

Methods: From April 2022 to January 2023, 13 consecutive MICAs were performed on 11 female patients (bilateral in 2 patients) with an average age of 61 by a single fellowship-trained foot and ankle orthopaedic surgeon who developed the device. Preoperative and postoperative intermetatarsal angle (IMA), hallux valgus angle (HVA), distal metatarsal articular angle (DMAA) and tibial sesamoid position (TSP) were measured in all patients using weight-bearing radiographs. Additionally, any difficulties or intraoperative complications were reported. All parameters were analysed with the one-tailed non-parametric Wilcoxon test.

Results: All the radiographic parameters improved significantly. The median IMA improved from 14.5 degrees (interquartile range [IQR]: 11.5-16) to 5 degrees (IQR: 4.0-6.0) (p <0.005), The median HVA also decreased from 27.5 degrees (IQR: 25.3-34.5) to 7.0 degrees (IQR: 4.0-8.5) (p <0.005). Moreover, the median DMAA fell from 15.5 degrees (IQR: 13.3-19.3) to 6.0 degrees (IQR: 6.0-8.0) (p <0.005). The median TSP was 2 (IQR: 2-3) pre-operatively and 0 (IQR: 0-1) (p <0.005) post-operatively. No intraoperative complications were reported.

Conclusion: This study presents the first report of a guided trajectory system for minimally invasive bunion correction, which led to good early radiological outcomes. This system can reduce the margin of error in K-wire and screw placement. There were no intraoperative complications or difficulties. The use of this system could potentially lead to more consistent and successful outcomes in third-generation MICA procedures. Overall, this study provides valuable insights into the benefits of using a guided trajectory system for MICA and highlights its potential to improve the success of bunion correction surgeries.

FM054

Patient-reported and radiological outcome after 3rd generation minimally-invasive Hallux valgus correction

Michael Strässle; Philippe Siegenthaler; Jonas Grossmann; Andreas Toepfer

Minimally-invasive techniques for hallux valgus correction are becoming increasingly popular. Several percutaneous hallux valgus correction techniques have been described in recent decades. MICA (Minimally-invasive Chevron & Akin), the 3rd generation of percutaneous hallux valgus correction, combines the advantages of an extra-articular osteotomy, stable internal fixation, and a high potential for correction. This study examines patient-reported outcome measurement (PROM), radiological correction and complication rates after third-generation MICA.

Between May 2018 and May 2021, 50 subsequent MICA procedures were prospectively analyzed and clinical and radiological outcomes were recorded with a minimum follow-up of 12 months. For assessment, the American Orthopedic Foot & Ankle Society score (AOFAS), the Manchester-Oxford Foot Questionnaire (MOXFQ), the Foot Function Index (FFI), the EuroQol 5-Dimensions-5-Levels Score (EQ5D5L), the EuroQol Visual Analog Scale (EQ-VAS) and the Visual Analog pain scale (VAS pain) were used. Further parameters included radiological parameters and complications. Patient satisfaction was recorded using a Likert scale.

50 consecutive MICAs in 43 adults were performed using the previously described K-wires-first technique. 36 adults (42 MICA, follow-up rate = 84%) with a mean age of 59 years (16-80 years) were included in the study, 7 patients (8 feet) were lost to follow-up. IMA improved from 16° (10-21) to 6° (3-11), HVA improved from 30° (22-42) to 10° (2-20). With a median follow-up of 20.3 months, we found an EQ5D5L of 0.888 (0.421-1.000), an AOFAS score of 87.9 (40-100), a MOXFQ score of 11.7 (0-62), a FFI score of 8.3° (0-85), and an EQ-VAS of 83.2 (10-100). Satisfaction was 9.2 (out of 10) and patient recommendation was 9.5 (out of 10). Hardware removal was performed in 12 of 36 patients (33%) due to soft tissue irritation. One case required intraoperative conversion to open hallux correction. There was no recurrence.

Compared to 1st and 2nd generation techniques for minimally-invasive correction of a hallux valgus, MICA has a high potential for correction, even in the case of severe hallux deformities. Good to excellent clinical and radiological results at 20 months postop can be expected. Overall, the complication rate is very low. When using traditional cannulated screws for fixation with a square headless design (non-bevel headed), there is a high incidence of hardware removal due to prominent proximal screw tips.

FM055

The Placebo Effect Influences the Results of the Conservative Treatment of Plantar Fasciitis. A Meta-Analysis with Meta-Regression

Davide Previtali[1]; Valentina Viglione[2]; Angelo Boffa[2]; Francesca Vannini[2]; Cesare Faldini[2]; Stefano Zaffagnini[2]; Giuseppe Filardo [1]

[1] EOC (Ente Ospadaliero Cantonale) - Ospedale Regionale di Lugano; [2] IRCCS Istituto Ortopedico Rizzoli, Bologna, Italy

Introduction: Conservative treatment for plantar fasciitis includes various approaches that range from oral Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) to physical therapies like extra-corporeal shock-wave therapy (ESWT) and local injections. These strategies have been widely studied, reporting on one side potential benefits, but on the other side conflicting results when tested in placebo-controlled randomized controlled trials (RCTs). There are no studies that quantify the placebo effect in plantar fasciitis, its magnitude, and potential influencing factors.

Methods: A systematic literature search was conducted on PubMed, Embase, and Web of Science. Double-blind RCTs with a placebo control group, reporting clinical results of a placebo intervention for the conservative treatment of plantar fasciitis were included. The magnitude of placebo effect in term of 0-10 VAS pain was evaluated with a single-arm meta-analysis grouping the results of the placebo arms of the included studies with sub-analyses based on the length of follow-up and type of placebo. Potential influencing factors were analyzed through a meta-regression.

Results: The database search retrieved 908 articles, out of which 35 were included in the meta-analysis. The meta-analysis showed a statistically significant improvement after placebo administration: 2.13/10 points ($p < 0.001$). The improvement was higher in the placebo-ESWT group compared to the placebo-injection group (2.59 vs 1.78; $p < 0.05$). All the sub-analyses based on the length of follow-up showed a statistically significant placebo effect: the magnitude was 0.84/10 at 1 week, 1.55/10 at 1 month, 2.03/10 at 3 months, 1.96/10 at 6 months, and 2.79/10 at 12 months. Age, BMI, sex, length of symptoms, intensity of symptoms at baseline, improvement in the experimental group, length of follow-up and year of publication did not significantly influence the magnitude of placebo effect.

Conclusion: The results of the conservative treatment of plantar fasciitis are influenced by a clinically significant placebo effect. The placebo effect appears to be stronger in ESWT compared to injections. This data should be accounted for not only in the research field, where the use of placebo controlled RCT is strongly recommended, but also in the clinical field, where the invasiveness and the cost of some approaches for the conservative treatment of plantar fasciitis should not be overlooked.

FM056*

Accuracy Of Fracture Reduction Using Cast Versus External Fixator In Dislocated Ankle Fracture

Verena Hecht; Fabian Götz Krause; Eleonore Mosimann; Helen Anwander

Inselspital Bern

Introduction: Primary treatment of dislocated ankle fracture is fracture reduction and joint alignment. The fracture can be immobilized in a cast or by using an external fixator (exfix). Splinting can lead to secondary loss of reduction despite radiographically controlled, initial full reduction. Secondary loss of reduction is a risk for complications including skin necrosis, prolonged swelling, and osteochondral lesions which can lead to osteoarthritis. The external fixator is more stable with a smaller risk for secondary dislocation; however, the exfix comes with the need for surgical application and the risk of pin track infection. Aim of this study is to compare the accuracy of the reduction and the complication rates after immobilization with a cast in comparison to an exfix in patients with a dislocated ankle fracture.

Methods: We conducted a retrospective study of all patients treated in our emergency department with a dislocated ankle fracture between January 2011 & July 2022. Demographic data and radiography including computed tomography were collected. The fractures were classified by Lauge-Hansen and AO. The medial clear space after initial reduction was measured to assess the accuracy of the reduction. Statistics were analyzed based on univariate analysis (Chi-square test, t-test, Mann-Whitney U test, Fisher's test).

Results: Out of 122 dislocated malleolar fractures included in the study, 85 (69.7%) were splinted and 37 (30.3%) were immobilized with an exfix. Seventy-two (59.0%) were females. Seventy-five (61.5%) were classified as 44B3 according to AO classification. The two groups did not differ regarding demographic characters including age, sex, fracture type, smoking, concomitant diseases. Patients immobilized in a cast were more often deficiently reduced seen as an increased medial clear space (p = 0.007) but still operated on faster (p = 0.001) and hospitalized shorter (p = 0.001). There was no difference in complication rate including skin necrosis and infection dependent on the immobilization technique. The presence of a Volkmann fragment is a risk fracture for deficient reduction in both groups.

Conclusion: The presence of a Volkmann fragment and the immobilization using a cast instead of an external fixator leads to inferior accuracy of initial fracture reduction. However, there was no difference in complications dependent on the immobilization technique and patients immobilized using a cast were operated faster, hospitalized shorter.

FM057*

Trimalleolar fractures: a 10-year radiological and functional follow-up

Sérgio De Barros Soares; Pedro Nogueira; Amal Chidda; Jospeh M Schwab; Moritz Tannast; Angela Seidel

HFR Fribourg Cantonal Hospital and University

Introduction: Ankle fractures are the third most common fracture in adults and account for 10% of all fractures. In short and mid-term follow-up, these patients suffer a high impact on their quality of life: 20% have chronic pain and 16% face unemployment. However, the long-term follow-up is sparse in the literature and dedicated on the development of ankle osteoarthritis as the only important outcome parameter. The goal of this retrospective study is to provide osthopaedic surgeons and patients detailed information about the function of the ankle after sustaining a trimalleolar (TM) fracture.

Methods: All patients who underwent surgical treatment for a TM fracture or equivalent (bimalleolar fractures with ligamentous syndesmotic lesion), in our hospital, between 2007 and 2014 were identified from the registry. Patient were contacted to complete a 22-item questionnaire which included the EFAS and the SF-12 score about their quality of life and patient-reported outcome. The progression of osteoarthritis (OA) was assessed by the Kellgren and Lawrence (KL) classification on ankle radiographs.

Results: 74 out of 418 patients were included (drop rate of 82.7%). 66% of patients were women (34% men). 25% were smokers and 11.3% were diabetic. Smoking was associated with a worst outcome (p = 0.04). Using the Lauge-Hansen classification, the mechanism of injury, in 78.4% were supination-external rotation type IV, 12.2% were pronation-external rotation type IV and 4.1% were other types. 55% of patients suffered a discolated TM fracture. EFAS score was lower in patients who suffered a dislocated TM fracture (p = 0.039).

The overall complication rate was 12.3% (n = 9). Using the Ernst–Sink classification, 22% of those were type II and 78% were type III. 63% of patients were submitted to a follow-up surgery. From those 91.5% got implants removed, 2.1% needed a revision due to non-union and in 6.3% the joint could not be preserved (4.2% underwent through total ankle replacement and 2.1% though ankle arthrodesis).

Using the KL classification, 80.4% presented grade I and II OA and 19.6% presented grade III and IV OA. This latter group had a worst functional outcome (p = 0.003).

Conclusion & perspectives: Sustaining an ankle fracture is a life changing event. However, patients can retrieve a good functional outcome. Smoking, discolated fracture and the presence of grade III and IV OA was associated with a worst outcome.

FM058*

Standardised MRI Protocol in 20° plantar flexion for Achilles tendon rupture

Andri Guetg[1]; Froso Katzioti[1]; Petra Heil[2]

[1] Spitäler fmi AG, Spital Interlaken, Switzerland; [2] Zentrum für Orthopädie Berner Oberland, Switzerland

Introduction: Rupture of the Achilles tendon is a common injury that causes significant morbidity.

Studies show a better outcome with a surgical therapy in acute ruptures with a dehiscence of >5mm. The ultrasound is less reliable and reproduceable to evaluate the rupture with possible diastasis in 20° plantar flexion. Additionally, it is necessary to take the foot out of the cast with multiple manipulations. Furthermore, the MRI is superior for additional information (partial tears, tendon and muscle quality) and confirmation of a 20° plantar flexion during the exam. Therefore, we implemented an MRI protocol for Achilles tendon ruptures in the position of the initial immobilisation in short leg cast in 20° plantar flexion.

Method: Patients with an acute Rupture are immobilized in a cast in 20 plantar flexion.

The Patient is placed in prone position feet first, with the foot in 20° plantar flexion inside the dStream Small Extremity 8ch coil (Philips®). The coil is placed over the cast, after confirmation of a good cast in 20° plantar flexion. The MR protocol includes the following sequences: STIR TSE sagittal, PD TSE sagittal, T2 TSE mDIXON 4mm TRA, T1 TSE transversal. Optional we include 2 sequences with gadolinium contrast agent T1 TSE Dixon km 2.5mm sagittal, and T1 TSE Dixon km 4mm transversal. The coil includes a field of view of 20cm.

Result: It is possible to acquire a good image quality in a cast in 20 ° plantar flexion in a safe und reproduceable manner and easy to implement in a clinical setting.

Conclusion: This MRI protocol gives us an exact and reproduceable method to evaluate the rupture in the position of the initial immobilisation, terms of sings of degenerative disorders, the condition/quality of the tendon, the morphology of the rupture (contact of the tendon stumps, diastasis, location), muscle quality, fatty degenerations and presence of a palmaris longus and/or flexor hallucis longus tendon. In case of a conservative treatment there is no further manipulation of the stumps with risks of secondary diastasis. Therewith it is possible to optimise the individual treatment strategy.

FM059

Talocalcaneal ligament reconstruction in flat foot deformity: a proof-of-concept kinematic analysis

Sylvano Mania; Silvan Beeler; Stephan Wirth; Arnd Viehöfer

Universitätsklinik Balgrist

Background: In progressive flat foot deformity a relative internal rotation of the talus to the calcaneus leads to subluxation in the subtalar joint. Various surgical procedures (spring ligament reconstruction, lateral column lengthening, medializing calcaneal osteotomy) aim to correct the talocalcaneal subluxation indirectly. To our knowledge no study addressed a direct talocalcaneal ligament (TCL) reconstruction to correct progressive flat

foot deformity. This study aims to analyze the kinematic behavior of a talocalcaneal reconstruction and determine its ability to stabilize the talonavicular subluxation in external rotation.

Method: Three-dimensional surface model from 10 healthy ankles were produced. The subtalar rotation axis was simulated to produce an inversion of 9° to an eversion of 9°. A vertical axis was defined to simulate the subluxation of the calcaneus around the talus in a low range of motion without bone impingement from 9° external rotation to 9° internal rotation.

The TCL reconstruction were simulated by joining a line in the subtalar space between 33 talar tunnel exit with 33 calcaneal tunnel exits, both based on incremental deviations along the subtalar rotation axis. 1089 combinations of TCL were produced and their length variation in inversion/eversion and internal/external rotation was calculated.

Results: A lengthening of the TCL in external rotation is observed with a calcaneal tunnel placement in distal, lateral, or latero-distal direction. The talar tunnel orientation leads to TCL lengthening in external rotation only if combined with the aforementioned calcaneal tunnel placement.

A latero-distal orientation of 6° of the talar tunnel combined with a latero-distal deviation of 8° of the calcaneal tunnels presents the highest ligament lengthening in maximal external rotation and shortening in maximal internal rotation, respectively +0.56 mm (3.8% of total length) and -0.57 mm (-3.9% of total length). This combination presented also a near-isometric lengthening in inversion/eversion, respectively +0.01 to -0.01 mm (0.1% of total length).

Conclusion: This study shows that a reconstruction of a subtalar ligament oriented approximately along the subtalar rotation axis would stabilize the subtalar joint in external rotation without impeding the normal hindfoot motion. Further studies should be performed to assess the biomechanical significance of such a reconstruction.

FM060*

Hallux valgus: the influence of inter-sesamoid crista's osteoarthritis on frontal plane pronation

Sérgio De Barros Soares[1]; Xavier Martin Oliva[2]

[1] HFR Fribourg Cantonal Hospital and University; [2] University of Barcelona

Introduction: The mechanical foot's positioning, first ray pronation and valgus deviation of the hallux are correlated. The TMT1 joint's instability disturbs muscle actions over the first metatarsal head. Thus, the peroneus longus is well-anchored in an unstable plane and is then unable to move the calcaneus into varus position, consequently forcing the first metatarsal to pronate. Biomechanically, the intersesamoid crista acts like a rail to keep the metatarsal's head in place, bellow both sesamoids. At deformity's early stage, the metatarsal starts to shift medially, and the tibial sesamoid meets the intersesamoid crista. The metatarsal and sesamoids rotate as a unit and each sesamoid remains on the respective condyle. Therefore, as the deformity progresses, the increasing pressure between the tibial sesamoid and the intersesamoid crista triggers the progression of the crista's osteoarthritis.

Pronation has been documented in a high percentage of hallux valgus (HV) patients. Nevertheless, there is no consensus on how to measure it. The aim of the present study was to correlated sesamoid's crest erosion to the frontal plane pronation in severe HV cases, through 3 different radiological methods.

Methods: Using cadaveric specimens, three commonly used radiographic methods to measure the frontal plane deformity in HV deformity were used: 1. round sign of the lateral edge of the first metatarsal head on anterior-posterior radiograph, 2. non-weightbearing CT-scan and 3. Bernard's axial projection of the first metatarsal head. Afterwards, feet were dissected, and a direct measurement of the pronation was done. The crista's depth was measured using CT sequences.

Results: Our data showed that alpha angle measurements made through the Bernard's axial projection were closer with those obtained during the dissection compared to those made through the CT-scan. The main finding of our study is that osteoarthritic changes at the metatarso-sesamoid joint play an important role in pronation on severe HV cases. When the crista is eroded, pronation is not as important as in those specimens without osteoarthritis.

Conclusion & perspectives: The proposed radiographic methods allow surgeons to verify whether rotation can be corrected during HV procedures and to determine which procedure may be the best for each patient. Understanding the role, the frontal plane plays in HV's biomechanics and in its radiographic appearance is vital to change the current treatment's paradigm.

FM061*

Young and fused: Assessing outcomes of first metatarsophalangeal joint fusion in patients younger than 50 years – a matched cohort analysis

Fabrice Scheurer; Stefan M. Zimmermann; Silvan Beeler; Phillipp Fischer; Stephan Wirth, Arnd Viehöfer

Universitätsklinik Balgrist

Introduction: Painful degenerative joint disease (DJD) of the first metatarsophalangeal joint (MTP I), or hallux rigidus, mainly occurs in later stages of life. For end stage hallux rigidus, MTP I arthrodesis is considered the gold standard, generally resulting in high patient satisfaction. As young and active patients are affected considerably less frequently, it currently remains unclear, whether they benefit to the same extent. This is particularly relevant in borderline cases, where both joint-preserving surgery as well as MTP I arthrodesis are an option. The aim of this study was to report the outcome following MTP I arthrodesis in patients bellow the age of 50 years. We hypothesized that MTP I arthrodesis in younger patients would lead to an inferior outcome with decreased rates of overall patient satisfaction compared to an older cohort.

Methods: All patients under the age of 50 years, who underwent MTP I arthrodesis at our institution for treatment either of primary hallux rigidus or hallux valgus with advanced osteoarthritis were included in this study between 1995 and 2012. This group was then matched and compared with a group of patients over 60 years of age. Minimum follow-up was 10 years. Outcome measures were Tegner activity score (TAS), a "Virtual Tegner activity score" (Virtual TAS), the Visual Analogue Scale (VAS) and the functional foot index (FFI).

Results: A total of 61 MTP I fusions (28 young, 33 old) in 46 patients were included in our study. The younger patients experienced significantly more pain relief in regards to the VAS ($p = 0.048$) and FFI pain score ($p = 0.014$). There were no differences in function ($p = 0.056$) or the ratio of Tegner score to Virtual Tegner score ($p = 0.478$) between both groups. The rate of revision surgeries ($p = 0.720$) did not differ between both groups besides hardware removal which was significant more likely in the young group ($p = 0.019$)...

Conclusion: In the long term follow up patients below the age of 50 years with end stage DJD of the first metatarsal joint, MTP I arthrodesis yielded satisfactory postoperative results comparable to the older cohort in functional outcome. Pain relief was even expierenced higher in the young patient group. Our study shows, thatFirst metatarsal joint fusion is a reliable procedure not only in elderly patients but also in patients under 50 years.

ORALS: A05 KNEE

FM062*

26% of native knees display identical coronal functional knee phenotype as the contralateral leg

Manuel-Paul Sava[1]; Alexandra Leica[1]; Felix Amsler[2]; Michael T. Hirschmann[1]

[1] Kantonsspital Baseland Bruderholz, Liestal, Laufen; [2] Amsler Consulting

Purpose: From osteoarthritic knees the native alignment and morphology cannot be directly deducted. If there is a high symmetry between the affected knee and unaffected contralateral knee, pre-operative planning for total knee arthroplasty (TKA) as well as realignment procedures could be facilitated. Therefore, the aims of this study were to check for correlations and systematic differences of alignment and morphology between left and right native knees in the coronal, sagittal and axial planes on three-dimensional single-photon emission computed tomography/computed tomography (SPECT/CT) acquired images.

Materials and Methods: 282 non-osteoarthritic knees of 141 patients were retrospectively included from the prospectively collected hospital registry. The registry was searched for patients aged between 16 and 45 years old, which received Technetium 99m-methyl diphosphonate SPECT/CT in both of their knees, in accordance with the Imperial Knee Protocol. Statistical analyses of 23 compared left-to-right knee morphometric parameters and their categorization according to Hirschmann's knee phenotype classification was made. These parameters were divided into coronal (n = 9), sagittal (n = 7) and axial (n = 7), depending on the imaging planes.

Results: The highest correlations in the coronal planes between left and right knees have been observed in Hip-Knee-Ankle angle (HKA) , Tibial Mechanical Angle and Hip-Knee-Shaft (Pearson's r = 0.76, p <0.001). 26% of the patients (n = 37) displayed identical coronal knee phenotypes in both their knees. Sagittal HKA correlated very well between left and right knees (Pearson's r = 0.92, p <0.001). Medial Tibia Posterior Slope and Lateral Tibia Posterior Slope were also found to strongly correlate between both knees ([Pearson's r = 0.72, p <0.001]; [Pearson's r = 0.64, p <0.001]). In the axial plane, External Tibia Torsion (Pearson's r = 0.68, p <0,001), Femoral Anteversion (Pearson's r = 0.64, p <0.001) and Anterior Trochlear Angle (Pearson's r = 0.60, p <0.001) showed the strongest correlations when compared between left and right. Statistically significant (p <0.05) systematic left to right differences in some of the analysed parameters have also been identified.

Conclusion: 26% of native knees display the same coronal phenotype as the contralateral knee. Significant correlations and systematic differences were observed between left and right knee in multiple coronal, sagittal and axial morphometric parameters.

FM063

Conservative Treatments of Patellar Tendinopathy: The Higher the Efficacy, the Stronger the Placebo Effect. A Meta-Analysis with Meta-Regression

Davide Previtali[1]; Jacopo Albanese[1]; Iacopo Romandini[2]; Giulia Merli[3]; Francesca Taraballi[4]; Giuseppe Filardo[1]

[1] EOC (Ente Ospadaliero Cantonale) - Ospedale Regionale di Lugano; [2] IRCCS Istituto Ortopedico Rizzoli, Bologna, Italy; [3] Applied and Translational Research Center, IRCCS Istituto Ortopedico Rizzoli; [4] Houston Methodist Research Institute

Introduction: Several therapeutic approaches have been developed for the treatment of patellar tendinopathy but, after the promising results obtained in single-arm studies, they often fail to confirm their efficacy in placebo-controlled randomized clinical trials (RCTs). In fact, the placebo effect in the conservative treatment of patellar tendinopathy is relevant. The aim of this RCTs meta-analysis was to quantify the placebo effect in the field of patellar tendinopathy and to highlight the influence of patient and treatment characteristics.

Methods: After the registration on PROSPERO, a systematic review of the literature was conducted following the Cochrane guidelines. All placebo-controlled RCTs on the conservative treatment of patellar tendinopathy were included and the results in the placebo arms were analyzed with a single-arm meta-analysis. VISA-P at the mid-term follow-up (3-6 months) was the primary outcome, but short- (1-3 months) and long-term (6-12 months) follow-ups and VAS were analyzed as well. A sub-analysis based on the type of placebo and a meta-regression was conducted to look for potential determinants of the placebo effect. Risk of bias and level of evidence were also analyzed with RoB 2.0 and GRADE.

Results: The database search retrieved 1079 articles, out of which 14 were included in the meta-analysis. VISA-P at the mid-term follow-up showed an overall statistically significant placebo improvement of 13/100 points (p = 0.001). The change at the short-term follow-up was not statistically significant, whereas the change at long-term was 27/100 points (p <0.001). Regarding VAS, the results were statistically significant both at mid- (MD = -1.5/10; p = 0.02) and long-term (MD = -3.2/10; p <0.001) follow-up. The meta-regression and sub-analyses showed a positive correlation between the response to placebo and the length of follow-up (p <0.001) and the effect size in the experimental group (P = 0.006). The level of evidence was moderate.

Conclusion: Placebo effect for the conservative treatment of patellar tendinopathy is long-lasting, statistically, and clinically significant. The effect size of the experimental group correlates with the magnitude of the placebo component in the documented results, questioning the real benefit of procedures currently appearing more effective.

FM064*

Outcomes after revision TKA and predictors of re-revision

Lukas Clerc; Anne Lübbeke Wolff; Christoph Barea; Didier Hannouche ; Hermes H. Miozzari

Hôpitaux Universitaires de Genève

Introduction: Rates of revision TKA are predicted to increase, and results are worse than in primary TKA, with a probability of re-revision within 2y between 24-36.2% after infection and 11-17.4% for different causes (1). The cumulative re-revision risk at 5,10 and 15y is 11.7%, 15.4% and 19% respectively, with a higher risk when revised shortly after primary TKA (2).

Our objective was to investigate the outcomes after first revision TKA (f-rev-TKA) and define predictors of re-revision among patients from a local Arthroplasty Registry.

Methods: The GAR is a prospective cohort of patients undergoing primary and revision TKA at a tertiary center. All patients with a f-rev-TKA were included in this study. Outcomes were cumulative risk and predictors of re-revision, satisfaction, WOMAC and SF-12 (introduced in 2010).

We performed Kaplan-Meier analysis and calculated cumulative risks of re-revision at 1,5,10 and 15y. Cox regression analysis was used to identify predictors of re-revision among the following parameters: age, sex, BMI, smoking status, number of comorbidities, number of previous surgeries, cause of first revision (infection yes/no).

Results: 407 f-rev-TKAs performed between 3/1998 and 12/2021 were included (mean age 69.9y, mean BMI 29.2, 62% women). The most frequent reasons for first revision were aseptic loosening 32.7%, prosthetic joint infection (PJR) 23.3%, and persistent pain 11.1%. Seven patients died within 90 days (1.7%). Over the follow-up period (mean 7.1y, SD 5.7), 70 re-revisions were performed and 29 PJRs occurred. Cumulative risks of re-revision were 6.5% (95%CI 4.5-9.4) at 1y, 16.7% (95%CI 13.2-21.1) at 5y, 21.2% (95%CI 16.8-26.5) at 10y and 23.7% (95%CI 18.5-30.2) at 15y. Strongest predictors of re-revision were infection as cause of first revision (adjHR 3.57, 95%CI 2.11-6.02), age <65 (adjHR 3.11, 95%CI 1.87-5.15), and having 4 comorbidities (adjHR 1.72, 95%CI 1.0-2.96).

1y PROMs improved on WOMAC pain in 81%, in 11.4% pain was like before surgery and worse in 7.6%. WOMAC function improved in 73%, remained similar in 9.4% and was worse in 17.6%. SF-12 pcs improved in 79.7% and was worse in 20.3%. 1y after surgery 46% of the patients were satisfied or very satisfied, 18% were very dissatisfied.

Conclusions: after re-revision, function was improved in 73% and pain in 81% of the patients and the rate of satisfaction was only moderate. PJR as a cause of first revision, younger age and poly-morbidity are strong predictor of re-revision.

FM065*

Robotic unicompartmental knee arthroplasty improves functional outcomes, complications, and revisions. A systematic review and meta-analysis

Alessandro Bensa[1]; Alessandro Sangiorgio[1]; Benedetta Pompa[1]; Giuseppe Filardo[1]; Andrea Illuminati[2]; Luca Deabate[1]

[1] EOC (Ente Ospadaliero Cantonale) - Ospedale Regionale di Lugano; [2] Ospedale San Raffaele, Università Vita-Salute San Raffaele

Introduction: Robotic-assisted unicompartmental knee arthroplasty (R-UKA) has been proposed as an approach to improve the results of the conventional manual UKA (C-UKA). The aim of this study was to analyze the studies comparing R-UKA and C-UKA in terms of clinical outcomes, radiological results, operative time, complications, and revisions.

Methods: The literature search was conducted on three databases (PubMed, Cochrane and Web of Science) on December 19, 2022 according to the guidelines for Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). Inclusion criteria were: comparative studies, written in English language, with no time limitations, on the comparison of C-UKA and R-UKA. The quality of each article was assessed using the "Downs and Black's Checklist for Measuring Quality".

Results: Among the 2896 articles retrieved, 21 studies on 19 series of patients were included. A total of 3074 patients (59.5% women and 40.5% men; age 65.2 ± 3.9; BMI 27.4 ± 2.2) was analyzed. R-UKA obtained a superior Knee Society Score (KSS) improvement compared to C-UKA (MD = 4.9; p <0.001) and better Forgotten Joint Score (FJS) post-operative values (MD = 5.5; p = 0.032). The analysis of radiological outcomes did not find a statistically significant difference between the two approaches. R-UKA showed longer operative time (MD = 15.6; p <0.001), but reduced complication and revision rates compared to C-UKA (5.2% vs 10.1% and 4.1% vs 7.2%, respectively).

Conclusion: This meta-analysis showed that the robotic approach for UKA provided a significant improvement in functional outcomes compared to the conventional manual technique. R-UKA showed similar radiological results and longer operative time, but reduced complication and revision rates compared to C-UKA. Overall, R-UKA seems to provide relevant benefits over C-UKA in the management of patients undergoing UKA.

FM066

Accuracy and Precision for Medial Patellofemoral Ligament Identification using CLASS: an anatomic confirmation

Grégoire Thürig; Elisab Alonso Domenech; Marc Barrera Uso; Stefan Blümel; Alina Malov; Raul Panadero Morales; Luis Filgueira; Daniel Petek

HFR - Hôpital Cantonal Fribourg

Introduction: Malpositioning of the femoral tunnel during reconstruction of the medial patellofemoral ligament (MPFL) may lead to an increase in peak medial pressure in the patellofemoral joint due to isometric changes. Several methods have been postulated by different authors to identify the femoral MPFL footprint. Still, tunnel malposition requiring revision accounts for more than a third of reconstruction failures. The compressed lateral and anteroposterior anatomical systematic sequence (CLASS) has shown to be a reliable and reproducible method in a previous study that allows individual identification of the MPFL. The aim of this study is to analyze the accuracy and precision of femoral MPFL footprint identification using CLASS under anatomical conditions.

Methods: Ten cadaveric knees were examined. First, an MRI scan of the native knee joint was performed. Then, careful dissection was performed to identify and mark (with gadolinium pearls >1mm) the anatomical MPFL femoral footprint, the adductor tuberosity, and the medial epicondyle. A second MRI scan was then performed. Both MRIs were processed independently with an ad hoc software (CLASS algorithm) implementing the previously defined anatomic structures to generate a true lateral view of the knee showing anatomical position of the marked structures. A true-lateral fluoroscopic view of the knee with the anatomic femoral MPFL footprint marked, has been taken to serve as gold standard. Localization of all anatomical described settings were compared to determine accuracy and precision.

Means, standard deviations and ranges were calculated for the distances between the CLASS identified tunnel positions and the true anatomical point. A two-tailed t-test was performed to compare distances from the anatomical points between the CLASS and fluoroscopy groups. Significance was set at p value ≤ 0.05.

Results: There was no statistical significance between between the CLASS and fluoroscopy groups. CLASS compared with the gold standard allowed precise and accurate identification of the femoral MPFL footprint.

Conclusions: The CLASS is a reliable and reproducible method that provides precise and accurate identification of the femoral isometric MPFL location on a reconstructed true lateral knee view. The CLASS algorithm could be used as a safe template for truthful fluoroscopic identification of the femoral tunnel in MPFL reconstructive surgery.

FM067

Star-wrap Technique: A New Option for Operative Treatment for Comminuted Patellar Fractures

Isabelle R. Bünter; Michele Arigoni; Vital Schreiber; Severin Meili

Spital Uster

Background: Patellar fractures are rare with 1% of all fractures. Displaced fractures are usually treated surgically with anatomical reduction and fixation using tension band or screw and plate fixation. Comminuted fractures can be challenging and equatorial cerclage is often added. Because of the proximity to the skin hardware removal is often necessary after fracture healing. Recently, the usage of non-resorbable sutures in tension band fixation has gained popularity.

Aim: We describe a new technique for fixation of comminuted patellar fracture using a combination of an equatorial and a tension band technique with a non-resorbable suture.

Patients and Methods: In the "Star-wrap technique" the main fracture fragments are reduced and fixed with at least two screws or K-wires to regain axial stability and alignment of the joint. Smaller fragments are kept in their soft tissue envelope to avoid disruption to the blood supply. A non-resorbable suture is positioned circumferentially around the patella leaving open loops in a garland fashion. With an additional non-resorbable suture, the loose loops are braided in a star shaped manner. After tightening and knotting of the equatorial cerclage the star suture is sequentially tightened and knotted. A tension band stability with equatorial compression is achieved.

Results: Seven patients (age 33–90 y) were operated with this technique. Three patients had AO 34-C2 and four AO 34-C3 fractures. At six weeks follow-up all patients showed a good clinical result with only one patient with a slight radiological secondary displacement. In this same patient removal of K-wires was necessary. For all other patients hardware removal was so far not necessary.

Conclusion: This new technique combines the tension band and the cerclage principles in treatment of comminuted patellar fractures. Clinical results show feasibility of this technique and hardware removal seems less frequent compared with other techniques.

FM068

C-Arm position influences femoral tunnel location in medial patellofemoral ligament reconstruction

Grégoire Thürig[1]; Elmar Herbst; Adrian Deichsel; Christian Peez; Thorben Briese; Johannes Glasbrenner; Michael Raschke; Christoph Kittl

HFR - Hôpital Cantonal Fribourg

Background: Medial patellofemoral ligament (MPFL) reconstruction is an established procedure in the treatment of patellar instability. However, femoral tunnel misplacement is responsible for 38.2% of cases in revision surgery.

Different methods are published for the identification of the femoral MPFL insertion site. In clinical practice, the Schöttle technique, using a C-arm can be considered as the gold standard.

Purpose: The purpose of the study was to evaluate the influence of the C-arm position on the radiographic controlled femoral MPFL placement.

Study Design: Descriptive laboratory study.

Methods: Ten cadaveric knees were dissected, the femoral MPFL insertion site was identified and marked using 10 mm eyelets. According to the possible clinical scenarios, true lateral radiographs in two different C-arm positions (ML5: 5cm from the receptor with X-ray beam from medial to lateral; LM25: 25cm from the receptor with X-ray beam from lateral to medial) were taken. At each radiograph, the eyelet position was recorded as the distance (proximal-distal and anterior-posterior) from the optimal radiographic insertion point according to Schöttle.

Differences were calculated using the Wilcoxon signed-rank test (2-related sample), and a p value of less than 0.05 was considered significant.

Results: The anatomic femoral MPFL insertion in the ML5-position was located a mean of 2.3 ± 2.4 mm (range, 0.2-5.8) proximally and 4.1 ± 6.0 mm (range, -6.2-13.6) anteriorly to the Schöttle point. This resulted in an absolute distance of 7.2 ± 3.0 mm (range, 3.6-13.6). In the LM25-position it was located a mean of 0.6 ± 1.8 mm (range, -3.2-5.6) distally, and 2.7 ± 5.7 mm (range, -8.4-9.8) anteriorly, which resulted in an absolute distance of 5.5 ± 3.1 mm (range, 1.1-9.8).

Wilcoxon signed-rank test (2-related sample) showed a significant difference between the two C-arm setups in the x-axis (proximal-distal). However, no significant differences could be determined between the C-arm setups in the y-axis (anterior - posterior), the absolute distance between the eylets, and the absolute distances between Schöttle point and the anatomic attachment of the MPFL (eyelet).

Conclusion: The intraoperative C-arm setup in MPFL reconstruction affects femoral tunnel positioning and may therefore alter patellofemoral kinematics.

FM069

Prevalence of combined torsional deformities of the lower leg in symptomatic patients with patellar instability

Till Lerch; Thierry Leimbacher; Frank Michael Klenke; Emanuel Liechti

Inselspital, Universitätsspital Bern

Introduction: Torsional deformities of the lower leg were associated with anterior knee pain, knee osteoarthritis and patellar instability. Increased femoral torsion (FT) causes lateral patella-hypercompression and lateral patellar instability. Therefore, distal femoral derotational osteotomies to correct FT are increasingly performed. On the other hand, an association between increased tibial torsion (TT) and patellofemoral disorders has been reported but not consistently confirmed. Femorotibial rotation (FTR), specifically external rotation of the tibia relative to the femur, has recently been identified as a risk factor for patellar instability. Currently, there is no consensus on how best to correct FTR. Theoretically, combined torsional deformities might compensate or aggravate each other regarding the influence on patellofemoral kinematics. Therefore, this study aims to determine the prevalence of combined abnormalities in symptomatic patients with patellar instability.

Methods: An IRB-approved radiographic retrospective study was performed of 207 consecutive patients with patellar instability. Of them 145 had documented patellar dislocation and 62 had patellar subluxation. All included patients had CT scan of the hip, knee and ankle. FT was measured according to the Murphy method assuming a normal range of 10-25°. FTR was defined by the angle between the femoral and the tibial posterior condylar lines assuming a normal range of -5 to +5°. TT was measured according to the method described by Waidelich et al (normal range 25-40°).

Results: Mean FT was 29.8°, mean FTR 6.8°, and mean TT 34.2°. 68% had FT>25, 57% had FTR>5, and 23% had TT>40. 39% had combined FT>25 and FTR>5. There was a negative correlation between FTR and TT (r = -.425, p <.001). Whereas 16% had combined FT>25 and TT>40, only 5% had combined FT>25, FTR>5 and TT>40. 9% had no torsional deformity (all 3 values normal).

If a femoral derotational osteotomy is indicated from FT>35°, 30% of the patients would be eligible. 19% had combined FT>35 and FTR>5. Only 2% had combined FT>35, FTR>5 and TT>40.

Conclusion: In patients with patellar instability, torsional deformities are highly prevalent. Only 9% had no torsional deformity. In up to 30% of patients, a femoral derotational osteotomy is a possible strategy to improve alignment. 2% have combined FT>35, FTR>5 and TT>40 and may be eligible for combined distal femoral and high tibial derotation osteotomy.

FM070

Use of the forgotten joint score (FJS)-12 to evaluate knee awareness after Quadriceps tendon repair surgery

Manuel-Paul Sava[1]; Benjamin L. Schelker[1]; Zainab Aqeel Khan[2]; Alexandra Leica[1]; Felix Amsler[3]; Michael T. Hirschmann[1]

[1] Kantonsspital Baseland Bruderholz, Liestal, Laufen; [2] AO Hospital; [3] Amsler Consulting

Purpose: Quadriceps tendon rupture (QTR) is a severe injury of the knee extensor apparatus. The study aims to validate the use of forgotten joint score (FJS-12) for QTR and assess the mid- to long-term functional outcome after surgical treatment of QTR.

Methods: Fifty-seven patients who underwent surgery for QTR with transosseous suture reconstruction in a single orthopaedic surgery and traumatology center between 2015 and 2020 were eligible for enrolment in this retrospective case series. The demographic data and other pre-operative details such as age, gender, comorbidities and medication use also were extracted from the medical records. Patient reported outcome measures (PROMs) were gathered in the form of Western Ontario and McMaster Universities Arthritis Index Score (WOMAC), Tegner Activity Score (TAS), Lysholm Score and FJS-12 at mid to long-term postoperative time interval. The FJS-12 was validated by correlation with WOMAC, TAS and Lysholm Score.

Results: The mean age of all patients were 69.2 ± 13.6 years with 51 (89.5%) males and 6 (10.5%) females. The mean time from injury to surgery was 3.39 ± 5.46 days. All patients reported satisfactory functional outcomes after surgery on FJS-12, WOMAC and Lysholm scores, except the TAS, which decreased slightly from pre-operative level. There was a high negative correlation between WOMAC and FJS-12, but moderate positive correlations between FJS-12 and TAS and Lysholm scores. The Cronbach's alpha value was 0.96 for 12 items in FJS-12.

Conclusion: This study has found that FJS-12 is a reliable and easy to assess tool for functional outcomes after QTR repair. It has shown moderate to strong correlation with other commonly used outcome measures (WOMAC, TAS and Lysholm). Furthermore, patients who underwent transosseous QT suture reconstruction have reported good mid- to long-term outcomes.

FM071

Placebo and Intra-articular Knee Injections: The Higher the Treatment Efficacy, the Stronger the Placebo Effect – A Meta-Analysis with Meta-Regression

Davide Previtali[1]; Angelo Boffa[2]; Giorgio Di Laura Frattura[1]; Stefano Zaffagnini[2]; Christian Candrian[1]; Giuseppe Filardo[1]

[1] EOC (Ente Ospadaliero Cantonale) - Ospedale Regionale di Lugano; [2] IRCCS Istituto Ortopedico Rizzoli, Bologna, Italy

Introduction: Among the conservative approaches for knee osteoarthritis, intra-articular injections are one of the most used. When the available treatments are tested in placebo-controlled randomized controlled trials (RCTs), they often fail to overcome the results of inert saline injections due to the presence of a strong placebo effect. The aim of this meta-analysis is to quantify the placebo effect of knee injections, evaluate its evolution over-time and identify its major determinants and components.

Methods: A systematic review of the literature was conducted following the Cochrane Guidelines to retrieve all the double-blind RCTs that compare an experimental treatment to saline injections. PubMed, Web of Science, EMBASE, Cochrane, and Scopus databases were used. The results of the groups in which saline was injected were analyzed through a single-arm meta-analysis. The primary outcome of the study was VAS pain (0-100), and WOMAC score, KOOS, SF-36 score were analyzed as well at 1, 3, 6, and 12 month follow-ups. The risk of bias and the quality of evidence were analyzed with RoB 2.0 and GRADE.

Results: The database research retrieved 2045 articles of which 74 were included in the meta-analysis. A significant improvement after saline injection was documented in terms of VAS at 1 month 1 (MD = 18.2; p <0.001), 3 months (MD = 18.4; p <0.001), 6 months (MD = 19.3; p <0.001), and 12 months (MD = 16.3; p <0.001). The analysis on WOMAC scale showed a significant benefit of saline injection at all the follow-ups and for all the sub-scores. The analyses of the KOOS, which was possible only at 3, 6 and 12 months, and of SF-36, possible at 3 and 6 months, showed a significant improvement in all the subscores as well. The meta-regression showed that the effect

size in the related experimental group was the main determinant of the response to saline injections (ρ = 0.49; P = 0.01). The level of evidence was moderate.

Conclusion: The placebo effect of intra-articular saline injection is long-lasting, statistically, and clinically significant not only in terms of pain but also in terms of knee function and quality of life. Both in the research and clinical practice, it is mandatory to consider the magnitude of placebo effect to understand the response to experimental treatments. To this regard, it should be considered that when the experimental approach appears to be more effective, the correlated documented placebo effect of saline is stronger.

FM072

Outcomes of Rotating- vs Fully Hinged Knee Arthroplasty in the Setting of One-Stage Exchange for Periprosthetic Joint Infection of the Knee

Emanuel Liechti[1]; Philip Linke[2]; Thorsten Gehrke[2]; Mustafa Citak[2]; Christian Lausmann[2]

[1] Inselspital, Universitätsspital Bern; [2] Helios ENDO-Klinik Hamburg

Introduction: At Helios ENDO-Klinik Hamburg, the preferred treatment of chronic periprosthetic joint infection (PJI) is the one-stage exchange of the infected total knee arthroplasty (TKA). Based on the surgeon's preference, a rotating hinge or a full hinge knee prosthesis is used. Data reported in the literature on rotating hinge implants for revision are inconsistent, with five-year survival rates ranging from 52% to 90%. Reports on the results of full hinge implants are very sparse, and to our knowledge, no study has reported the outcomes of rotating- vs fully hinged TKA.

Methods: The institutional database was retrospectively reviewed to identify all 237 one-stage septic exchanges of a primary unconstrained TKA to a hinged TKA performed between 2008 and 2017. Exclusion criteria were intramedullary stem extensions or augments used in primary TKA, history of knee extensor mechanism reconstruction, and a follow-up of <two years after surgery. The final study cohort included 167 exchanges, using 117 rotating hinge implants and 50 full hinge implants (Endo Model; Waldemar Link, Germany). The radical surgical debridement included a complete capsulectomy, and release or radical debridement of the collateral ligaments. The implants were always cemented for local antibiotic therapy.

Results: At 5 years, the all-cause revision-free survival was 77% (95% CI 69 to 82). 31 patients (19%) had their further revision for aseptic reasons, namely, mechanical failure (18), anterior knee pain (9), arthrofibrosis (4), periprosthetic fracture (2), and heterotopic ossification (1). Mechanical causes of failure included aseptic loosening and failure of the hinge mechanism, all of which were revised by exchanging the loose and defective components. In the rotating hinge group, the mechanical failure rate was more than twice as high as in the full hinge group (13% vs 6%). At a mean follow-up of 6.7 years, 21 (13%) patients had a reinfection, all of them underwent a further one- or two-stage exchange. Reinfection rates did not differ between the two groups.

Conclusion: The use of hinged TKA in the revision of PJI shows favourable five-year infection-free and all-cause revision-free survival rates of 91% and 77%, respectively. In this setting, the rotating hinge design showed poorer results with more than twice the mechanical failure rate compared to the full hinge design. Our results can be used to counsel patients following infected TKA and help clinicians make informed implants.

FM073

One-Step Autologous Minced Cartilage Procedure for the Treatment of Knee Joint Chondral and Osteochondral Lesions: 5-Year Outcomes of a novel Cartilage Repair Procedure

Jakob Hax[1]; Robert Ossendorff[2]; Vincent A. Stadelmann[1]; Stefan Schneider[3]; Stefan Preiss[1]; Gian M. Salzmann[1]; Armin Runer[4]

[1] Schulthess Klinik; [2] Universitätsklinikum Bonn; [3] Orthocentrum Hamburg; [4] Klinikum rechts der Isar der Technischen Universität München

Introduction: Cartilage injuries in the knee are frequent but their treatment remains challenging. Minced cartilage (MC) is a one-step, autologous procedure with promising short-term results. The aim of the present study was to evaluate mid-term results in a patient cohort with chondral and osteochondral lesions in the knee joint treated with MC.

Methods: From February 2015 through December 2016, a total of 34 consecutive patients were treated with a single-step, autologous MC for knee chondral and osteochondral lesions. Numeric analogue scale (NAS) for pain and knee function were obtained prior to surgery and at 12, 24 and 60 months postoperatively. Secondary outcomes, including Lysholm score, Tegner activity score, and the International Knee Documentation Committee (IKDC) score were recorded at final follow up. MRI examinations of patients with unplanned radiological follow up were analyzed using the MOCART (Magnetic Resonance Observation of Cartilage Repair Tissue) score.

Results: A total of 28 patients (44.1% females, age at surgery: 29.5 ± 11.5 years) were available at a mean follow up of 65.5 ± 4.1 months. Mean defect size was 3.5 ± 1.8 cm2. NAS for pain decreased from a median of 7 (range: 2 -10) preoperatively to 2 (0 – 8) postoperatively. NAS knee function improved from a median of 7 (range: 2 -10) to 3 (0 – 7) after five years, respectively. Satisfactory Lysholm (76.5 ± 12.5), IKDC (71.6 ± 14.8) and Tegner activity (4, range 3–9) scores were reported at final follow up. The average overall MOCART score for all postoperatively performed MRIs (n = 23) was 62.6 ± 15.8. Four (11.6%) surgery-related complications required revision operation.

Conclusion: One-step, autologous minced cartilage repair of chondral and osteochondral lesions of the knee demonstrated good patient-reported mid-term outcomes, low complication rates, and graft longevity at midterm follow up. Minced cartilage represents a viable treatment option to more traditional cartilage repair techniques.

FM074*

Conservative Treatment for Patellar Tendinopathy: A Systematic Review and Meta-Analysis

Alessandro Sangiorgio[1]; Alessandro Bensa[1]; Angelo Boffa[2]; Luca Andriolo[2]; Giuseppe Filardo[1]

[1] Service of Orthopaedics and Traumatology, Department of Surgery, EOC, Lugano, Switzerland; [2] IRCCS Istituto Ortopedico Rizzoli, Bologna, Italy

Introduction: Patellar tendinopathy, also known as jumper's knee, is a pathological condition characterized by activity-related pain that may significantly affect patients' quality of life. The first-line therapy is a conservative approach, but there is still no consensus on the most effective treatments. The purpose of this study was to analyze which is the best conservative approach at short and long-term follow-ups.

Methods: A literature search was conducted on four databases (Pubmed, Cochrane, Web of Sceince, and Embase) from inception up to January 2023. Inclusion criteria were articles written in English, addressing nonsurgical treatment of patellar tendinopathy. The studies were divided by treatment and a meta-analysis was conducted on the clinical outcomes measured

through the Victorian Institute of Sport Assessment scale for patellar tendinopathy (VISA-P) at short (<6 months) and long-term (≥ 6 months) follow-ups. Studies addressing the use of platelet-rich plasma (PRP) were further divided in single or multiple injections.

Results: 107 articles (3845) were retrieved. VISA-P scores at short-term follow-up were 74.4 for eccentric exercise (SE 2.6; improvement 22.0, SE 3.2), 63.6 for External Shockwave Therapy (ESWT) (SE 2.6; improvement 11.8, SE 3.0), 67.6 for single PRP injection (SE 3.7; improvement 20.5, SE 4.4), and 63.5 for multiple PRP injections (SE 3.4; improvement 13.5, SE 3.9). Eccentric exercise was significantly better compared to ESWT in VISA-P scores (p = 0.005) and compared to multiple PRP injections in terms of VISA-P scores (p = 0.015) and mean improvement (p = 0.025). VISA-P scores at long-term follow-up were 78.3 for eccentric exercise (SE 3.9; improvement 26.3, SE 5.1), 73.1 for External Shockwave Therapy (ESWT) (SE 4.2; improvement 23.6, SE 5.2), 67.2 for single PRP injection (SE 4.0; improvement 22.9, SE 5.0), and 79.4 for multiple PRP injections (SE 3.6; improvement 32.4, SE 4.5). Multiple PRP injections showed statistically higher VISA-P scores compared to single PRP injection (p = 0.03).

Conclusions: This review found an overall high success of all the conservative treatments analyzed. The meta-analysis showed that the best short-term results could be obtained with eccentric exercise, while multiple PRP injections showed promising long-term results.

FM075

Influence of Different Reconstruction States in ACL-deficient Knee with Associated Tibial Posterolateral Fracture: a Biomechanical Cadaveric Study

Grégoire Thürig; Adrian Deichsel; Elmar Herbst; Christian Peez; Thorben Briese; Johannes Glasbrenner; Michael Raschke; Christoph Kittl

HFR - Hôpital Cantonal Fribourg

Introduction: Tibial posterolateral impression fractures (PLTF) are common concomitant injuries of an anterior cruciate ligament (ACL) rupture resulting in a loss of osseous support of the posterior horn of the lateral meniscus. It is unknown if the additional treatment of the PLTF presenting a 3mm of tibial depression and 50% of support of the external meniscus posterior horn brings a benefit in the treatment of symptomatic ACL-deficient knees.

Aim: The purpose of this biomechanical study was to compare the effect of different reconstruction state in a ACL-deficient knee with PLTF to the native state on kinematics.

Material And Methods: A 6° of freedom robotic system equipped with a force-torque sensor was used to test 8 knees in the intact, ACL-deficient, ACL-deficient with PLTF, ACLR with PLTF, ACLR with ALT and PLTF, and ACLR with reconstructed PLTF states. Simulated laxity tests were performed at 0°,30°,60°, and 90° of flexion, anterior tibial translation (ATT), valgus rotation (VR), internal (IR) and external rotation (ER). The simulated Pivot-shift (PS) test was performed. The primary outcome measures of this force-controlled setup were anterior tibial translation and axial tibial rotation. A two-way repeated-measures ANOVA with post hoc Bonferroni corrections for multiple comparisons was performed to evaluate the effect of different states over different angles($p < 0.05$ = significant).

Results: ACLR with reconstructed PLTF compared to native state presented in 60° a significant increase of IR. ACLR with ALT presented a significant reduction of IR in 30° and 90° compared to native state. In the simulated PS the ACLR with reconstructed PLTF showed a significant higher ATT compared to native state in 15-45°. In comparison, the ACLR with ALT showed no significant differences to the native state in 0-45°. ACLR with ALT presented a significant reduction of IR in PS compared to the native state in 15-45°. The ER was significantly reduced in 0° in the ACLR with ALT compared to native state.

Conclusion: ACLR with additional reduction and fixation of the PTLF in ACL-deficient knees with low-grade PTLF provides only incomplete restitution of knee kinematics, especially for anterior translation in the simulated pivot-shift test. ACLR with ALT restores more native anterior translation, including in the simulated pivot-shift test. However, it carries the risk of an overall reduction in rotation, especially internal rotation, compared with native knee kinematics.

FM076*

Differences between two-dimensional (2D) weight-bearing and three-dimensional (3D) non-weight-bearing planning in total knee arthroplasty (TKA)

Patrick Pflüger; Sandro Hodel; Stefan M. Zimmermann; Svenja Knechtle; Lazaros Vlachopoulos; Sandro F. Fucentese

Balgrist University Hospital, Zurich, Switzerland

Introduction: Preoperative planning of total knee arthroplasty (TKA) is usually based on weight-bearing (WB) long-leg radiographs (LLR). With the rise of patient-specific instrumented (PSI) TKA, preoperative planning is performed on the base of non-weight-bearing ((NWB) computed tomography (CT).

Purpose: The aim of this study is (1) to assess differences between two-dimensional (2D) WB and three-dimensional (3D) NWB planning in TKA and (2) to identify influencing factors.

Methods: Retrospective single-center analysis of patients planned for a TKA with PSI and complete 2D an 3D planning protocol. Preoperative WB LLR and NWB CT were analyzed and following radiographic parameters included: hip-knee-ankle angle (°) (HKA) (+ varus/ - valgus), joint line convergence angle (°) (JLCA), femorotibial subluxation (mm) and bony defect classified according to Anderson. Preoperative range of motion was also considered as possible covariate. Demographic factors included age, sex, and body-mass index (BMI). Multiple regression analysis was performed to analyze the relationship between the variables and the difference of 2D/3D HKA.

Results: Three-hundred-fifty-two knees of 327 patients (66% females) with a mean age of 66 ± 9.7 years were analyzed. The HKA differed significantly between 2D and 3D planning modalities in varus knees (n = 231): 9.9° ± 5.1° vs. 6.7° ± 4° ($p < 0.001$) and in valgus knees (n = 121): -8.2° ± 6° vs. -5.5° ± 4.4° ($p < 0.001$). In varus knees the HKA ($\beta = 0.38$; $p < 0.0001$) and JLCA ($\beta = 0.14$; $p = 0.04$) were associated with increasing difference between 2D/3D HKA (regression model fit: $R2 = 0.41$; $p < 0.0001$). In valgus knees the HKA ($\beta = -0.49$; $p < 0.0001$), JLCA ($\beta = -0.29$; $p = 0.002$) and age ($\beta = -0.05$; $p = 0.049$) were associated with increasing difference between 2D/3D HKA (regression model fit: $R2 = 0.5$; $p < 0.0001$).

Conclusion: Two-dimensional weight-bearing and three-dimensional non-weight-bearing planning in total knee arthroplasty differ significantly regarding the HKA and correlate with the extent of varus/valgus deformity and JLCA in the weight-bearing state. In NWB CT 3D planning the HKA is underestimated in varus and valgus knees. This is an important factor to consider for coronal alignment of 3D planning when using PSI.

FM077

Kinematic vs mechanical alignment in total knee arthroplasty: the trochlea perspective

Petros Ismailidis[1]; Ilya Borukhov[2]; Christina Esposito[2]; Sally Li-Arno[2]; Jenna Lyon[2]; Peter McEwen[3]

[1] University Hospital of Basel; [2] Stryker; [3] Orthopaedic Research Institute of Queensland

Introduction: Kinematic (KA) and mechanical (MA) alignment are the most common techniques regarding implant placement in total knee arthroplasty (TKA). Numerous studies have provided evidence of the biomechanical differences in the tibiofemoral joint that result from the different placement of the components. However, little is known about the changes in the patellofemoral joint biomechanics resulting from KA and MA. The goal of this study was to examine the influence of KA and MA on the orientation of the trochlea as well as on the trochlear fill.

Methods: 1,012 CT-scans of healthy femora were included. A computer analysis software (SOMA, Stryker Anatomy Analysis Tool, Stryker, Mahwah, NJ) was used to segment bone surfaces from the CT images. Eleven coaxial cutting planes were rotated equally around the trochlear sulcus axis. The femoral component of a TKA system was virtually implanted in both MA and KA techniques in each knee. Measurements were performed in the native knee as well as after virtual KA and MA implant placement. In order to describe the orientation of the trochlear sulcus the distal trochlear sulcus angle, defined as the angle between the distal femoral joint line and a straight line fitted through trochlear sulcus points projected onto the coronal plane, was measured. Regarding the trochlear fill, in order to measure over- or under-stuffing of the prosthetic joint, the medial and lateral trochlear peaks were defined as the most prominent points on the medial and lateral trochlea along the anterior axis of the femur at each of the eleven coaxial cutting planes.

Results: The prosthetic trochlear sulcus orientation was more valgus than native with both MA and KA techniques. Prosthetic sulcus orientation deviated less from native in KA than MA (4.8, SD 2.2° vs. 8.8, SD 1.8°, $p<0.001$). Regarding the medial trochlear height both techniques understuffed the patellofemoral joint, MA more than KA. Regarding the lateral trochlear height MA and KA understuffed the patellofemoral joint in the proximal 80% of the trochlear groove arc. At the terminal point of the arc, KA replicated lateral trochlear height whereas MA resulted in overstuffing.

Conclusions: Neither KA nor MA consistently reproduce the native trochlea anatomy. Both MA and KA produce a more valgus orientation and an understuffing of the trochlear sulcus. KA is more biomimetic than MA regarding sulcus orientation and lateral trochlear height at the terminal point of the trochlear arc.

FM078

Accuracy of 3D-planned patient specific instrumentation in high tibial slope correction osteotomy

Christoph Zindel; Sandro Hodel; Lukas Jud; Stefan M. Zimmermann; Lazaros Vlachopoulos; Sandro F. Fucentese

Universitätsklinik Balgrist

Background: High tibial slope correction osteotomy (HTSCO) is a well-established procedure for the treatment of anterior cruciate ligament graft (ACL) failure or in combination with coronal realignment and combined ACL insufficiency. However, the influence of patient-specific instrumentation (PSI) or the type of osteotomy on the accuracy of the procedure remains unclear.

Purpose: The aim of the study was (1) to evaluate the accuracy of PSI navigated HTSCO and (2) to analyze the influence of an open wedge osteotomy (OWO) vs. closed wedge osteotomy (CWO) on the accuracy of the PTS correction. We hypothesized that (1) the accuracy of PSI navigated HTSCO will be high and (2) that CWO will be more accurate than OWO.

Methods: All PSI HTSCO were reviewed in a single-center analysis and 3D accuracy analysis was performed after 3D triangular surface model reconstruction of the pre- and postoperative computer-tomography (CT) of the lower leg. Accuracy was defined as the mean absolute angular 3D difference and projected difference in the sagittal, coronal and axial plane between the planned and achieved surgical correction (°). The influence of the type of HTSCO (open vs. closed wedge) was analyzed.

Results: Eighteen patients (M: 16, F: 2) with a mean age of 31.1 ± 10.4 (range: 17 – 47) years that underwent either a slope reducing CWO (n = 9) or OWO (n = 9) between 2019 to 2022 were included. 3D accuracy was 2.3° ± 1.1° in the sagittal plane (PTS), 1.9° ± 1.4° in the coronal plane and 1.4° ± 1.2° in the axial plane. CWO was significantly more accurate than OWO in PTS correction (1.4° ± 0.9° vs. 3.1° ± 0.6°; $p<0.01$). No significant difference was found in coronal and axial plane.

Conclusion: Slope reducing osteotomy can be achieved accurately when using PSI. CWO demonstrated an increased accuracy to achieve the planned PTS and should be considered as the first choice when accurate slope reduction is the primary goal of realignment.

ORALS: A01 SHOULDER/ELBOW II

FM079

Functional and radiographic outcome of degenerative versus traumatic non-massive, full-thickness supraspinatus tendon tears

Cornelia Baum[1]; Laurent Audigé[2]; Thomas Stojanov[1]; Sebastian A. Müller[3]; Pietro Feltri[4]; Giuseppe Filardo[4]; Andreas Marc Müller[1]; Study Group ARCR_Pred

[1] University Hospital Basel; [2] Schulthess Clinic Zuerich; [3] Kantonsspital Baselland, Bruderholz; [4] EOC Lugano

Introduction: Arthroscopic rotator cuff repairs (ARCR) are among the most commonly performed orthopedic procedures. Several factors, including age, gender and tears size, have been identified as predictors for outcome after repair. The influence of tear etiology (traumatic versus degenerative) on functional and structural outcome remains controversial.

Methods: Patients undergoing ARCR from nineteen centers were prospectively enrolled between June 2020 and November 2021 (ARCR_Pred cohort). To create homogenous groups, only patients with full-thickness, non-massive tears involving the Supraspinatus (SSP) tendon were included. Tears were classified as either degenerative (chronic shoulder pain, no history of trauma) or traumatic (acute onset of symptoms after trauma, no prior shoulder pain). Range of motion, strength, Constant Score (CS), Subjective shoulder Value (SSV) and Oxford Shoulder Score (OSS) were assessed at baseline, 6- and 12-month follow up; SSV and OSS were additionally recorded at 24-month follow-up. Repair integrity was evaluated by ultrasonography one year after ARCR, and additional surgeries were documented until 24 months follow up. The two groups were compared using mixed models adjusted for baseline values and potential confounding effects.

Results: From the 973 ARCR_Pred patients, rotator cuff entities of eligible patients were traumatic in 191 and degenerative in 230 patients. Baseline strength, OSS, SSV and CS were significantly lower in the traumatic group but demonstrated significantly greater changes after surgical repair up to 6- and 12-month follow-up and higher overall Scores. At 24-month follow-up, patients reported no significant differences for OSS (mean 44 degenerative vs. 47 traumatic; 95%CI of group difference -1 to 4) and SSV (mean 89 degenerative vs. 92 traumatic; 95%CI of group difference -2 to 8). Furthermore, there was no significant difference in repair failure (p = 0.897) or additional surgeries (p = 0.723) between groups.

Discussion: Both patients with traumatic and degenerative full-thickness Supraspinatus tendon tears show satisfactory functional results at short term follow-up after ARCR. While baseline functional scores are lower in patients with traumatic tears, they rehabilitate over time and score significantly higher one year after surgery. Traumatic and degenerative rotator cuff tears show comparable structural outcomes, suggesting that degenerated tendons retain adequate healing potential.

FM080

Scapular Morphology Differentiates Glenohumeral Osteoarthritis But Not Rotator Cuff Pathology

J Tomas Rojas[1]; Alexandre Lädermann[2]; Penny Atkins[3]; Lukas Dommer[4]; Matthijs Jacxsens[5]; Matthias Zumstein[6]

[1] Clínica Santa María, Santiago, Chile; [2] Division of Orthopaedics and Trauma Surgery, La Tour Hospital, Meyrin, Switzerland; Department of Orthopaedics and Trauma Surgery, University of Geneva, Geneva, Switzerland.; [3] University of Utah, USA

Background: Anatomic factors associated with rotator cuff (RC) pathology and shoulder osteoarthritis development are still a topic of debate. Most studies use two-dimensional methodology, but recent three-dimensional (3D) methods allow for a better understanding and analysis of the scapula´s complex shape. The purpose of this study is to investigate whether scapular anatomy is associated with RC pathology or glenohumeral osteoarthritis using 3D statistical shape modelling (SSM).

Methods: A total of 125 computed tomography (CT)-scans of complete scapula were allocated to three groups. RC group (RCG) included patients with posterosuperior RC tears. Osteoarthritic group (OAG) included patients with centric glenohumeral osteoarthritis. Each group included 55 patients matched by age and gender. Control group (CG) included 16 patients without shoulder pathology. A 3D segmentation of each scapula was manually created and surfaces were reconstructed for input to SSM analysis. SSM-based correspondence particles were analyzed using principal component analysis (PCA) and linear discriminant analysis (LDA). Different landmarks were manually identified on each scapula. From these landmarks, 3D measurements of glenoid version and inclination, critical shoulder angle (CSA), acromial angle, among others, were obtained. Measurements were compared between the CG, RCG and OAG using ANOVA or Student's T-test, as appropriate.

Results: There were no differences in mean age (RCG:57±9, OAG:58±8 and CG:61±7) and gender proportion (males:RCG:51%, OAG:51% and CG:75%) between groups. 13 PCA modes captured significant shape variation (83.5% of overall variation) among the three groups. The LDA was significantly different between OAG and both RCG and CG (RCG:1.0±1.4, OAG:-1.0±1.9 and CG:1.4±1.2). Glenoid version and inclination had no differences between groups. Compared to CG, OAG had smaller CSA (25.0˚±6vs32.4˚±4;p <0.01), smaller acromion-spine angle (71.9˚±8vs76.6˚±8;p:0.03), larger acromion angle (65.7˚±9vs57.4˚±9;p <0.01), a more superior and anterior postero-lateral corner of the acromion (p <0.01 for both) and more anterior coracoid tip (p <0.01).There were no significant differences in any measurements between RCG and CG.

Conclusions: Scapular morphology of OAG indicated more superior and more horizontal acromion with lower CSA compared to control group. Conversely, this study was not able to identify association between scapular morphology and the presence of RC pathology.

FM081

Structural Musculotendinous Parameters Predicting Failed Tendon Healing after Rotator Cuff Repair

Maurits G. L. Olthof; Martin Flück; Paul Borbas; Paola Valdivieso; Marco Toigo; Fabian Egli; Jin Joshy; Lukas Filli; Jess G. Snedeker; Christian Gerber; Karl Wieser

Balgrist University Hospital

Background: Healing of the rotator cuff after repair constitutes a major clinical challenge with reported high failure rates. Identifying structural musculotendinous predictors for failed rotator cuff repair could enable improved diagnosis and management of patients with rotator cuff disease.

Purpose: To investigate structural predictors of the musculotendinous unit for failed tendon healing after rotator cuff repair.

Study design: Prospective Cohort study.

Methods: 116 shoulders of 115 consecutive patients with an MR-arthrography documented supraspinatus tear were treated with an arthroscopic rotator cuff repair. Preoperative assessment included standardized clinical and imaging (conventional radiography, MR-arthrography) examination. Intraoperatively, biopsies of the joint capsule, the supraspinatus tendon and muscle were harvested for histological assessment. Three and 12 months postoperatively patients were re-examined clinically and with MR imaging. Structural and clinical predictors of healing were evaluated using logistic and linear regression models.

Results: Structural failure of tendon repair, which was significantly associated with poorer clinical outcome, was associated with higher age (p = 0.009; 95% CI = 1.03, 1.26), shorter supraspinatus tendon length (p = 0.006; 95% CI = 0.79, 0.96) and increased proportion of slow myosin heavy chain (MHC) I /fast MHC II hybrid muscle fibers (p = 0.003; 95% CI = 1.073, 1.43). Clinical outcome was less favorable for shoulders with fatty infiltration of the infraspinatus muscle (p = 0.044; 95% CI = -9.30, -0.12). Conversely, a high content of fast MHC II muscle fibers (p = 0.028; 95% CI = 0.026, 0.44) was associated with better clinical outcome at 12 months.

Conclusion: Both decreased tendon length and increased hybrid muscle fiber type appear to be independent predictors for retear. Clinical outcome is compromised by tendon retearing and increased fatty infiltration of the infraspinatus muscle. A high content of fast MHC-II supraspinatus muscle fibers appears associated with a better clinical outcome.

FM082*

Fluoroscopy-based scapula rotations of a 30° loaded and unloaded shoulder abduction test in symptomatic and asymptomatic rotator cuff tears

Eleonora Croci[1]; Hanspeter Hess[2]; Jeremy Genter[3]; Cornelia Baum[4]; Balazs Kovacs[4]; Corina Nüesch[1]; Daniel Baumgartne[3]; Kate Gerber[2]; Annegret Mündermann[1]; Andreas Marc Müller[4]

[1] University of Basel, University Hospital Basel; [2] University of Bern; [3] Zurich University of Applied Science; [4] University Hospital Basel

Introduction: Glenohumeral joint stability after rotator cuff (RC) tears is not yet fully understood. A superior glenohumeral translation is likely to occur, however, scapula rotation might also be affected. The aim of this study was to investigate fluoroscopy-based scapula rotations during a 30° loaded abduction test after rotator cuff tears.

Methods: Twenty-five patients with unilateral RC tears (64.3±10.2 years), 25 asymptomatic control subjects (55.4±8.2 years) and 25 healthy control subjects (26.1±2.3 years) participated in this study. Shoulders were grouped based on magnetic resonance images in healthy (n = 43), RC tendinopathy (n = 24), asymptomatic (n = 38) and symptomatic (n = 25) RC tears. Twenty shoulders were discarded due to absence of MRI or other findings not involving RC. All subjects performed a 30° arm abduction and adduction movement in the scapular plane with handheld weights (0, 2 and 4 kg). Fluoroscopy images were acquired for all shoulders and were labelled with a deep learning based automatic landmark detection algorithm (accuracy: 1.5 mm, 1°). Downward-upward scapula rotations were measured for abduction and adduction, considering the landmarks on the glenoid. A linear mixed model (loads, shoulders) with subjects as random effects was used to assess differences from healthy shoulders.

Results: Mean upward scapula rotation was 2.3°, 4.0°, 4.2° and 3.6° at 0 kg, and 4.1°, 3.4°, 5.1° and 6.5° at 4 kg, respectively for healthy subjects, RC tendinopathy, asymptomatic and symptomatic RC tears. Rotations were similar in magnitude but directed downwards during adduction. There was a significant effect for load ($p < 0.001$) and RC tendinopathy ($p = 0.047$) and a significant interaction effect of these two ($p = 0.006$) during abduction. During adduction, we detected a significant effect for load ($p < 0.001$) and asymptomatic RC tears ($p = 0.043$) and a significant interaction effect of load and RC tendinopathy ($p = 0.013$). Post-hoc tests showed significant differences between 0 and 4 kg load in healthy and in symptomatic RC tears ($p \leq 0.006$).

Conclusion: These results indicate that kinematics of the glenohumeral joint are load-dependent. Greater upward scapula rotations are present in RC tears and increase with increasing weight, suggesting that by rotating, the scapula compensates an insufficient RC. Further analyses of load-dependent joint stability are needed to obtain a better understanding of glenohumeral and scapula motion during activities of daily living.

FM083

Range of motion at 6 weeks is an independent risk factor for non-healing at 6 months after arthroscopic supraspinatus repair

Tiago Martinho[1]; Marko Nabergoj[2]; Alexandre Lädermann[1]; Anthony Pernoud[1]; Hugo Bothorel[1]; Philippe Collin[3]

[1] Hôpital La Tour; [2] Valdoltra Orthopaedic Hospital; [3] Hôpital Américain de Paris

PURPOSE: This study aimed to analyze the effect of the range of motion (ROM) progression pattern on healing after supraspinatus (SSN) repair.

HYPOTHESIS: We hypothesized that a faster ROM recovery in the immediate postoperative period would be detrimental for tendon healing.

METHODS: This was a retrospective study of prospective collected data. All primary arthroscopic SSN repairs for full-thickness tears, with retraction Patte grade <2, fatty infiltration Goutallier grade <3 and no glenohumeral osteoarthritis were eligible. Patients who did not attend all follow-ups were excluded. One surgeon performed all arthroscopic repairs using a double-row technique. All patients followed the same rehabilitation protocol with an abduction pillow and passive ROM for 6 weeks. One observer assessed all patients preoperatively and at 1.5, 3 and 6 months postoperatively. Collected outcome measures included: ROM, Visual Analogue Scale (VAS) for pain and Constant Score (CS). Repair integrity was evaluated at 6 months by ultrasound. 2 groups were established based on repair integrity (healed/non-healed). A multivariable analysis was performed to assess potential confounding factors and ROC curve analysis was used to identify predictive thresholds for non-healing.

RESULTS: Of 1397 consecutive SSN repairs, 169 were excluded and 1207 were finally included. The overall healing rate was 87.3%. All preoperative outcome measures were similar between groups. Non-healed repairs at 6 months were slightly younger (57.8±7.9 vs 61.6±8.8, p <0.001) and had a faster postoperative ROM recovery pattern. This difference was most distinct at 6 weeks in passive anterior elevation (AE) (143±22 vs 128±26,p <0.001) and external rotation (ER) (32±17 vs 23±17,p <0.001) but was fully compensated by 6 months. VAS pain and CS at each follow-up were similar between groups. Multivariable analysis confirmed 6-weeks passive EA (OR:1.36) and ER (OR:1.16) as independent risk factors for non-healing. The non-healing rate increased when 6-weeks passive EA >140° (20.4 vs 7.9%) and ER >30° (18.4 vs 8.8%).

CONCLUSION: In a large cohort of isolated arthroscopic SSN repairs treated with the same surgical technique and rehabilitation protocol, a faster postoperative ROM progression pattern, reflected by higher 6-weeks AE and ER, was associated with an increased rate of non-healing. This study illustrates the benefit of a conservative rehabilitation protocol on tendon healing without affecting ROM at 6 months.

FM084*

Sling Versus No Sling After Superior Rotator Cuff Repair: A Long-Term Follow-up

Xue Ling Chong; Alberto Guizzi; Tiago Martinho; Jeanni Zbinden; Arash Amiri; Alexandre Lädermann

Hôpital La Tour

Background: Patients who underwent arthroscopic rotator cuff repair are often required to wear a sling after surgery despite the known negative effects of immobilization with the intention to protect the cuff repair. Short term results have proved to have good clinical outcome even without sling. The aim of this study is to compare long term clinical and radiological outcomes after arthroscopic rotator cuff repair with and without postoperative sling immobilization.

Methods: We analyzed a consecutive cohort of 404 patients scheduled for arthroscopic repair of small to medium superior cuff tear into sling and no sling groups. Active-assisted mobilization was performed in both groups during the first 4 weeks after surgery. Patients were evaluated both clinically and radiologically with US at 6 months and at last follow-up, which was 4.2±1.7 years for the sling and 3.0±1.6 years for no-sling group. Univariable and multivariable analyses were performed to determine if postoperative scores were associated with sex, age at surgery, immobilization, arm dominance, a biceps procedure, resection of the distal part of the clavicle, or preoperative scores.

Results: The sling and no-sling groups has similar preoperative patient characteristics, function and adjuvant procedures performed. At 6 months follow-up, the return to work and satisfaction was similar between the 2 groups. At last follow-up, anterior forward flexion and SANE score were similar. The healing rate was also similar in both groups (p = 0.364) with only 1.6% and 2.7% of the patients that did not heal (Sugaya 4 and 5) in sling and no-sling groups, respectively. The no-sling group showed mean greater external rotation (65.8°±25.6 vs. 58.6°±24.2, p = 0.011) whereas the sling group had a better internal rotation hand in the back (p = 0.015). The sling group had significantly higher ASES (88.3±16.0 vs. 85.4±16.1, p = 0.021), Constant (81.2±16.7 vs. 78.1±15.9, p = 0.018) and pain (11.4±18.1 vs. 16.0±20.4, p = 0.06) scores that, however, did not reach the MCID, meaning that they were clinically comparable.

Conclusion: Functional outcomes and tendon healing were similar at 6 months and 3 years. Therefore, mobilization early without sling seems to be a safe and validated rehabilitation regimen.

FM085

Bringt die metallische, glenoidale Lateralisierung Vorteile in der inversen Endoprothetik bei Frakturfolgezuständen?

Jan-Philipp Imiolczyk; Florian Freislederer; Laurent Audigé; Victoria Harzbecker; Philipp Moroder; Markus Scheibel

[1]Schulthess Klinik Zürich

Frakturfolgezustände stellen eine sehr komplexe Pathologie des Schultergelenkes dar.

Ziel dieser Studie war es daher, klinische und radiologische Ergebnisse der inversen Schultertotalendoprothetik (RSA) mit metallischer, glenoidaler Lateralisierung bei Frakturfolgezuständen zu evaluieren.

Methoden: In dieser prospektiven Studie wurden Patienten eingeschlossen, die im Rahmen einer proximalen Humerusfraktur, mit einer RSA versorgt wurden. Die metallische, glenoidale Lateralisierung mittels augmentierter Basisplatte (Gruppe A) wurden mit den Ergebnissen des klassichen Grammont-Konzeptes ohne glenoidale Lateralisierung (Gruppe B) verglichen.

Klinisch wurde der Constant-Murley Score (CS) und der Subjective Shoulder Value (SSV) erhoben. Radiologisch wurden eine mögliche Endoprothesenlockerung und das scapuläre Notching (SN) evaluiert.

Ergebnisse: Gruppe A umfasste 16 Patienten (weiblich: n = 9; Ø = 66 Jahre). Gruppe B umfasste 37 Patienten (weiblich: n = 23; Ø = 67 Jahre). Beide Gruppen wiesen präoperativ vergleichbare Kohortenmerkmale auf, in Bezug auf Alter zum Operationszeitpunkt, Geschlecht und die Dominanz der behandelten Schulter.

Die Patienten in Gruppe A (Ø CS: 69 Punkten (25-87), Flexion: 160° (40-170), Außenrotation: 30° (0-80)) verbesserten sich statistisch signifikant in CS, SSV, aktiver Flexion, Abduktion (p <0,01) sowie in Innen- (p = 0,04) und Außenrotation (p = 0,003).

Patienten in Gruppe B (Ø CS: 59 Punkten (27-91), Flexion: 120° (75-170), Außenrotation: 20° (-5-60)) verbesserten sich statistisch signifikant in CS, SSV, aktiver Flexion und Abduktion und Innenrotation (p <0,01) im Vergleich zu präoperativ. Die Außenrotation (p = 0,07) verbesserte sich nicht signifikant.

Patienten mit Lateralisation (Gruppe A) zeigten eine statistisch signifikante bessere Flexion (p = 0,04), Abduktion (p = 0,03) und Außenrotation (p = 0,03) im Verglich zur Gruppe B.

Die Komplikationsrate (Gruppe A: Traktionsschaden N. axillaris n = 2, Instabilität n = 1) (Gruppe B: Traktionsschaden N. axillaris n = 1, Instabilität n = 1; Lockerung n = 1; periprothetische Fraktur n = 1) war in beiden Gruppen vergleichbar.

Radiologisch wurde SN Grad 1 (A: n = 0; B: n = 6) nur bei Patienten ohne glenoidale Lateralisation beobachtet. Es gab keine Anzeichen für eine frühe Lockerung.

Schlussfolgerung: RSA liefert zuverlässige klinische und radiologische Ergebnisse als Revisionsverfahren bei Patienten mit Frakturfolgezuständen. Die metallische glenoidale Lateralisierung bietet eine bessere ROM und weniger Notching.

FM086*

BASELINE CHARACTERISTICS OF THE ARCR_PRED STUDY: THE SWISS-WIDE MULTICENTER COHORT FOR THE EVALUATION AND PREDICTION OF CORE OUTCOMES IN ARTHROSCOPIC ROTATOR CUFF REPAIR

Thomas Stojanov[1]; Laurent Audigé[2]; Soheila Aghlmandi [1]; Study Group ARCR_Pred; Andreas Marc Müller[1]

[1] Universitätsspital Basel; [2] Schulthess Klinik

Introduction: High-quality multicenter prospective studies are lacking in the field of orthopedics. Our primary objective is to describe the key characteristics of screened patients in the context of the ARCR_Pred study. We further described the main patient- and diagnostic-related factors for the included patients; and reported multivariable associations between baseline characteristics and the patient-reported shoulder function-measured by the Oxford Shoulder Score (OSS).

Methods: Patients undergoing a primary arthroscopic rotator cuff repair (ARCR) were prospectively considered for inclusion in one of the 19 Swiss and German orthopedic tertiary care center. Various clinical, patient-reported and quality of life scores were described at baseline, including our primary endpoint being the OSS. Over an 18-month period starting June 2020, 1997 patients were screened and eligible for inclusion in our study.

Results: Patients included in the study (N = 973) were on average 57 years old and 63% male. Partial tears were less frequent in our study population (15%) than in non-included patients (26%). Baseline OSS ranged from 0 (minimum) to 48 (maximum) and followed a normal distribution.Depending on the center, the mean age ranged from 52 to 61 years. The proportion of male patients and traumatic tears ranged from 41 to 86% and from 39 to 92%, respectively. Regarding the tear severity distribution, the proportion of partial and massive tears ranged from 0 to 42% and from 0 to 29%, respectively. Our final model for predicting baseline OSS was composed of the following variables: The following factors were included in the multivariable model: Age, sex, body mass index, one or more comorbidities, diabetes, symptom duration, depression symptoms, fat infiltration of the subscapularis muscle, critical shoulder angle, acromiohumeral distance, preoperative steroid infiltrations, medications, and physical therapy.

Conclusion: Our ARCR patient cohort shows variability of baseline characteristics and baseline scores, as well as high heterogeneity across centers. Consideration of the case-mix will be required when analyzing and interpreting post-operative outcome data.

FM087

Patients with Rotator Cuff Tendinopathy Present a Psychological Impairment, not only a Functional Deficit. A Systematic Review

Pietro Feltri[1]; Andrea Stefano Monteleone[1]; Laurent Audigé[2]; Francesco Marbach[1]; Giuseppe Filardo[1]; Christian Candrian[1]

[1] EOC (Ente Ospadaliero Cantonale) - Ospedale Regionale di Lugano; [2] Schulthess Clinic Zurich

Introduction: Rotator cuff tendinopathy is a very common musculoskeletal disease, and most of the patients face severe pain, weakness, functional impairment, and sleep disturbance that cause an important and progressive worsening of their quality of life (QoL).

In this light, recently there has been a growing awareness of the importance to explore these aspects to better understand and improve shoulder tendinopathy management and outcomes.

Aim: The aim of this systematic review is to quantify the prevalence of psychological factors in patients with rotator cuff tendinopathy and evaluate their influence on patient-reported outcomes (PROMs) in terms of pain, shoulder function, and QoL.

Methods: A literature search was performed on the bibliographic databases PubMed, Web of Science, and Wiley Cochrane Library up to July 1, 2021. Studies about rotator cuff tendinopathy, with a description of psychological variables evaluated with validated questionnaires and description of PROMs, were included. The tool proposed by Murad et al. was used to evaluate the methodological quality of the included studies.

Results: The 38 studies analysed included 6685 patients. Depression was described in 8 studies (prevalence range 7.0%–26.2%, mean 19.2%), anxiety in 6 studies (prevalence range 6.4%–23.4%, mean 13.0%). Sleep disturbance was reported in five studies (prevalence 41.3%–91.0%, mean 71.3%), and distress in three studies (prevalence 20.0%–41.2%, mean 26.4%). One study reported 15% of patients with somatisation. All the studies evaluating the relationship between psychological impairment and pain assessed greater and prolonged pain in patients with altered psychological status, and a similar relation was found for shoulder function, although not all the authors agreed.

Conclusion: An impaired psychological status is a condition that affects a wide range of patients with rotator cuff tendinopathy. These patients also often present sleep disturbance. Overall, these conditions have an important impact on patients' perception of their disease. Rotator cuff tendinopathy patients with psychological alterations experience greater and prolonged pain and, very often, reduced shoulder function, thus having a worse quality of life. Finally, they also affect treatment results, which underlines the importance of multidisciplinary biopsychosocial intervention to favour better results of rotator cuff treatment.

FM088*

A new circle method for measuring humeral torsion on MRI-scans less sensitive to Hill-Sachs lesions

Stefan Demarmels; Holger Grehn; Dirk Müller; Andreas Freiburghaus; Arno Frigg

Kantonsspital Graubünden

Introduction: The literature on humeral torsion angles (retrotorsion) reveals great inconsistencies between methodology and values. Decreased retrotorsion was suspected to correlate with instability, but evidence is contradictory. The measurement according to the gold standard method of Bernageau and Godefroy (B&G) can be challenging especially in the presence of Hill-Sachs-lesions. Therefore, we have developed and evaluated a new measurement method for the humeral torsion angle on MRI-scans.

Methods: Three investigators have measured 67 patients (35 with shoulder instability, 32 healthy) on axial MRIs with 603 measurements used for reliability calculation. The new Circle-method determines the retrotorsion by overlaying two circles on the transversal section of the humeral head. The first circle is adjusted congruent with the margin of the humeral head, whereas the second circle is adjusted to the greater tubercle. The line bisecting the centres of these circles is defined as the humeral head axis. This method was compared to B&G.

Results: The mean retrotorsion angle of all patients was 25±25 (mean ± SD) with B&G, and 24±27 with the Circle-method. Neither method revealed a significant difference between stable and unstable shoulders (p = 0.47). Of the 35 patients with un-

stable shoulders 21 (60%) presented Hill-Sachs lesions. No significant differences between patients with or without Hill-Sachs lesions (Circle-method: p = 0.61; B&G: p = 0.67). The reliability parameters for both methods were similar.

Conclusions: The new Circle-method is as precise as the method of B&G. It may yield more consistent values in cases with substantial Hill-Sachs-lesions. Our data do not suggest retrotorsion as a predictor of instability.

FM089

Distal peripheral nerve tension after reverse shoulder arthroplasty: a cadaveric study

Gregory Cunningham[1]; Lauryne Bernardino; Rodrigo Brandariz[1]; Nicolas Holzer[2]; Daniel Da Rocha; Jean-Yves Beaulieu[2]

[1] Centre Epaule Coude la Colline (CEPCO); [2] Hôpitaux universitaires de Genève (HUG)

Background: Peripheral nerve injury is a known complication after reverse shoulder arthroplasty (RSA) which has mainly been studied at the level of the proximal plexus branches. However, the effect of RSA on distal peripheral nerves and the influence of elbow and wrist position is not known. The aim of this cadaveric study was to analyse the influence of RSA implantation and upper limb position on tension in the distal median and radial nerves. The hypothesis was that RSA increased distal nerve tension, and that the latter was further influenced by elbow and wrist position.

Methods: 12 upper limbs in 9 full fresh-frozen cadavers were dissected in this study. Nerve tension was measured in the median nerve at the level of the proximal arm, elbow, and distal forearm, and in the radial nerve at the level of the elbow, using a customised three-point tensiometer. Nerve tension was measured before and after RSA implantation, using a mid-lay implant (Medacta, Castel San Pietro, Switzerland). Two different configurations were tested, using the smallest and largest available implant sizes. 3 upper-limb key positions were considered (plexus at risk, plexus relief, and neutral), from which the effect of elbow and wrist position was further tested.

Results: RSA implantation significantly increased median and radial nerve tension throughout the upper limb. The distal nerve segments were particularly dependant on elbow and wrist position. There was no significant difference between the 2 tested implant configurations. The plexus at risk position induced the most tension in all nerve segments, while the neutral position the least. Flexing the elbow was the most efficient way to decrease nerve tension in all tested segments and key positions. Wrist flexion significantly further decreased nerve tension in the median nerve, whereas wrist extension decreased tension in the radial nerve.

Conclusions: RSA significantly increases tension in the median and radial nerves, regardless of implant size, making it more vulnerable to wrist and elbow position. Elbow flexion is the most effective to decrease nerve tension, supporting the use of a protective postoperative sling, while elbow extension should be avoided when implanting the humeral component.

FM090

Transcutaneous compression suture with iodine gauze for the treatment of chronic, fistulizing wounds in periprosthetic shoulder infections

Florian Grubhofer; Karl Wieser

Universitätsklinik Balgrist

Introduction: Periprosthetic and implant associated shoulder infections in polymorbid patients often result in multiple surgeries, which affect soft tissue negatively. Wound closure is a basic requirement for infection control and is particularly challenging in multimorbid patients with compromised soft tissues. This study describes a so-called compression suture technique, in which a gauze soaked in iodine is used to apply compression to the wound area and simultaneously disinfect the wound area.

Methods: A retrospective cohort study of nine consecutive patients was performed. In all patients, prior debridement including antibiotic loaded spacer implantation failed to achieve infection control. All nine patients were treated with the a so-called "iodine-gauze-compression-suture" wound closure after removal of the arthroplasty, radical debridement, implantation of an antibiotic loaded cement spacer with postoperative antibiotic therapy. The primary endpoint was defined as infection control, and the secondary endpoint was defined as surgery revision rate. Patient-reported outcomes were collected as the third outcome.

Results: The mean age of patients was 71±10 years, the patients had a mean of 5 ±2,3 previous surgeries before the index surgery was performed. The mean ASA score was 3,3±0,8. Nine out of nine patients (100%) showed infection control and nine out of nine (100%) patients did not need revision surgery after a mean follow up of 14±2 months. Mean Subjective Shoulder Value was 45±9%, patient satisfaction was very good in 2, good in 5, moderate in 2 patients. The main reason for the high satisfaction rate despite poor function was the achievement of infection control in the absence of pain.

Conclusion: Iodine gauze compression suture was used to achieve successful infection control without additional revision surgery in 9 of 9 polymorbid patients who previously underwent unsuccessful surgery with failed infection control. The described new wound closure method is safe and leads to reliable wound closure and infection control in multiple pre-operated patients with fragile wound conditions.

FM091*

Komplikationen und Revisionen nach anatomischer TEP mit metal-back Glenoiden

ein klinischer und radiologischer Vergleich von Kalottenersatz vs. Schaftendoprothese

Johanna Illner[1]; Moritz Kraus[2]; Markus Scheibel[3]

[1] Schulthess Clinic, Zurich, Switzerland; [2] Schulthess Clinic, Zurich, Switzerland; Muskuloskelettales Universitätszentrum München, LMU Klinikum München; [3] Schulthess Clinic, Zurich, Switzerland, Centrum für Muskuloskelettale Chirurgie, Charité, Berlin

Bei Patienten (P) mit primärer Omarthrose (pO), funktionell intakter Rotatorenmanschette und geringgradigen Glenoiddefekten ist der anatomische Gelenkersatz eine bevorzugte Therapiestrategie. Eine Option sind konvertierbare metal-back Glenoide (MBG) mit humeraler Schaftendoprothese (SEP) oder Kalottenersatzendoprothesen (KEP). In dieser Studie soll beantwortet werden, ob 2 gängige metal-back Glenoidkomponenten (GK) mit entweder nicht-konvertierbarer schaftloser

Humeruskomponente oder konvertierbarer zementfreier SEP vergleichbare klinische und radiologische Resultate sowie Komplikations- und Revisionsraten (RR) erzielen.

Retrospektiv wurden 68 P mit prim. aTSA (G1: n = 37 KEP mit MBG (Eclipse, Universal Glenoid Convertible Baseplate, Arthrex, Naples, Florida) und G2: n = 31 (SMR Anatomic-SEP, L2 metal-back glenoid component, Lima, Udine Italy)) bei pO aus unserem lokalen Endoprothesenregister analysiert. Die P wurden klinisch (Constant Score (CS), DASH, SPADI, SSV und EQ-VAS, EQ-5D-5L) und röntgenologisch (true-ap und axial) evaluiert sowie Komplikationen und RR analysiert.

Hinsichtlich Alter, Geschlecht, Walch-Klassifikation und den präoperativen Outcome-Scores (OS) wiesen die Gruppen keine signifikanten Unterschiede auf (p <0,05). Nach 2 J. waren bei den nicht revidierten Patienten die erhobenen OS nicht sign. verschieden (p >0,05). Nach 5 J. waren in G1 29 und in G2 21 Patienten noch nicht revidiert. Bei diesem Kollektiv zeigte lediglich der CS signifikante Unterschiede (G1: 86 ± 6 und G2: 72 ± 16, p = 0,044). Insgesamt lag das mittlere Follow-Up bei 57 ± 35 Monaten (G1: 43 ± 24 M., G2: 74 ± 39 M., p = 0,003). Die RR innerhalb von 5 Jahren war mit 22% (n = 8) in G1 und 32% (n = 10) in G2 (p = 0,3) ebenso wie die mittlere Zeit bis zur Revision (G1 = 51±25 M., G2 = 37±31 M. mit p = 0,2) nicht signifikant verschieden. Revisionsgründe (RG) in G1 waren: Rotatorenmanschetteninsuffizienz (RMI) (n = 4), Abrieb oder Verschleiß des PE-Inlays (n = 3), Lockerung der GK (n = 1). Dabei war ein Wechsel der GK mit Knochendefektfüllung notwendig. Die KEP erwies sich bei unipolarer Konversion der GK als leicht revidierbar. RG bei G2 waren: Abrieb oder Verschleiß des PE-Inlays (n = 4), sekundäre RMI (n = 3), Luxation des Inlays (n = 3). Die Revisionsoperation erfolgt hier als einfache bipolare Konversion der anatom. in eine inverse SEP.

Zusammenfassend lässt sich folgern, dass SEP und KEP mit MBG nach 5 Jahren vergleichbare klinische Ergebnisse liefern. RG und RR sind bei beiden Systemen ähnlich.

FM092

Does current literature about conservative versus surgical management for patients with rotator cuff tears reflect a Swiss practice?

Alexandre Lädermann; Jeanni Zbinden; Alberto Guizzi; Hugo Bothorel; Arash Amiri; Tiago Martinho

Division of Orthopaedics and Trauma Surgery, La Tour Hospital, Meyrin, Switzerland; Department of Orthopaedics and Trauma Surgery, University of Geneva, Geneva, Switzerland.

Introduction: Several high-level studies analyzing conservative versus surgical management for patients with rotator cuff tears have been published, questioning the utility of repairs. Unfortunately, many insurance companies and even governments have latched onto the lack of difference in short-term clinical outcomes and have begun denying both the procedure and reimbursement. Our hypothesis is that operative indications established in the previously mentioned studies represent an imperceptible proportion of conventional indications.

Methods: We compared indications for surgery including age of the patient, localization and type of lesions (degenerative vs. traumatic), duration and type of conservative treatment (physiotherapy, number of cortisone injection(s)) of published studies with our database.

Results: In the studies of Kukkonen et al., Lambers-Heerspink et al., Moosmayer et al., and our database of superior RCR repairs, the mean age was 65, 61, 59, and 53 years, respectively. The proportion of males was 55, 25, 52 and 52%. The number of preoperative infiltrations were 56, NA, 10 and 27%, respectively. The origin was degenerative in 0, 0, 46 and 54% of the cases. Mean duration of symptoms was 28, 12, 12, and 15 months, respectively. Lesions included in the three former studies involved almost only supraspinatus lesions (>90%) and were only partial in one study. From our whole database (n = 843), isolated superior RCR repairs represented only 262 patients (31%). Only a few % of our cases filled the inclusion criteria and demographic data of the three other studies.

Conclusion: The actual literature analyzed a tiny sample of surgical traditional indications for rotator cuff repairs. Such proportion do not reflect our actual practice. Consequently, published results should not be extrapolated to a whole cohort and generalized to a health care system. Delisting a procedure based on existing literature will thus prevent patients from benefiting from potentially effective surgery.

FM093

The effect of stem length and width on proximal humerus stressshielding in uncemented primary reverse total shoulder arthroplasty

Manuel Kramer[1]; Martin Olach[2]; Vilijam Zdravkovic[1]; Melanie Manser[1]; Bernhard Jost[1]; Christian Spross[1]

[1] Kantonsspital Sankt Gallen; [2] SRFT Wil

Introduction: To preserve humeral bone during RTSA, stems have become shorter and cement is avoided whenever possible. However, with the upcoming of uncemented RTSA, a phenomenon called stressshielding has been described for the proximal humerus. It was the aim of this study to investigate the influence of stem length and width on stressshielding effects after primary uncemented RTSA in non-fracture cases.

Methods: After starting with a new uncemented standard shaft in 2017, a short stem version became standard for primary non-fracture RTSA in 2019. The prospective institutional shoulder arthroplasty database was reviewed for all primary uncemented RTSAs from January 2017 to March 2020. Exclusion criteria were all other indications than omarthritis and cuff tear arthropathy and <2 years follow-up. A total of 50 patients fulfilled the inclusion criteria. We compared the clinical (Constant Score (CS)) and radiographic 2 years outcome (deltoid tuberosity index (DTI), stressshielding, lucent zones, humeral filling ratios, scapular notching) of the short and the standard stems of the same prosthesis model. This allowed us to assess the effect of stem leght and width on stressshielding effects on the proximal humerus. Furthermore, we compared two different measurements for the filling ratio and defined a cut off value to prevent stress shielding.

Results: 19 patients were in the short stem group (SHORT) and 31 in the standard stem group (STANDARD). The groups showed no differences in age, gender or DTI. After two years, SHORT showed a relative Constant score of 91.8% (23–120) and STANDARD of 98.3% (74–118) (p = 0.256). Stressshielding was found in 4 patients (21%) in SHORT and in 16 patients (52%) in STANDARD (p = 0.03) and occurred more frequently in patients with higher distal and metaphyseal humeral filling ratios. (p <0.05). The calculated cut off to prevent stress shielding was 0.675 for the metaphysel filling ratio and 0.725 for the distal filling ratio. No revisions were needed in the observed time span.

Conclusion: While short stems and standard stems for reverse total shoulder arthroplasties have the same good clinical results after 2 years, we found a negative effect of higher length and width of the stem in regard of radiographic stressshielding. Eventhough, the final clinical effect of this radiographic finding is yet to be assessed, uncemented stems should be, whenever possible, chosen short with a filling ratio below 0.7.

FM094

Sleep Quality and Response after Rotator Cuff Repair, Total Shoulder Arthroplasty, and Reverse Shoulder Arthroplasty

Florian Grubhofer[1]; Jon JP Warner[2]; Lukas Ernstbrunner[3]

[1] Universitätsklinik Balgrist; [2] Massachusetts General Hospital/Harvard Medical School, Boston, MA; [3] Royal Melbourne Hospital, Parkville, Australia

Background: Sleep disturbance secondary to shoulder pathology is a common complaint. Preliminary studies have shown improvement in sleep quality following common shoulder procedures. The purpose of this study was threefold: 1) to compare the sleep quality response between rotator cuff repair (RCR), total shoulder arthroplasty (TSA), and reverse shoulder arthroplasty (RSA); 2) to determine which comorbidities predict sleep response; and 3) to determine which patient reported outcome measures (PROMs) correlate with sleep quality metrics.

Methods: The Pittsburgh Sleep Quality Index (PSQI) and Visual Analog Scale - Quality of Sleep (VAS-QOS) were utilized to measure sleep quality in consecutive patients undergoing RCR, TSA, or RSA. Sleep quality and PROMs, including the American Shoulder and Elbow Surgeons (ASES) Shoulder Score, Single Assessment Numeric Evaluation (SANE) score, and VAS pain score, were measured preoperatively and at 2 weeks, 6 weeks, 3 months, and 6 months postoperatively. Patient demographics, preoperative diagnosis, and comorbidities were recorded. Univariate and multivariate analyses were performed. Correlations between sleep quality metrics and PROMs were assessed.

Results: Included in the study were 141 patients who underwent shoulder surgery (RCR: n = 34, TSA: n = 58, RSA: n = 49). When all shoulder surgeries were pooled, there were significant improvements in sleep quality as measured by PSQI and VAS-QOS preoperatively to final follow-up (8.8 vs. 6.0, 55.4 vs. 75.2, p <0.01 for both, respectively). The rate and magnitude of sleep quality improvement varied by surgical intervention. Sleep quality after RSA and TSA showed statistical improvement by 6 weeks postoperatively, which was durable through final follow-up. After RCR sleep quality metrics were incongruous, demonstrating a trend toward worsening at 2 weeks with improvement at 3- and 6-months postoperatively. In multivariable regression analyses, only surgical intervention, and not preoperative diagnosis or comorbidities, was associated with sleep quality at final follow-up. Quality of sleep strongly correlated with the SANE score (r = 0.45, p <0.01).

Conclusion: Sleep quality improves after shoulder surgery, though the rate of recovery varies by surgical intervention. Sleep quality improves more rapidly after shoulder arthroplasty when compared to RCR. The SANE score may be a useful surrogate in assessing sleep quality.

FM095

Clinical and radiographic outcomes after reverse total shoulder arthroplasty in patients 85 years of age and older

Farah Selma; Brett Moreira; Philipp Kriechling; Karl Wieser

Balgrist Hospital, University of Zurich, Department of Orthopaedics

Background: Previous studies have found less favorable outcomes for elderly patients after reverse total shoulder arthroplasty (RTSA). However, the results for very old patients are rarely analyzed. The purpose of this study was to analyze clinical, functional and radiographic outcomes after RTSA in patients aged 85 years and older.

Methods: We identified 1460 patients treated with RTSA from 2005-2020 of which 5% (n = 75) were older than 85 years. 32 (43%) patients were excluded due to death (n = 10), travel difficulties (n = 18), refused to participate in research (n = 3) and one with lost of follow-up.

42 patients undergoing primary RTSA between November 2009 and January 2018 with a minimum age of 85 years and a minimum follow-up of 2 years were included. Statistical analyses were performed based on pre- and postoperative function, range of motion (ROM) scores, pain scores and patient satisfaction. Postoperative X-rays after 6 weeks, 4.5 months, 1 and 2 years were evaluated for notching, lucency, bone formation and resorption, implant migration and periprosthetic fractures.

Results: We included 42 cases (71% female) with a mean age of 87 ± 2 years. The main indication for RTSA was rotator cuff tear with arthritis (36%), cuff tear arthropathy (17%), rotator cuff tear without arthritis (17%), primary arthritis (17%), proximal humeral fracture (10%), revision after failed plate osteosynthesis (7%) and instability (2%). The mean follow-up was 47 ± 22 months. Relative Constant-Murley scores improved significantly from 41% ± 20% to 83% ± 11% and SSV from 38% ± 20% to 80% ± 19%. All aspects of range of motion, except of external rotation improved significantly. Force and pain improved as well. Glenoid lucency (21%), bone formation (4.9%) and implant migration (4.9%) were significantly associated with poorer outcome in the absolute Constant score (p = 0.013, p = 0.002 and p = 0.008). One patient (1/42, 2.4%) suffered multiple shoulder dislocations and needed a revision. No other reoperations were performed.

Conclusions: Patients aged 85 and older can expect significant improvement in shoulder function and subjective value after primary RTSA. Age should not be a limiting factor when considering RTSA.

FM096

The effect of humeral stem filling-ratio on clinical- and radiological outcome

Stijn De Joode; Philipp Kriechling; Alexandra Volp; Stefan Klotz; Mazda Farshad ; Karl Wieser ; Florian Grubhofer

Balgrist Hospital, University of Zurich, Department of Orthopaedics

Introduction: Reversed total shoulder arthroplasty (RTSA) is a well-established procedure. Though, the question if the diaphyseal filling ratio of the humeral stem has an effect on clinical- and radiological outcome remains unclear.

Methods: 199 Patients were included and analysed for clinical and radiological outcome at a mean follow-up of 38.9 months after RTSA. Diaphyseal humeral stem filling ratios were measured directly postoperative and patients were divided in a low-, medium- or high filling ratio group. Shoulder range of motion and the Constant-score were analysed for clinical outcome. Periprosthetic bone resorption was measured for radiological outcome.

(Preliminary)Results: No differences were found between the low- medium- or high filling ratio groups regarding range of motion (flexion, abduction and rotation) and absolute- and relative Constant-scores (p>0.05). Bone resorption was significantly more present in the high filling ratio group, compared to the low filling ratio group, 6.6 (SD±2.9) versus 5.2 (SD±2.4), respectively (p = 0.003).

Conclusion: High humeral diaphyseal stem filling ratios in RTSA may lead to more bone resorption, compared to low filling ratios. The humeral diaphyseal stem filling ratio does not have an effect on functional outcome.

FM097

Comparison of characteristics and outcome of periprosthetic shoulder infections caused by staphylococci and anaerobes

Andri Guetg[1]; Helen Moser[2]; Sebastian Wangler[2]; Tabea Schmocker[2]; Nora Renz[3]; Michael Schär[2]

[1] spitäler fmi ag, Spital Interlaken; [2] Department of Orthopedic Surgery and Traumatology, Inselspital, Bern University Hospital, University of Bern, Switzerland; [3] Department of Infectious Diseases, Inselspital, Bern University Hospital, University of Bern

Introduction: Periprosthetic joint infection (PJI) is a rare but complex complication after shoulder arthroplasty. The aim of this study was to compare characteristics and outcome of shoulder PJI caused by anaerobes and those due to staphylococci.

Methods: All shoulder PJI confirmed by EBJIS criteria and treated in our institution between 2015 and 2022 were included in a retrospective cohort study . The cohort was stratified into two groups according to pathogen, i.e., PJI caused by anaerobes and those caused by staphylococci. Characteristics and outcome were compared using Fisher's exact test.

Results: A total of 35 PJI episodes experienced by patients with a median (range) age of 74 (51-87) years were included. 19 episodes (54%) were caused by staphylococci (coagulase-negative staphylococci in 12 and Staphylococcus aureus in 7 episodes) and 16 episodes (46%) by anaerobes (Cutibacterium acnes in 15 and Peptostreptococcus in 1 episode(s)). Sex distribution considerably differed with 9/19 (47%) females in staphylococcal PJI (sPJI) and 3/16 (19%) females in anaerobic PJI (aPJI) group. In 5 (26%) sPJI hematogenous origin was confirmed, whereas all aPJI were caused by perioperative colonization. Acute manifestation was documented in 8 (42%) of sPJI and 3 (19%) of aPJI. The median (range) time between arthroplasty and infection was 34 (0.7-266) months for sPJI and 57 months (0.6-119) for aPJI. Median (range) CRP was 75 (3-423) mg/l in sPJI and 15 (3-137) mg/l in aPJI(p = 0.009). Applied surgical strategies were prosthesis retention (7 (37%) in sPJI and 1 (6%) in aPJI), one-stage exchange (2 (11%) in sPJI and 8 (50%) in aPJI) and multi-stage-exchange (5 (26%) in sPJI and 7 (44%) in aPJI). The median (range) duration of antimicrobial treatment was 15 (1-68) weeks in sPJI and 13 (1-25) weeks in aPJI. After a median (range) follow-up of 12.4 (0.2-72.7) months, overall treatment success was documented in 23 episodes (66%), with 53% in sPJI and 81% in aPJI (p = 0.005). Non-fatal failures were predominantly caused by a new pathogen in sPJI (5/7) and by the same pathogen in aPJI (2/3). Of note, in 3/10 sPJI episodes , successful outcome could only be reached by removal of the prosthesis, while in all aPJI episodes a prosthesis was in place at time of follow-up.

Conclusion: The success rate was significantly higher in PJI caused by anaerobes than those due to staphylococci. In the latter group, prosthesis was permanently removed more often than in PJI caused by anaerobes.

FM098

DEVELOPMENT AND VALIDATION OF A MODEL PREDICTING POST-OPERATIVE SHOULDER STIFFNESS BY PATIENTS UNDERGOING AN ARTHROSCOPIC ROTATOR CUFF REPAIR IN SWITZERLAND

Thomas Stojanov[1]; Laurent Audigé[2]; Soheila Aghlmandi[1]; Philipp Moroder[2]; Study Group ARCR_Pred; Andreas Marc Müller [1]

[1] Universitätsspital Basel; [2] Schulthess Klinik

Introduction: Post-operative shoulder stiffness (POSS) is one of the most frequent adverse events (AE) after an arthroscopic rotator cuff repair (ARCR). Predicting POSS occurrence could support healthcare in closely monitoring patients with a high risk of occurrence of AE after surgery. We aimed to update and validate a clinical prediction model for POSS, using data from a multicenter cohort setting (ARCR_Pred study).

Methods: ARCR_Pred cohort recruitment between June 2020 and November 2021 included 973 patients. POSS was defined as a composite outcome (1/ limitation in range of motion at 6 months, or 2/ symptomatic stiff shoulder leading to deviation from the routine postoperative management up to 6 months). A set of 35 factors was firstly identified via a Delphi consensus process involving 44 surgeons of the study. These factors were assessed for inclusion in a multivariable logistic regression model. To identify the set of factors maximizing the apparent and bootstrap validated area under the receiver-operating characteristics curve (AUC), a backward elimination procedure was performed. Associations were reported in terms of Odds Ratio (OR) along with their 95% confidence intervals.

Overall, 105 patients (10.8%) out of 973 had a POSS occurring within the six months postsurgery. The backward elimination procedure led to retaining 10 factors in the final model. Being a female (OR = 1.52[0.96;2.40]), being a current (OR = 1.56 [0.91;2.61]) or former smoker (OR = 1.70 [0.98;2.90]), drinking alcohol daily (OR = 1.78 [0.92;3.27]), carrying moderate (OR = 1.56 [0.97;2.53]) or heavy (OR = 1.71 [0.91;3.17]) loads in working activities under the head, pre-operative medication (OR = 1.58 [1.03;2.43]), traumatic tears (OR = 1.56 [0.94;2.60]) and longer symptoms duration (OR = 1.79 [1.09;2.98]) were associated with a higher risk of POSS. Greater acromiohumeral distance (OR = 0.85 [0.77;0.93]), better pre-operative functional scores (OR = 0.95 [0.93;0.98]) and greater passive motion in abduction (OR = 0.99 [0.97;1.00]) were associated with lower risk of POSS. The apparent and bootstrap-validated model performances were AUC = 0.73 and 0.68, respectively.

Conclusion: This model combining ten baseline factors is useful for healthcare eager to provide their patients with individualized predictions of risks of post-operative AE.

FM099

Reverse Total Shoulder Arthroplasty for Proximal Humeral Fractures and Sequalae Compared to Non-Fracture Indications: A Matched-cohort Analysis of Outcome and Complications

Alexander Paszicsnyek[1]; Philipp Kriechling[1]; Sam Razaeian[1]; Lukas Ernstbrunner[2]; Karl Wieser[1]; Paul Borbas[3]

[1] Balgrist University Hospital, University of Zurich; [2] Royal Melbourne Hospital, Parkville, Australia; [3] Balgrist Universitätsklinik

Background: With increase in utility and popularity of the reverse total shoulder arthroplasty (RTSA) within the last decades, indications for RTSA have expanded. Besides the established indications such as cuff tear arthropathy and massive irreparable rotator cuff tears, RTSA for complex proximal humeral fractures in elderly patients has been proven to be a reliable treatment option.

Methods: A prospectively enrolled RTSA database of 1457 RTSAs implanted between September 2005 and November 2020 was reviewed. Patients treated with RTSA for a complex proximal humerus fracture and fracture sequalae (F-RTSA) were 1:1 matched with a group of patients that was treated electively with RTSA for indications other than a fracture (E-RTSA). Matching criteria included sex, age, length of follow-up and body mass index. Evaluation after a minimum of 2 years follow-up included evaluation of the absolute and relative Constant-Murley score (aCS; rCS), Subjective Shoulder Value (SSV), range-of-motion (ROM) assessment and complications.

Results: Each of the matched cohort comprised 134 patients with a mean follow-up of 58 ± 41 months for the fracture group

and 58 ± 36months for the elective group. The mean age for both groups was 69 ± 11 years in the F-RTSA and 70 ± 9 years for the E-RTSA group. There were no significant differences in clinical outcome measures including aCS, rCS and SSV (p>0.05). There was a significant difference in mean active external rotation with 20° ± 18° in the F-RTSA group compared with 25° ± 19° in the E-RTSA group (p = 0.017). Complication rate was not significantly different, with 41 complications in 36 shoulders in the F-RTSA and 40 complications in 32 shoulders in the E-RTSA group (p = 0.73). The main complication for the F-RTSA group was dislocation of the greater tuberosity (6%), whereas acromial fractures (9%) were the leading complication in the E-RTSA group. There was also no significant difference in revision rate comparing F-RTSA with E-RTSA (10% vs 14%; p = 0.25).

Conclusion: RTSA for complex proximal humeral fractures and its sequalae leads to comparable clinical outcome as patients treated electively with RTSA for indications other than fracture. There was however, a significant difference in active external rotation with inferior rotation in patients undergoing RTSA for fracture. This valuable information can help in informed consent of patients with proximal humeral fractures.

FM100

Why is female gender associated with poorer clinical outcome after reverse total shoulder arthroplasty?

Bettina Hochreiter; Farah Selman; Anna-Katharina Calek; Philipp Kriechling; Tobias Götschi; Florian Grubhofer; Karl Wieser; Samy Bouaicha

Universitätsklinik Balgrist

Introduction: There is a lack of gender-specific research after reverse total shoulder arthroplasty (RTSA). While previous studies have documented differences in pre- and postoperative clinical scores between male and female patients – with worse outcome in women – a more thorough understanding of why outcome may differ is needed. We therefore asked: (1) Are there gender-specific differences in pre- and postoperative clinical scores, complications and surgery-related parameters? (2) Is female gender an independent risk factor for poorer clinical outcome after RTSA? (3) If so, why is female gender associated with poorer clinical outcome after RTSA?

Materials and Methods: Data of 422 female and 271 male patients were analyzed. Clinical outcome (Constant Score (CS) and Subjective Shoulder Value (SSV)), complications (intra- and/or postoperative fracture, loosening), surgery-related parameters (indication, implant related characteristics) and demographics (age, gender, BMI, number of previous surgeries) were evaluated. Pre- and postoperative radiographs were analyzed (Critical Shoulder Angle (CSA), Deltoid-Tuberosity Index (DTI), Reverse Shoulder Angle (RSA), Lateralization (LSA) and Distalization Shoulder Angle (DSA)).

Results: Preoperative clinical scores (aCS, rCS, SSV, pain level) as well as postoperative clinical outcome (aCS, rCS) were significantly worse in women. However, the improvement between pre- and postoperative outcome was significantly higher in females for rCS (p = 0.037), internal rotation (p <0.001) and pain (p <0.001). Female patients had a significantly higher number of intraoperative as well as postoperative fractures (24.9% vs. 11.4%, p <0.001). The proportion of female patients with a DTI <1.4 was significantly higher than in males (p = 0.01). Female gender was an independent predictor for postoperative rCS (p = 0.047, Coefficient -0.084) and pain (p = 0.017, Coefficient -0.574). In addition to female sex per se being a predictive factor of worse outcome, females were significantly more likely to meet two of the three most significant predictive factors: (1) significantly worse preoperative scores and (2) higher rate of intra- and/or postoperative fractures.

Conclusions: Female sex is a weak, but isolated, negative predictive factor that negatively affects objective clinical outcome (rCS) after RTSA. The main reason for worse outcome in females seems to be a combination of higher preoperative disability and higher incidence of fractures.

ORALS: A04 HIP

FM101*

Topographical anatomical landmarks for intraoperative identification the Gibson interval: a study of 617 hips

Veerle Franken; Stefan Blümel; Moritz Tannast

HFR - Hopital Cantonal Fribourgeois

Background: The classic Kocher-Langenbeck approach uses a posteriorly curved incision with splitting of the gluteus maximus and subsequent denervation of its anterior fibers. In contrast, the Gibson approach uses a straight lateral incision with development of the same space just anteriorly to the gluteus maximus border. Reliable anatomical landmarks for the sometimes-demanding surgical development of this interval do not exist. The aim of this study was to provide reference values for the spatial relationship between palpable anatomical landmarks and the anterior border of the gluteus maximus.

Questions: (1) What is the distance between the anterior border of the gluteus maximus and five palpable anatomical landmarks? (2) Are there differences in the location of the Gibson interval dependent on age, sex and/or femoral torsion? (3) What is the location of the perforating vessels (PC) of the inferior gluteal artery with regard to the innominate tubercle?

Methods: Single center retrospective study of 370 patients (617 hips) who underwent a CT scan of the hip and proximal femur between 2019 - 2021. We defined 5 anatomical markers: (A) Anterior superior iliac spine, (B) mid distance between A and C, (C) trochanter tip, (D) center of trochanter, (E) innominate tubercle. The distance to the Gibson interval was assessed in the axial plane, the distance of the PV to the innominate tubercle was measured in the coronal plane in a CT-scan. We compared the following subgroups for each landmark: male vs. female, young vs. old (cut-off age at 40yo), categorical age (<20; 20 to 40; 40 to 60; >60), categorical torsion (<10; 10 to 25; 25 to 35; >35). Cluster analysis and linear regression analysis were also performed.

Results: (1) Mean location of the parameters A-E was at -8.1 cm, 1.1 cm, 1.8 cm, 1.3 cm and 0.4cm. (2) In men the Gibson interval was more posteriorly than in female patients. In younger patients the interval was more anteriorly than in older patients. Comparing categorical age, the interval lies more posterior in patients over 60 years of age. Comparing categorical torsion, the interval lies more posterior with increasing femoral torsion. (3) 50% of the PV are found between 5 and 9 cm proximal to the innominate tubercle.

Conclusion: We provide useful anatomical landmarks for reliable identification of the Gibson interval with regards to sex, torsion and age.

FM102

Joint damage detected by preoperative MR arthrography under leg traction improves prediction of failure at 2-5years following arthroscopic FAI surgery

Markus Simon Hanke; Moritz Wagner; Alexander Brunner; Peter Vavron; Till Lerch; Simon Steppacher; Moritz Tannast; Klaus Arno Siebenrock; Ehrenfried Schmaranzer; Florian Schmaranzer

Inselspital Universitätsspital Bern

Background: MR arthrography (MRA) combined with leg traction for improved visualization of the central compartment of the hip has been proposed for improved detection of cartilage damage. However, its prognostic value in predicting outcome of arthroscopic femoroacetabular impingement (FAI) surgery yet to be evaluated.

Objectives: To assess the association between joint damage detected on preoperative traction MR arthrography of the hip with mid-term failure following arthroscopic FAI surgery compared to demographics and radiographic grades of osteoarthritis (OA).

Study design and methods: Retrospective cohort study of patients undergoing arthroscopic FAI surgery preoperative traction MRA of the hip and biplanar radiographs and minimum followup of 2 years postoperatively. 106 patients (60% men) with a mean age of 33 ± 10 years were included. Patients completed postoperative questionnaires for calculation of international Hip outcome scores (iHOT-12). Failure was defined as subsequent THA or patients not meeting the patient acceptable symptom state (PASS) <60 points. Preoperative MR arthrography was performed at 1.5T using an MRI-compatible traction device. A radiologist retrospectively assessed presence of extensive cartilage damage (>2 hours on the clock-face), acetabular and femoral osteophytes, acetabular cysts on coronal, sagittal and radial MRA images. Age >40 years, radiographic Tönnis grades of osteoarthritis and joint degeneration on traction MRA were assessed regarding their association with failure of FAI surgery using odds ratios (OR) and calculation of positive- and negative predictive values (PPV and NPV).

Results: Twenty-six (25%) patients met at least one endpoint: 9 patients had subsequent THA, 17 had iHOT-12 <60 points. Extensive cartilage damage yielded the highest odds (OR = 39, p <0.0001) of failure of FAI surgery followed by femoral osteophytes (OR = 9.8, p <0.001), acetabular cysts (OR = 5.1, p = 0.0007), age >40 years (OR = 3.7, p = 0.006) and Tönnis grade >0 (OR = 3.4, p = 0.009). Prognostic accuracy in predicting failure was higher for presence of extensive cartilage damage on MRA (PPV = 87% and NPV = 86%) than that of patient age >40 years (PPV = 43% and NPV = 83%) and Tönnis grades >0 (PPV = 39% and NPV = 84%).

Conclusion: Joint damage detected by preoperative traction MRA improves prediction of failure at 2-5years following arthroscopic FAI surgery compared to the established parameters of advanced patient age and OA.

FM103*

A Novel Method for Evaluating Combined Component Anteversion in Total Hip Arthroplasty on Cross-Table Lateral Hip Radiographs

Dimitris Dimitriou; Christoph Zindel; Elin Winkler; Frédéric Cornaz; Peter Mazel; Patrick Zingg

Universitätsklinik Balgrist

Introduction: Accurate measurement of combined component anteversion (CA) is important in evaluating the radiographic outcomes following total hip arthroplasty (THA). The aim of the present study was to evaluate the accuracy and reliability of a novel radiographic method in estimating CA in THA.

Material and Methods: The radiographs and computer tomography of patients who underwent a primary THA were retrospectively reviewed, to measure the radiographic CA (CAr), defined as the angle between a line connecting the center of the femoral head to the most anterior rim of the acetabular cup and a line connecting the center of the femoral head to the base of the femoral head to allow a comparison with the CA measured on the CT (CACT). Subsequently, a computational simulation was performed to evaluate the effect of cup anteversion, inclination, stem anteversion, and leg rotation on the CAr and develop a formula that would correct the CAr according to the acetabular cup inclination based on the best-fit equation.

Results: In the retrospective analysis of 154 THA, the average CAr_cor, and CACT were 53 ± 11° and 54 ± 11° (p >.05), respectively. A strong correlation was found between CAr and CACT (r = 0.96, p <.001), with an average bias of -0.5° between CAr_cor and CACT. In the computational simulation, the CAr was strongly affected by the cup anteversion, inclination, stem anteversion, and leg rotation. The formula to convert the CAr to CA_cor was: CA-cor = 1.3 * CAr - (17 * ln (Cup Inclination) - 31.

Conclusions: The combined anteversion measurement of THA components on the lateral hip radiograph is accurate and reliable, implying that it could be routinely used postoperatively but also in patients with persistent complaints following a THA.

FM104*

Metal Artifact Reduction Sequence (MARS) MRI for diagnosis of aseptic stem loosening in uncemented total hip arthroplasty

Andreas Fischer[1]; Martin Aepli[1]; Hannes A. Rüdiger[1]; Michael Leunig[1]; Andrea B. Rosskopf[2]; Anika Stephan[1]; Vincent A. Stadelmann[1]; Christian W.A. Pfirrmann[2]

[1] Schulthess Clinic, Zurich, Switzerland; [2] Medical Radiological Institute (MRI) Zurich, Switzerland

Introduction: Following the rising number of total hip arthroplasty (THA), revision surgery (rTHA) is becoming more frequent. In Switzerland, aseptic loosening of the femoral component is the most common cause for rTHA. Some of these implants are still mechanically stable and preserving them is required to minimize the surgical trauma in rTHA. Identifying fixed or loose implants can be challenging both in the preoperative examination and in conventional radiographs. So far, there is only limited data available about the specific presentation of loose and fixed femoral stems in MARS-MRI, especially in the context of aseptic loosening.

Methods: In a single center retrospective cohort study, we identified 747 THA revision operations performed in our hospital between 1.1.2015 and 22.03.2021 by using the SIRIS Swiss implant registry. MARS-MRI was available in 339 cases, performed within 1 year before revision surgery. After application of exclusion criteria like cases with infection, cemented implants and revisions within the first year after primary THA, 117 cases were included in the study. The presence of radiolucent lines (RLLs), fluid signal in RLLs, osteolysis, periosteal reactions, bone marrow edema (BMEs) was assessed in preoperative MARS-MRIs by two radiologists. Data was compared against the definitive intraoperative judgement (fixed or loose) using Wilcoxon ranked or Pearson's Chi-squared test as appropriate. The analysis was restricted to 111 cases with consistent MRI ratings from the two raters.

Results: Out of 111 cases, 61 were fixed and 50 were loose stems. In MARS-MRI readouts, there were significantly more implants with radiolucent lines in loose stems (74%) than fixed stems (30%, p <0.001), periosteal reaction (68% vs 28%, p <0.001), and BMEs (84% vs 64%, p <0.05), but no difference in osteolysis. Analyzing the RLL-affected Gruen Zones, RLLs appeared more frequently in the most proximal zones (1, 7, 8 and 14), and significantly more in the loose stems. The number of affected Gruen Zones was significantly higher in loose stems than fixed ones as well for all parameters except osteolysis.

Conclusion: MARS-MRI is a potentially useful tool in the preoperative assessment of painful uncemented THAs. Stem loosening can be detected by evaluating the number and location of radiolucent lines, fluid signals, periosteal reactions and bone marrow edema. Further analysis is needed to define clear criteria for predicting loose stems from MARS-MRI.

FM105*

Mean 11-year follow-up of the Burch-Schneider acetabular reinforcement ring: a retrospective analysis of 205 hips at the inventor's institution

Darius Marti; Florine Petitat; Alexander Frank Heimann; Vlad Popa ; Emanuel Gautier; Jospeh M Schwab; Moritz Tannast

hôpital fribourgeois (HFR)

Purpose: Since the invention of the Burch-Schneider Reinforcing Ring (BSRR) in 1974 at our institution, we have been using this implant in patients with acetabular defects in the context of primary or revision total hip arthroplasties. Having access to a large cohort of the first patients treated with this implant worldwide, we therefore asked:

What is the overall survival rate of the implant at long-term follow-up?

What is the long-term clinical and radiologic outcomes in these patients?

What complications are associate with this implant?

Methods: Retrospective analysis of 205 consecutive hips (196 patients) undergoing primary or revision THA using a BSRR in our institution between 1975 and 2018. All patients underwent a chart review and living patients were invited for a clinical and radiographical follow-up (mean follow-up was 11 ± 5 (range 3 to 32) years). Demographic, radiographic, and clinical factors were collected including the acetabular defects according to the Paprosky classification and the DeLee/Charnley classification. Femoral stem loosening was quantified by the Gruen-Classification. (1) We assessed the revision rate using Kaplan-Meier survivorship analysis, (2) patient reported outcomes (Harris-Hip-Score, WOMAC score, UCLA activity score, Hip osteoarthritis outcome score (HOOS), and (3) Perioperative complications according to the Sink.

Results: The cumulative 30-year survivorship was 58% (95CI 47-69%) for any reason and 92% (87-97) for the BSRR only. A total of 6 BSRR were revised: three cages due to recurrent prosthetic dislocation resulting from malposition of the cage with excessive anteversion, one had to be cut partially and the polyethylene inlay was exchanged because of mechanical conflict, and two hips required a Girdlestone procedure because of uncontrollable deep infection. (2) Of all patients available for follow-up, the mean HHS score at follow-up was 52.9 ± 25.1 (8.4 - 93.4), WOMAC score 49.6 ± 40.6 (0 – 151), UCLA activity score 4.7 ± 1.9 (1 – 7), Hip osteoarthritis outcome score (HOOS) 73 (25 – 100). 27 hips (22%) Eighteen stems and nine cups had radiographic loosening without clinical correlation. (3) 36 hips (13%) had complications grade II or more.

Conclusions: This study at the inventor's institutions shows, that the BSRR presents an excellent long term follow-up survivorship in complex primary and revision hip arthroplasty comparable or even superior to other implants.

FM106*

Periacetabular Osteotomy or Hip Arthroscopy with Capsular Plication for Borderline Hip Dysplasia? A Propensity-Matched Multicenter Study with Minimum 5-Year Patient-Reported Outcomes

Octavian Andronic; Daniel Karczewski; Edwin Chaharbakhshi; Christoph Germann; Privat Dozent Stefan Rahm; Benjamin Domb; Patrick Zingg; Ajay Lall

Balgrist Hospital, University of Zurich

Introduction: As the management of borderline hip dysplasia (BHD) remains controversial, our retrospective matched study is the first to compare patient-reported outcomes (PROMs) for both hip arthroscopy (HA) and periacetabular osteotomy (PAO) in a similar population.

Methods: Hips with a lateral center-edge angle (LCEA) with values 18° ≤ LCEA <25° that underwent either PAO or HA were selected from two institutions. Exclusion criteria were Tönnis osteoarthritis (OA) grade >1, prior hip surgeries, active inflammatory disease, Worker's Compensation, and concomitant surgery. Patients were propensity-matched based on age, gender, body-mass index (BMI) and Tönnis grade of OA. PROMs included the modified Harris Hip Score (mHHS), calculation of the minimal clinically important difference (MCID), Patient Acceptable Symptom State (PASS) and maximum outcome improvement satisfaction threshold (MOIST). Preoperative radiographic predictors included comparison of the Femoro-Epiphyseal Acetabular Roof (FEAR) Index and ligamentum teres lesions.

Results: A total of 29 PAO patients were propensity-matched to 48 HA patients. Both groups were similar in terms of mean age, gender, preoperative BMI and LCEA. The PAO group had a higher mean follow-up (95.8 vs. 81.3 months; p = 0.001). The mean FEAR index was significantly lower pre-operatively in the HA group (p <0.001). Both groups demonstrated similar and significant improvements in mean mHHS from pre-operatively to latest follow-up (p <0.001). The relative risk for future surgery in the PAO group was 3.49 (p = 0.024), mostly attributed to hardware removal (25%). The revision rate was 3.6% in the PAO group and 8.2% in the HA group (p = 0.65). One patient required revision HA for intraarticular adhesions in the PAO group. Three of the revisions in the HA group required PAO due to persistent pain, and one underwent revision HA alone. One patient in the HA group required conversion to total hip arthroplasty (THA), with none in the PAO group.

Conclusion: Both PAO and HA provide BHD patients with clinically significant improvements and low revision rates at a minimum of five years postoperatively. With HA, particular attention must be paid to the patient selection with emphasis on capsular plication and optimal management of labral tears. For PAO, technical accuracy without bony overcorrection is necessary in order to avoid secondary impingement. Long-term comparative studies are necessary to draw final conclusions.

FM107*

Chemical shift artefact: an unknown pitfall for the orthopaedic surgeon

Debora Studer; Karl Stoffel; Petros Ismailidis; Dorothee Harder

Universätsspital Basel (USB)

Introduction: A chemical shift artefact is a signal processing-dependent artefact occurring in magnetic resonance imaging (MRI) caused by misregistration of two adjusting tissues with distinct differences in chemical shifts, such as water and fat. We demonstrate that this pitfall is poorly understood in the orthopaedic community and present a case of a patient with persistent hip pain after hip contusion.

Methods: A 54-year-old healthy male patient presented to the emergency department with a hip contusion after falling down stairs. X-Ray examination revealed no pathological findings. Due to persistent pain, an MRI was performed, showing a black line in the femoral neck on gradient echo sequences; this was misinterpreted by two orthopaedic surgeons as a nondisplaced femoral fracture. After consulting the radiologist, the diagnosis was corrected to bone marrow oedema of the femoral head and neck with a chemical shift artefact on the interface between oedema and fatty marrow. The patient was treated conservatively, and an MRI scan 6 months posttraumatically showed disappearance of the chemical shift artefact after remission of the bone marrow oedema.

Inspired by this case, a questionnaire-based survey was conducted in a single orthopaedic department of a university hospital. Participants were orthopaedic surgeons with varying levels of experience. The clinical history, clinical findings and radiological examinations (X-Ray, MRI) of this case were presented, and the participants were asked to make a diagnosis and treatment plan. The survey contained multiple-choice answers and a free text entry option.

Results: Out of 25 questionnaires distributed, we received 17 responses (68%). Around 70% of the participants considered the chemical shift artefact to be a fracture and 30% suspected necrosis, bone oedema or osteoarthritis. None of the participants justified a possible artefact when given the option in the multiple-choice questionnaire. Regarding treatment options, almost 80% opted for surgical treatment and only around 20% for a conservative approach. 95% were not at all familiar with the existence of chemical shift artefacts in MRIs.

Conclusion: Chemical shift artefact is an occasional phenomenon on MRI scans of bone that can be mistaken as a fracture and lead to incorrect treatment. This artifact is largely unknown in the orthopaedic community. Greater awareness and consultation with radiologists in MRI interpretation is critically important.

FM108

Factors influencing Patient-Reported Outcomes following Periacetabular Osteotomy and Open Osteochondroplasty in the Setting of Borderline Hip Dysplasia: A Retrospective Study with Minimum Follow-Up of 5 Years

Octavian Andronic; Lukas Jud; Christoph Germann; Patrick Zingg

Universitätsklinik Balgrist

Background: The treatment strategy of patients with borderline hip dysplasia (BHD) remains controversial. The current study is the first to report mid-term outcomes after periacetabular osteotomy (PAO) exclusively in a BHD population.

Methods: Eligible participants had BHD and a lateral center-edge angle (LCEA) with values 18° ≤ LCEA <25° and a minimum follow-up of 5 years. Patient-reported outcomes (PROMs) including Tegner score, subjective hip value (SHV), modified Harris Hip Score (mHHS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) were measured preoperatively and at the last follow-up. Pre- and postoperative morphological parameters were evaluated: LCEA, acetabular index (AI°), alpha angle (α°), Tönnis staging, acetabular retroversion, femoral version, femoro-epiphyseal acetabular roof index (FEAR), iliocapsularis-to-rectus-femoris (IC/RF) ratio, labral lesions or hypertrophy and ligamentum teres (LT) pathology. One-way ANOVA, partial Pearson correlation and multiple regression analysis were used to evaluate correlations.

Results: Forty-two out of 53 hips (75%) were included for analysis. The mean follow-up was 96 months (range 67 – 139

months). The SHV, mHHS, WOMAC and Tegner significantly improved (p <0.001) at last follow-up. According to SHV and mHHS - there were 3 hips (7%) with poor results (SHV <70), 3 (7%) with a fair score (70-79), 8 (19%) with good results (80-89) and 28 (67%) that scored excellent at the last follow-up. There were 11 subsequent surgeries: 9 implant removals due to local irritation, 1 resection of postoperative heterotopic ossification and 1 hip arthroscopy for intraarticular adhesions. No hips were converted to THA at last follow-up. The presence of preoperative labral lesions or LT lesions did not influence any PROMs at last follow-up (p = 0.355 and p = 0.438). From the 3 cases that had poor PROMs, 2 have developed severe osteoarthritis (>Tönnis 2), presumably due to surgical overcorrection (postoperative AI Index <-10°).

Conclusions: PAO is reliable in treating BHD with favourable mid-term outcomes. Concomitant LT and labral lesions did not negatively influence outcomes in our cohort. Technical accuracy with avoidance of overcorrection is essential in achieving successful outcomes.

FM109

Prevalence of supraacetabular fossa according to acetabular morphology in patients with hip pain undergoing magnetic resonance arthrography

Vera M Stetzelberger; Julien Hirt; Vlad Popa ; Alexander Frank Heimann; Jospeh M Schwab ; Moritz Tannast

Cantonal Hospital Fribourg HFR, University of Fribourg

Introduction: The supraacetabular fossa (SAF) is known to be a normal anatomic variant of the acetabular roof, which can be misdiagnosed as an acetabular cartilage defect. It is typically located in the 12 o'clock position and can be categorized into type I, (not filled), or type II (filled with hyaline cartilage).

The aims of this study were to determine (1) the prevalence of SAF in patients with hip pain undergoing MRA (magnetic resonance arthrography). (2) if the SAF is associated with a specific acetabular morphology.

Methods: IRB approved retrospective cohort study. We evaluated 992 consecutive patients undergoing MRA between January 2010 and December 2020 for hip pain. After excluding patients with skeletal immaturity, preexisting osteoarthritis, incomplete documentation, previous surgery, Legg-Calvé_Perthes disease, slipped capital femoral epiphysis and avascular necrosis, 594 hips were available for final analysis. Three observers independently conducted the measurements twice to obtain intraobserver reliability and interobserver reproducibility. Standardized anteroposterior (AP) pelvic radiographs were obtained from each patient to determine the corresponding acetabular morphology according to previously established reference values.

(1) The overall prevalence of a SAF was documented. (2) The specific prevalence of SAF was determined for each acetabular morphology and groups with and without an SAF were compared using a Chi2 square test.

Results: (1) The overall prevalence of SAF was 12% (3% of type I, unfilled and 9% of type II, filled). (2) The highest prevalence of SAF was found in patients with a protrusio acetabuli (31% of patients with protrusio, p = 0.04), whereas the lowest prevalence of SAF was present in patients with dysplasia (3% of patients with dysplasia, p = 0.03).

Conclusion: Patients with a protrusio acetabuli are more likely to present a SAF in MRA. Therefore the presence of an SAF should be considered in the evaluation of these patients and not be misinterpreted as an osteochondral lesion or a cartilage defect in MRA. In addition, special care should be taken not to overcorrect the lateral coverage with an already reduced lateral articular surface in these patients.

FM110

How Useful are Indirect Radiographic Signs of Hip Instability in Borderline Hip Dysplasia? An MRI-based Comparison to a Healthy Cohort

Octavian Andronic; Lukas Jud; Christoph Germann; Florian Imhoff; Stefan Fröhlich; Johannes Scherr; Jörg Spörri; Patrick Zingg

Universitätsklinik Balgrist

Background: Symptomatic hips with borderline hip dysplasia (BHD) morphology pose a challenge in differentiating stable from unstable hips. The current study is the first to compare indirect radiographic signs of instability in a symptomatic BHD population to those in a healthy cohort.

Methods: The study group consisted of patients with a lateral center-edge angle (LCEA) with values 18° ≤ LCEA <25° who underwent corrective periacetabular osteotomy (PAO) and reported an improvement in patient-reported outcome measures (PROMs). The comparison group consisted of a healthy cohort of athletes who did not complain of any hip-related symptoms and who had normal values of their hip morphological parameters (LCEA, acetabular index (AI°), alpha angle (α°), femoral version, acetabular version). Indirect signs of instability consisting of the femoro-epiphyseal acetabular roof index (FEAR), iliocapsularis-to-rectus-femoris (IC/RF) ratio and labral dimensions (height-to-length ratio) were assessed in both groups. Partial Pearson correlation, logistic multiple regression analysis and Receiver-Operating Characteristic (ROC) curve analysis were performed to determine correlations, as well as the sensitivity and specificity of these signs to differentiate between healthy hips and BHD.

Results: On binary logistic multiple regression analysis, the FEAR Index was the only independent predictor to differentiate between BHD and healthy hips (p <0.001). The IC/RF ratio did not achieve significance. The calculated area under the curve (AUC) was 0.93 (0.87 – 0.99, CI 95%, p <0.001) for the FEAR Index and 0.813 (0.703 – 0.923, CI 95%, p <0.001) for the height-length ratio. Using the predefined cut-off values (dysplastic - FEAR Index ≥ 5° or labral height-to-length ratio ≤ 0.5), 73% sensitivity/100% specificity and 20% sensitivity/100% specificity, were achieved.

Conclusion: In our cohort, the FEAR index was an independent parameter that could differentiate between borderline dysplastic and asymptomatic hips. Both the FEAR index and labral hypertrophy ratio showed good specificity in differentiating patients with BHD and hip instability from healthy cohorts. The labral height-to-length ratio had a limited sensitivity. Both of these parameters may be employed for surgical decision making.

FM111

How does pelvic tilt evolve over the long-term after unilateral Bernese periacetabular osteotomy ?

Alexander Frank Heimann[1]; Iris Brouze[2]; Guoyan Zheng[3]; Jospeh M Schwab [1]; Moritz Tannast[1]; Corinne A Zurmühle [1]

[1] HFR Fribourg Cantonal Hospital and University; [2] Hôpital du Valais (RSV) – Centre Hospitalier du Valais Romand; [3] Institute of Medical Robotics, School of Biomedical Engineering, Shanghai Jiao Tong University

Background: In this study, we investigated the hypothesis that patients with developmental dysplasia of the hip (DDH) present with reactively increased anterior pelvic tilt to compensate for reduced anterior femoral head coverage. While this has been

postulated it has not been scientifically established. It is reasonable to believe that if this hypothesis is true, the pelvic tilt of patients presenting with DDH should decrease over time following optimization of femoral head coverage that occurs after Bernese periacetabular osteotomy (PAO).

Objectives: We therefore asked: (1) What was the preoperative pelvic tilt before unilateral Bernese PAO? (2) How does pelvic tilt evolve during long-term follow-up of unilateral Bernese PAO compared to before surgery?

Study design & Methods: In this retrospective longitudinal study, we assessed pelvic tilt of patients undergoing unilateral PAO for DDH preoperatively, immediately postoperatively, and at long-term follow-up using standardized AP pelvis radiographs with the previously validated noncommercial HipRecon software. This software uses a 2D-3D deformation reconstruction method and, after creating a patient-specific 3D pelvic model based on the AP pelvis radiograph, allows calculation of the pelvic orientation in relation to the anterior pelvic plane (APP). The mean radiographic follow-up was at 12 (8–30) years postoperatively. Level of evidence III, therapeutic study. In the statistical analysis, normally distributed data were analyzed with a repeated measures ANOVA and non-normally distributed data were analyzed with the Friedman test. The significance level was set at $\alpha = 0.05$. Thus, a statistical test was significant if $p < 0.05$.

Results: Mean pelvic tilt decreased significantly from 4,7 ± 2,3° (range -4.3° to 15.0°) before the intervention to 1,7 ± 2,3° (range -5.0° to 14.0°) at long-term follow-up ($p = 0,001$).

Conclusions: We observed a statistically significant decrease in pelvic tilt of three degrees when comparing pelvic orientation on AP pelvis radiographs preoperatively and at long-term follow-up after unilateral Bernese PAO in patients with DDH. However, considering the interindividual differences in pelvic orientation is almost 20 degrees, this decrease does not seem to be of major clinical relevance. This leads us to believe that, rather than being compensatory for the lack of anterolateral coverage in DDH, pelvic tilt more likely represents a patient-specific, individual morphologic feature.

FM112

The Fossa-Foveolar Mismatch- The Answer To Lesions Of The Ligamentous-Fossa-Foveolar-Complex In The Hip? Validation Of A 3D Computerized Model For A New Biomechanical Concept

Vera M Stetzelberger; Jannine Segessenmann; Cem Cek; Corinne A Zurmühle ; Vlad Popa ; Jospeh M Schwab ; Moritz Tannast

Cantonal Hospital Fribourg HFR, University of Fribourg

Introduction: Lesions of the ligamentous-fossa-foveolar complex (LFFC) are highly prevalent in young patients with hip pain, but the underlying pathomechanism is yet unknown. We propose a new explanation for the origin of these lesions: the fossa-foveolar mismatch (FFM): a pathological movement of the fovea capitis outside of the acetabular fossa onto the acetabular cartilage during normal range motion. This "off the track" motion of the fovea capitis would lead to an impingement of the ligamentum teres (LT) and associated degenerative lesions. The FFM-index for a specific motion: ratio of surface occupied by the fovea overlapping on the lunate cartilage to the total foveolar tracking surface.

Aims of this validation study were to determine the (1) intraobserver reliability and (2) interobserver reproducibility of our computer-assisted 3-dimensional (3D) model of the FFM.

Methods: IRB approved 3D motion study. From all 304 patients with joint preserving surgery (11.2015- 05.2019), exclusion of hips with Perthes deformity, posttraumatic disorders, slipped capital femoral epiphysis, incomplete documentation, and previous surgery. Of the remaining hips we randomly selected 15 for this validation study. Computed tomography (CT) scans of the pelvis and femur were utilized to build a 3D surface model using the software AMIRA (Visage imaging Inc, Carlsbad, CA, USA). The acetabular fossa was virtually excised, the fovea capitis was marked. The 3D models were then subjected to physiological range of motion with a validated 3D collision detection software; the FFM-index was calculated. (1) Intraobserver reliability and (2) interobserver reproducibility were determined using intraclass-correlation-coefficients (ICC) with 95% confidence intervals (CI) with software MedCalc (Version 19.2.1).

Results: (1) We obtained excellent intraobserver ICCs for the FFM-index averaging 0.92 (95% CI 0.77-0.97) among the three raters for all motions. (2) Interobserver reproducibility between raters was also excellent, with ICCs ranging from 0.76 to 0.98.

Conclusion: Our computer-assisted 3D model of the FFM showed excellent intraobserver reliability and interobserver reproducibility. As the FFM could explain lesions of the LLFC and resulting hip pain, it should be implemented in therapeutic decisions. This validation study should provide a base for future studies focusing on correlating the actual intraoperative damage with the FFM-index and identifying patients at risk.

FM113*

Decentration of the femoral head: Is it associated with osseous deformities predisposing to hip instability and the need for periacetabular osteotomy

Alexander Becker[1]; Florian Schmaranzer[2]; Simon Steppacher[1]; Alexander Heimann[3]; Moritz Tannast[3]; Klaus Arno Siebenrock[1]; Till Lerch[2]

[1] Universitätsklinik für Orthopädische Chirurgie und Traumatologie, Inselspital Bern ; [2] Universitätsinstitut für Diagnostische, Interventionelle und Pädiatrische Radiologie (DIPR), Inselspital Bern ; [3] Orthopädische Chirurgie und Traumatologie - HFR Frei

Hip instability is a significant challenge in surgical decision making in patients eligible for joint preserving surgery since unstable hips are treated with osteotomies opposed to resection of femoroacetabular impingement (FAI) deformities. Diagnostic tools that facilitate the preoperative diagnosis of instability are needed. To see the prevalence of decentration of the femoral head on hip MR arthrography on 1)different imaging planes, 2)in a wide range of femoroacetabular deformities and assess its association with deformities leading to hip instability and 3)subsequent periacetabular osteotomy (PAO). This retrospective diagnostic study was performed in 351 patients (48% men, mean age 31 ± 12 years) with hip pain undergoing radiography and MR arthrography. On radiographs lateral center edge angle (LCE) and neck-shaft angle (CCD) were measured, on MR alpha angles and femoral torsion. Presence of anterior decentration was defined as a layer of contrast agent between the posterior femoral and acetabular cartilage layer. 1)Prevalence of decentration sign was compared between sagittal, axial, and radial images and between 2)hips with / without hip dysplasia (LCE <25°), increased femoral torsion (>39°) and valgus hips (CCD >139°). 3)Among the 171 hips (49%) undergoing joint preserving surgery association between positive decentration sign and PAO was assessed. For statistical comparison t-test, 2x2 tables with fisher exact test and odds ratio (OR) were calculated. 1)Decentration was detected with the highest ($p < 0.001$) frequency on radial (28%), axial (13%) and sagittal (5%) images. 2)Hips with decentration sign had a lower LCE(24 ± 9° vs 32 ± 7°; $p < 0.001$), higher CCD(134 ± 7° vs 131 ± 6°; $p < 0.001$) and higher femoral torsion(24 ± 15° vs 16 ± 12°; $p < 0.001$) than hips without decentration sign. Hips with decentration had a higher prevalence and were associated with hip dysplasia (56% vs

17%, OR 6.4; p <0.001) excessively high femoral torsion (18% vs 5%, OR 4.2; p <0.001) and valgus deformity (24% vs 8%, OR 3.8; p <0.001) than hips without decentration sign on MRI. 3)Hips with a positive decentration sign had a 11.6 higher odds (p <0.001) of undergoing PAO. Decentration sign was most frequent on radial MR images and was significantly associated with osseous deformities predisposing hip instability. Patients with the sign were more likely to have PAO for hip instability, emphasizing the potential of this sign to improve preoperatiive patient selection.

ORALS: A72 INFECTIONS

FM114

Performance of the KLIC score and the CRIME80 score to predict early and late failure of DAIR procedures in patients with periprosthetic joint infections: a ten-year retrospective cohort study

Johanna Mettler[1]; Jonathan Tschopp[1]; Arnaud Fischbacher[1]; Olivier Borens[2]; Noémie Boillat Blanco[1]; Sylvain Steinmetz[1]

[1] CHUV - Centre hospitalier universitaire vaudois; [2] Clinique Bois-Cerf

Introduction: Acute periprosthetic joint infection (PJI) are usually treated with Debridement, Antibiotics and Implant Retention (DAIR). To identify patients at risk of early or late failure, two scores have been created. The KLIC score was designed to predict early DAIR failure and the CRIME80 to predict late failure in patients with late acute PJI.

The objective of this study was to analyze the performance of both scores in a retrospective monocentric cohort of consecutive patients treated for an acute PJI with DAIR procedure.

Methods: Inclusion of patients with acute PJI of hip and knee treated by DAIR procedure between January 2009 and December 2018. Univariate analyses were performed using logistic regression to compare patients with early failure (within 60 days of DAIR) and late failure (within 2-year of DAIR) to those without failure. Both scores were calculated retrospectively and analyzed using cut-offs: <4 vs. ≥ 4 for KLIC score and <3 vs. ≥ 3 for CRIME80 score. For the KLIC score, we considered early failure and for the CRIME80 score, 2-year failure.

Results: We included 101 patients diagnosed with acute PJI: 77% (78/101) were microbiologically documented (main etiologies: Staphylococcus aureus MSSA, Streptococci, Enterobacterales, Coagulase negative Staphylococci). The rate of early failure was 10% (10/101) and the rate of late failure was 23% (23/101).

KLIC score had a sensitivity of 60%, a specificity of 49.5% and an area under ROC curve of 0.56. The negative predictive value is 91.8% and the positive predictive value is 11.5%. CRIME80 score had a sensitivity of 34.8%, a specificity of 75.6% and an area under ROC curve of 0.61. The negative predictive value is 79% and the positive predictive value is 29.6%.

Conclusion: KLIC and CRIME80 scores did not predict accurately the risk of early failure and late failure after DAIR procedure for acute PJI.

FM115

No increased risk for treatment failure and revisions for conservative surgery in diabetic foot osteomyelitis

Madlaina Schöni[1]; Laura Soldevila-Boixader[2]; Thomas Böni[1]; Ilker Uçkay[1]; Felix Waibel[1]

[1] Universitätsklinik Balgrist; [2] Bellvitge Hospital Universitari, Barcelona

Objective: The optimal treatment strategy for diabetic foot osteomyelitis (DFO) remains debated in the literature. Conservative surgery, meaning resection of infected bone and soft tissues without amputation, continues to gain importance. This study compared the treatment failure proportions between patients treated with conservative surgery and with minor amputation.

Methods: Single-center, retrospective comparative study comparing 113 episodes of conservative surgery to 576 episodes of minor amputation in case of DFO. Multivariate Cox regression analysis and Kaplan Meier survival estimates were performed.

Results: The proportion of clinical failures was not different with 24% in the conservative surgery group compared to 24% in the minor amputation group (p = 0.93). Clinical failure was associated with polymicrobial DFO (Hazard ratio (HR) 1.63, 95% confidence interval (CI) 1.06-2.5; p = 0.03) and age (HR1.02, 95%CI 1.01-1.04; p = 0.05). Conservative surgery was not associated with clinical failure (HR 0.97, 95% CI 0.52-1.84; p = 0.94). Microbiological recurrence was not different between both groups (conservative surgery 8%, minor amputation 5%; p = 0.15), as well. Cumulative revision free survival was not different with 81% at 1 year, 76% at 5 years and 10 years in the conservative survery group and 79% at 1 year, and 76% at 5 and 10 years in the minor amputation group (log rank test p = 0.9).

Conclusions: In diabetic foot osteomyelitis, conservative surgery can be used as the surgical treatment part with the same amount of clinical failure and microbiological recurrence at one year, and with similar revision free survival, compared to minor amputations.

FM116*

One-stage versus two-stage revision surgery in patients with prosthetic joint infection: a retrospective cohort study

Niccolò Marelli[1]; Camille Savoy[2]; Olivier Borens; Noémie Boillat Blanco[1]; Sylvain Steinmetz[1]

[1] CHUV - Centre hospitalier universitaire vaudois; [2] UNIL / CHUV

Introduction: More and more patients are having knee and hip replacements and the incidence of these operations will continue to rise in the coming decades. Despite many precautions, one of the most feared complications is infection of the prosthetic material in avoiding infection. The material can be changed in one or two steps. The Gold Standard in the international literature is the two-stage revision. We decided to compare the results after one-stage and two-stage changes in our center. The main objective of this study was to show the non-inferiority of the one-stage revision compared to the two-stage exchange.

Method: We conducted a retrospective study comparing two groups of patients (n = 248) with periprosthetic infection according to EBJIS criteria, with one-stage (n = 49) versus two-stage (n = 199) exchanges. The outcome was analyzed at two years and according to the criteria defined by the Delphe consensus. Thus, the following events were considered as a failure of the procedure: persistence or recurrence of infection (presence of a fistula or abscess, wound dehiscence, joint pain), repeat surgery, or death due to a condition directly related to the periprosthetic infection (sepsis, necrotizing fasciitis).

Results: We found no difference in outcome between one-stage and two-stage exchange arthroplasty in our cohort. Indeed, the two-year success rate for one-stage surgery was 87.8%, and 85.4% for two-stage surgery.

The most common pathogens found in our cohort were coagulase-negative Staphylococci, followed by Streptococcus spp and Staphylococcus aureus.

We did not find any influence on the outcome due to the patients' comorbidities. The two-year cure rate was 95.3%, whereas it was 83.9% in the group of patients with chronic infection.

Discussion: The main conclusion of our study is that in well-selected patients, the results of a one-stage revision of an infected prosthesis are non-inferior to those achieved by a two-stage revision.

ORALS: A073 TUMORS

FM117

Limb-preserving biological reconstruction for Ewing-Sarcoma around the ankle joint – a consecutive case-series

Maximilian Ernst Scholl; Lukas Jud; Arend-Jan Christiaan Nieuwland; Daniel Müller

Universitätsklinik Balgrist

Introduction: Ewing's sarcoma is a primary malignant bone tumor that occurs in young patients under the age of 30 years. Typically, Ewing's sarcoma is located in the diaphysis of long bones or the pelvis. Few case reports exist, describing the uncommon occurrence of Ewing's sarcoma around the ankle joint. In this rare situation, below knee amputation was usually considered in the past. We describe a case-series of 3 patients diagnosed with Ewing's sarcoma around the ankle joint and in which limb-preserving resection and biological reconstruction by ankle arthrodesis was performed.

Methods: A consecutive case series at the University Hospital Balgrist was performed. All patients with histologically confirmed Ewing's sarcoma located around the ankle joint, between January 2020 and February 2023, were included. A total of 3 patients could be identified (2 female, 1 male). Patients age at time of surgical intervention was 13, 17 and 28 years, respectively. In two patients, Ewing's sarcoma was located in the distal tibia, affecting the distal tibial growth plate. In one patient, the tumor was located in the talus. All patients received preoperative chemotherapy according to the 2012 Euro-Ewing protocol. Due to the affection of the epiphysis, preservation of the ankle joint was not possible in any of the patients. Therefore, ankle joint arthrodesis was performed by using a two-stage procedure in the patient with the Ewing's sarcoma located in the talus and primary ankle joint arthrodesis was performed in the remaining two patients by using vascularized fibula-autograft and allograft composite.

Results: There were no perioperative complications. Complete tumor resection (R0) was histologically confirmed in all three patients. Full consolidation of the ankle joint arthrodesis could be confirmed two years postoperatively in the patient with Ewing's sarcoma in the Talus and she is already working as a fitness instructor. Due to the short follow-up in the other two patients, confirmation of the complete bone healing is pending in these cases. In none of the patient local recurrence or remote metastases were seen in regular follow-ups.

Conclusion: In the presented case series, a safe tumor resection could be achieved even with preservation of the limb. Biological reconstruction of the bone defect with simultaneous arthrodesis of the ankle joint was technically feasible and is therefore a valid treatment option for Ewing's sarcoma involving the distal tibia or talus.

FM118

Allogenic cancellous bone versus injectable bone substitute for endoscopic treatment of simple bone cyst and intraosseous lipoma of the calcaneus

Andreas Toepfer

Kantonspital St.Gallen

Introduction: Simple bone cyst (SBC) and intraosseous lipoma (IOL) of the calcaneus are rare tumor entities which are mostly diagnosed due to unspecific heel pain, as an incidental finding or rarely due to a pathological fracture. Endoscopic resection of these benign tumors aims to minimize the surgical morbidity and maximize surgical efficiency. Grafting is regularly performed to reduce the risk of recurrence and stimulate osseous consolidation. As the incidence is low and treatment strategies are heterogeneous, there is no clear consensus in the therapy of SBC or IOL of the heel. The objective of this study is to present medium to long-term results after endoscopic resection and grafting with allogenic cancellous bone or bioresorbable hydroxyapatite and calcium sulfate cement.

Methods: Between 2012 to 2019 a total of 25 benign bone tumors consisting of 17 SBCs and 8 IOLs were treated by the author with endoscopic resection and grafting, representing the largest cohort up to date. For grafting, 13 patients received allogenic cancellous bone (group A) and 12 patients injectable bone substitute (group B). One patient in group B was lost to f/u. Pre- and postoperative imaging with plain x-rays and MRI was retrospectively analyzed with a minimum f/u of 36 months to assess tumor size, osseous consolidation (modified Neer classification) and tumor recurrence. A retrospective chart analysis focusing on adverse intra- and perioperative events and other complications associated to the surgical procedure was performed using the modified Clavien-Dindo classification (CD1-3).

Results: 12/13 cases with allogenic bone grafting showed a type Neer 1 osseous healing of the tumorous lesion after endoscopic resection whereas only 5/11 cases with injectable bone substitute showed a sufficient healing (type 1&2). There were three recurrent cysts (Neer 4) and two persistent cysts (Neer 3) after using injectable bone substitute (all Cerament ©). Two CD1 complications were observed in group A (prolonged wound drainage, sural neuritis) and 8 complications in group B (6x CD1, 2x CD3).

Conclusion: Allogenic cancellous bone grafting after endoscopic resection of calcaneal SBC or IOL shows very low rate of complications and no tumor recurrence in our series. Injectable bone substitute with Cerament (Bonesupport©, Lund/Sweden) showed a high rate of "white-out"(excessive drainage) resulting in multiple complications such as prolonged wound healing, revision surgery and recurrence.

FM119

Outcome Analysis of Bone Defect Reconstructions with an osseous xenograft

Melissa Lagger[1]; Rik Osinga[2]; Nora Leu[1]; Andreas Krieg[3]

[1] Universitätskinderspital beider Basel; [2] Universitätsspital Basel (USB); [3] Universitäts-Kinderspital beider Basel (UKBB)

Introduction: The current gold standard for bone reconstruction is the use of autologous grafts. Harvesting these grafts can lead to bone defects of various sizes. Bone defects can be reconstructed with osseous xenografts such as Tutobone® (Novomedics GmbH, Zürich, Switzerland). Although Tutobone® is frequently used, very few studies attest to its efficacy and outcome. This study aims to highlight the clinical and radiological outcomes following bone defects reconstruction with this xenograft.

Method: Forty-six patients who underwent surgery at our hospital and met our inclusion criteria were enrolled in this retrospective study. They were 22 men and 24 women with a mean age of 14 years (range 1-47 years, SD ± 9 years) at the time of surgery. The last radiological follow-up including xenograft was recorded up to a mean of 47 months (range 1-150, SD ± 40 years). Records of regular follow-up were also examined for clinical/radiologic outcome and postoperative complications.

Results: The Xenograft was used to reconstruct defects in different localisations: Pelvis (15 donor site reconstruction of the iliac crest, 10 other locations), Femur, Tibia and Foot, respectively n = 25, 10, 8, 3. Two third of the patients recovered without any complications or complaints. 17% (n = 8) of the patients reported pain in the postoperative course, which in most cases resolved spontaneously or after removal of the osteosynthesis material. There was only 1 case of persistent pain following donor site reconstruction in the context of a complex tumor resection at the pelvis. 11% of the patients (n = 5) suffered from a postoperative infection. 3 patients (7%) had a scarring disorder. The radiological follow-up showed a complete or partial integration of the xenograft block without signs of resorption in two third of the cases.

Conclusion: Bovine xenograft is a safe material for reconstruction of various bone defects up to 3 cm and can prevent additional complications as no additional harvest site is required. However, as with any foreign body material, there is a significant potential for bacterial adhesion and thus postoperative infection. Bony integration is also limited comparing to the autologeous grafts. Therefore, close postoperative follow-up is required for early detection of complications.

FM120

Extra-skeletal chondrosarcomas – a consecutive case series of an ultra-rare tumor identity

Arend-Jan Christiaan Nieuwland; Lukas Jud; Daniel Müller
Balgrist Hospital, University of Zurich

Introduction: Primary extra-skeletal localization of chondrosarcomas is a seldom phenomenon, as chondrosarcomas normally represent bone tumors. Typical lesions are found in the pelvis, the proximal and distal femur as well as the scapula. Literature describing this type of pathology is scarce and clinical implications are unclear. We identified in our tertiary sarcoma clinic several cases of primary extra-skeletal presentations of chondrosarcoma and report the treatment outcome, as well as follow up measures.

Methods: We retrospectively reviewed a consecutive case series. All patients with extra-skeletal presentations of chondrosarcoma, between January 2016 and February 2023, were included.

Results: Two histologically different pathologies were described: two cases of mesenchymal chondrosarcomas and two cases of myxoidal chondromas were identified in 4 male patients (aged 29 to 69 years at time of surgery).

All tumors were in the lower limb (one tumor in the gluteus medius, two in the thigh, one in the lower leg) and were excised with tumor-free margins (R0). All patients received neoadjuvant radiation therapy according to our soft tissue protocol. In the two patients with mesenchymal subtype a chemotherapy was proposed: One patient underwent a preoperative chemotherapy (high-dose ifosfamid), whereas the second patient refused any systemic treatment. Regular after care entails CT-Thorax und focused MRI scans.

Short to middle term follow up shows no complications. 3 Patients showed no local recurrence or metastases and good clinical satisfaction.

In one patient, after care examinations showed 4 years postoperatively pulmonal metastases for which local excision and radiotherapy was performed. 5 years postoperatively further follow up including PET-CT examination showed 3 more new metastases (pancreas, iliopsoas, vertebral body L5) for which radiotherapy and stereotactic body radiation therapy was successfully applied.

Conclusion: Extra-skeletal chondrosarcomas define an ultra-rare histological entity of primary malignant soft tissue tumors, which is why available knowledge remains limited. Even after R0 resection, prolonged after care seems indicated in order to identify and treat metastases early. In our series, atypical localization of the metastases outside of the lungs was present. Therefore, follow up controls with intermittent total body imaging has to be considered.

A03 SPINE

FM121

Intraoperative anteroposterior and oblique fluoroscopic views for the detection of pedicle screw misplacement of the lumbar spine: A cadaveric experiment for analysis of accuracy

Caroline Passaplan; Marie-Rosa Fasser; Jonas Widmer; Florian Wanivenhaus; Christoph J. Laux; Mazda Farshad; José Miguel Spirig

Balgrist Universitätsklinik

Introduction: Pedicle screw fixation is commonly used for posterior fixation of the lumbar spine. Inaccuracy of screw placement can lead to disastrous complications. As fluoroscopic assisted pedicle screw instrumentation is the most frequently used technique, the aim of this study was to assess the specificity, sensitivity and accuracy of fluoroscopy to detect screw malpositioning. We also analyzed whether the addition of an oblique view could improve these parameters.

Method: On 12 human cadavers, 138 pedicle screws were placed intentionally either completely within the pedicle (29 control screw), with 2-4mm (26 medial and 26 lateral screws) and with >4mm (28 medial and 29 lateral) breach of the pedicle from Th12 to L5. The positions of the screws were verified with a postoperative CT. Fluoroscopic anteroposterior (AP) and oblique view radiographs of the instrumented cadaveric lumbar spines were obtained. Three experienced spine surgeons interpreted AP-views first and 4 weeks later AP-views together with oblique views.

Results: With a cut-off of more than 2mm pedicle breach, the sensitivity of AP views was 0.68 and 0.67 with AP + oblique views. The specificity of AP views was 0.86 and 0.93 with AP + oblique views. The accuracy was 0.78 with AP views and 0.81 with AP + oblique views. Overall, there was no significant difference between AP views and AP + oblique views. There was a substantial inter-reader agreement (Fleiss's kappa: 0.632).

Conclusion: Fluoroscopic screening of pedicle screw misplacement has limited sensitivity. Adding an oblique view does not have a significant advantage while the radiation exposure is increased. When in doubt, other modalities such as intraoperative CT imaging or an intraoperative screw exploration must be evaluated.

FM122

Development and validation of the new AOSpine Upper Cervical Injury Classification

Lorin M. Benneker[1]; Cumhur Oner[2]; Emiliano Vialle[3]; Shanmuganathan Rajasekaran[4]; Marcel R. Dvorak[5]; Frank Kandziora[6]; Mohammad El-Sharkawi[7]; Richard Bransford[8]; Klaus Schnake[9]; Gregory Schroeder[10]; Brian Karamian[10]; Mark J. Lambrechts[10]; Jose A. Canseco[10]

[1] Orthopädie Sonnenhof Bern; [2] University of Utrecht; [3] Catholic University of Parana; [4] Ganga Hospital; [5] University of British Columbia; [6] Unfallklinik Frankfurt am Main; [7] Assiut University; [8] University of Washington; [9] Malteser Waldkrankenhaus St. Marien, Erlangen

Introduction: The many existing classifications on injuries of the upper C-Spine are based on the individual level of injury (ie, the occipital condyle, atlas and axis, etc.). The AOSpine knowledge forum trauma (KFT) has developed a new classification based on injury level (I. occipital condyle and craniocervical junction, II. C1 and C1-C2 joint, and III. C2 and C2-3 joint) and type of injury (A-bony injury, B-tension band injury, C-fracture dislocation). Interobserver reliability and intraobserver reproducability was assessed internally by experts from the KFT and externally by an international group of spine surgeons from various regions, background and level of expertise.

Methods: Thirteen international AO Spine Knowledge Forum Trauma members (expert group EG) participated in two live webinar-based classifications of 29 upper cervical spine injuries presented in random order, four weeks apart. For the external validation an international group (IG) of 275 spine surgeons classified twice in an interval of 3 weeks a set of 25 cases; a REDCap survey captured all participants classification grades. Pearsons chi square test was used to compare the effect of surgeon experience and surgeon subspecialty on percent agreement with the gold-standard. Significance was set at $p < 0.05$. Fleiss' kappa (ƙ) was used to calculate the interobserver reliability and intraobserver reproducibility.

Results: The overall percent agreement with the gold-standard on assessment one was was for the EG 80.8% versus 82.7% on assessment two (79.7% versus 78.8% for the IG). When evaluating the anatomical location (I, II, or III injury), EG members agreed with the gold-standard at a 95.1% and 94.1% rate (assessment 1 and 2) (IG: 95.1% and 94.1%), while the injury type (A, B, or C injury) agreement was 82.4% and 82% (IG: 82.4% and 82%.). Injury classification intraobserver reproducibility was excellent for the EG (ƙ = 0.82) and substantial for the IG (ƙ = 0.70). The overall interobserver reliability was substantial at ƙ = 0.729 and 0.732 for EG (ƙ = 0.63 and ƙ = 0.61 for IG). Participants from Europe and North America had the highest classification accuracy, while participants from Africa and Central/South America had the lowest accuracy, especially when evaluating moderate to severe injuries of the atlas (IIB and IIC) and atypical hangman's type fractures (IIIB).

Conclusion: The international vaildation of the AO Spine Upper Cervical Injury Classification demonstrated substantial overall interobserver reliability and intraobserver reproducibility, with excellent interobserver reliability for injury location and moderate reliability for the injury type.

FM123*

Stent-screw assisted internal fixation with apex pushing technique for kyphosing thoracolumbar fractures (SAIFAP)

Stefan Motov; Gregor Fischer; Thomas Forster; Roman Schwizer; Vilijam Zdravkovic; Benjamin Martens; Martin N. Stienen

Cantonal Hospital St. Gallen & Medical School of St.Gallen

Background: Short- or long-segment posterior stabilization with vertebral body stent (VBS) in the index vertebra and cement-augmented pedicle screws (stent-screw assisted internal fixation = SAIF) is a treatment option in kyphosing thoracolumbar fractures. SAIF was effective in obtaining height restoration, kyphosis correction and pain relief in smaller series. There is little information about the effect of the combination of SAIF with the apex pushing technique (APT) to reduce segmental kyphosis.

Methods: We retrospectively included all patients treated at the Kantonsspital St. Gallen between 2016 and 2023 with a surgical technique, which combines the SAIF and APT (SAIFAP). Radiological and clinical data for all patients with osteoporotic, traumatic and pathological fractures treated with SAIFAP were obtained. Statistical analysis was performed through SPSS Version 28, IBM. We performed t-tests for independent samples and a Chi-Square tests to explore statistical significance.

Results: We included a total of 48 patients (54% male) with a mean age of 75 years (CI 54;93), ASA score of 2, CCI score of 5 and BMI of 27 kg/m2. 22 osteoporotic (46%, OF types II-V),

20 traumatic (42%, A3, A4) and 6 pathological (12%) fractures were evaluated. Most fractures (67%) were located in the thoracolumbar junction and operated via open midline approach (63%). The mean length of surgery was 171 minutes (SD 54), mean estimated blood loss 436 ml (SD 497). We achieved a mean sagittal angle correction of 5° (SD 11) and sagittal anterior/posterior wall height correction of 6 (SD 8)/4 (SD 6) mm on first follow up after 54 days (SD 28). While the sagittal angle correction (6° (SD 13)) persisted on last follow up after 627 days (SD 465), the anterior/posterior wall height correction declined to 1 (SD 15) and -4 (SD 14) mm, respectively. Surgical complications (junctional/distant fractures, wound infections/ healing disorders and screw loosening) occurred in 14/44 patients (29%) for whom the follow up was available on last follow up. Patients with traumatic fractures tended to have less complications (n = 2, 12.5%) than patients with osteoporotic (n = 6, 33%) or pathological (n = 2, 50%) fractures (p = 0.68).

Conclusions: In our series the SAIFAP technique appears to be an effective correction method for kyphosing fractures, including those of the thoracolumbar region. However, the initial satisfying correction might be lost in the long-term and complication rates were not negligible.

FM124*

Influence of the involved vertebral level and coronal segmental angulation on patient-rated outcome following microsurgical treatment of far lateral nerve root compression

Alina Jacob; Anne F. Mannion; Alexander Pieringer; Markus Loibl; François Porchet; Raluca Reitmeir; Frank Stefan Kleinstück; Tamas Fekete; Dezsö J. Jeszenszky; Daniel Haschtmann

Schulthess Clinic, Zurich, Switzerland

Introduction: Anatomically lumbar levels differ in pedicle size, area of the isthmus, dimensions of the facet joints and length of the nerve root channel. Accessibility of the L5/S1 segment may be impaired by the pelvis. Degenerative changes with asymmetric segment alteration in the coronal plane are frequently present. Aim of this study was to evaluate the influence of the level and coronal segmental angulation on patient-reported outcome following microsurgical treatment.

Methods: This was a single centre retrospective study of data collected prospectively between the years 2005 and 2020. The framework of the EUROSPINE Spine Tango Surgery Registry and local database was used. We included patients who had undergone lumbar, single level decompression surgery via FLA or midline approach for far lateral nerve root compression. A control group was formed by patients suffering from monoradicular symptoms. For radiographic evaluation the most recent conventional radiographs no longer than 2 years prior to surgery were used. Coronal segmental angulation (CSCA) was measured in degrees between the lower endplate of the superior vertebra and the upper endplate of the inferior vertebra. Positive values indicated a tilt towards the affected side. Primary outcome measure was the COMI score at 2-year follow-up.

Results: The final study group comprised 148 patients and control group 463 patients. There was no significant difference between the groups for gender, BMI, baseline COMI. Both main set and control group showed a significant reduction in COMI score from preoperative to 2-year follow-up ($p < 0.0001$). Outcome was better (COMI score 0.6 points lower) for patients treated at the higher lumbar levels than for those operated at L5/S1 ($p = 0.03$). In the final study group, there was a statistically significant correlation between the preoperative CSCA and change in COMI score from baseline to 2-year follow-up ($p < 0.001$). The association was retained in multiple regression analysis controlling for possible confounders. A one-degree increase in CSCA was associated with a 0.3-point higher (i.e., worse) COMI score at 2-year follow-up ($p = 0.008$).

Conclusion: Our results suggest microsurgical treatment of far lateral nerve root compression shows overall good patient-rated outcome with less improvement in patients treated at level L5/S1 or advanced coronal segmental angulation. These results are important in decision-making and management of patients' expectations.

FM125

Pain relief as the primary trigger for the restoration of global sagittal balance after single-level spinal fusion surgery

Ines Unterfrauner; Regula Schüpbach; Marie-Rosa Fasser; Jonas Widmer ; Mazda Farshad

Balgrist University Hospital, University of Zurich

Introduction: In spinal fusion surgery, maintenance or restoration of a balanced global sagittal alignment, represented statically through the sagittal vertebral axis (SVA) on full-body radiographs, is of major importance. The dynamic presentation of the global balance and posture during walking, however, remains underreported. Further, the opinion about the trigger for change of global sagittal balance after short-level spinal fusion varies. Hence, the aim of this study was to investigate the change of posture and of sagittal balance, and its causative factor, after single-level spinal fusion with data from pre- and postoperative full-body radiographs, kinematic analysis in motion lab and clinical outcome scores.

Methods: Fourteen adult patients (mean 58.8 years (SD 10); 50% females) undergoing first time single-level spinal fusion and 14 age- and gender-matched healthy controls without spinal pathologies were prospectively included. Before and six months after surgery, participants underwent application of a plug-in gait marker set following radiographic and dynamic analysis with full-body standing x-ray EOS respectively with VICON motion capture system in the motion lab to analyze global spinal balance with radiographic SVA respectively dynamic SVA during walking. Correlations were analyzed between pre- versus postoperative patient versus control group, including the influence of the postoperative change of patient reported outcome measures (PROMs: ODI, VAS, EQ-5D) and of local spinal alignment (fusion angle).

Results: Postoperative improvement of both radiographic SVA and dynamic SVA moderately correlated with relief of pain through VAS ($r = 0.57$, $p = 0.03$ respectively $r = 0.67$, $p = 0.01$) and dynamic SVA also with improvement of the ODI ($r = 0.48$, $p = 0.08$), especially in patients without spinal canal stenosis (VAS: $r = 0.85$, $p = 0.01$ respectively $r = 0.92$, $p < 0.01$; ODI: $r = 0.78$, $p = 0.02$ respectively $r = 0.59$, $p = 0.1$). Despite spinal fusion surgery resulted in improvement of global sagittal balance, it did not correlate with restoration of segmental lordosis (fusion angle).

Conclusions: Single-level spinal fusion results in restoration of segmental but also of global sagittal spinal balance through relief of pain and improvement of PROMs, especially in patients without spinal canal stenosis. Consequently, the SVA is considered a pain-related posture problem.

FM126

A Simple Preoperative Score Predicting Failure Following Decompression Surgery for Degenerative Lumbar Spinal Stenosis

Dimitriou Dimitris; Elin Winkler; Sabrina Weber; Samuel Haupt; Michael Betz; Mazda Farshad

Balgrist Hospital, University of Zurich, Department of Orthopaedics

Introduction: Proper patient selection is crucial for the outcome of surgically treated degenerative lumbar spinal stenosis (DLSS). Nevertheless, there is still not a clear consensus regarding the optimal treatment option for patients with DLSS. The purpose of this study was therefore to investigate the treatment failure rate following decompression surgery and to introduce a simple, preoperative score to aid surgical decision-making.

Methods: In this retrospective observational study, 445 patients who underwent a surgical decompression for DLSS, were analyzed. Treatment failure was defined as conversion to a fusion of a previously decompressed level. Several risk factors associated with worse outcomes and treatment failure such as age, body mass index, smoking status, previous surgery, low back pain (LBP), facet joint effusion, disc degeneration, fatty infiltration of the paraspinal muscles, the presence of degenerative spondylolisthesis and the facet angulation, were investigated.

Results: At a mean follow-up of 44 ± 31 months, 6.5% (29/445) of the patients underwent revision surgery with spinal fusion at an average of 3 ± 9 months following lumbar decompression due to low back or leg pain. The baseline LBP (≥ 7) (OR = 5.4, p <.001), the presence of facet joint effusion (>2mm) in MRI (OR = 4.2, p <.001), and disc degeneration (Pfirrmann >4) (OR = 3.2, p = .03) were associated with an increased risk for treatment failure following decompression for DLSS. The ROC curve analysis demonstrated that a score ≥ 6 points yielded a sensitivity of 90% and specificity of 64% for predicting a treatment failure following lumbar decompression for DLSS in the present cohort.

Conclusion: The newly introduced score can predict treatment failure and the need for revision surgery for DLSS patients undergoing lumbar decompression. The baseline low back pain, the presence of facet joint effusion in MRI, and disc degeneration were associated with an increased risk for treatment failure following decompression for degenerative lumbar spinal stenosis. Patients with scores >6 have a high chance of requiring a fusion following decompression surgery (OR = 15.5; 95% Confidence interval = 4.6 to 52.2, p <.001).

FM127

3D printed fracture reduction guides planned and printed at the point of care show high accuracy – A cadaveric feasibility study

Sophie C. Eberlein; Silvan Hess; Frank Michael Klenke; Andreas Hecker

Universitätsspital Bern, Inselspital

Introduction: After surgical treatment of comminuted diaphyseal femoral and tibial fractures, relevant malalignment, especially rotational errors occur in up to 40-50%. This either results in a poor clinical outcome or requires revision surgery. This study aims to evaluate the accuracy of reduction in a human cadaver setting, if 3D guides planned and printed at the point of care support the surgery.

Methods: Ten human cadaveric legs underwent computed tomography (CT) and 3D models of femur and tibia were built. Reduction guides were virtually constructed and fitted to the proximal and distal metaphysis. The guides were 3D printed using medically approved resin. Femoral and tibial comminuted diaphyseal fractures were simulated and subsequently reduced using the 3D guides. Postoperative 3D bone models were reconstructed to assess the accuracy by comparison to the preoperative planning.

Results: Femoral reduction showed a mean deviation ± SD from the plan of 1.5mm ± 1.1mm for length, 0.9° ± 0.4° for varus/valgus, 1.3° ± 1.3° for procurvatum/recurvatum and 4.3° ± 1.9° for rotation. Analysis of the tibial reduction revealed a mean deviation ± SD of 3.2mm ± 2.0mm for length, 1.2° ± 0.9° for varus/valgus, 1.4° ± 1.8° for procurvatum/recurvatum and 2.0° ± 1.2° for rotation.

Conclusion: This study shows high accuracy of reduction of comminuted diaphyseal fractures with 3D guides planned and printed at the point of care. Applied to a clinical setting, this technique has the potential to avoid malreduction and consecutive revision surgery.

FM128*

Open reduction and internal fixation (ORIF) versus stem revision (SR) in Vancouver B2 periprosthetic hip fractures: a monocentric, 10-year retrospective study

Adrian Dascal[1]; Sylvain Steinmetz[2]; Kevin Moerenhout[2]; Stéphane Cherix[2]

[1] Lausanne University Hospital and University of Lausanne (CHUV-UNIL); [2] CHUV - Centre hospitalier universitaire vaudois

Introduction: Periprosthetic hip fractures are radiologically categorized using the Vancouver classification. Vancouver B periprosthetic fractures are situated around the prosthesis stem, and further subclassified depending on the stability of the prosthetic stem, and the quality of the bone stock. Type B2 fractures involve an unstable prosthesis stem surrounded by sufficient bone stock. While SR is usually performed, recent studies have suggested that ORIF may be a less invasive and equally effective alternative. These observations led us to compare the outcomes of ORIF and SR in the treatment of Vancouver B2 periprosthetic hip fractures.

Method: This retrospective, monocentric study analyzed patients treated with ORIF or SR for Vancouver B2 periprosthetic hip fractures between 2009 and 2020. The study recorded surgeon experience, operation duration, intraoperative blood loss, patient-related complications, prosthesis longevity and complication rate as well as mortality. Functional outcome was determined using the Parker Mobility Score (PMS).

Results: The study included 94 patients treated with ORIF and 82 patients treated with SR. Mean follow-up was 3.91 years for ORIF and 4.14 years for the SR group. Patients treated with ORIF were significantly older (83.4 years) on average than those treated with SR (75.6 years). One-year survival was significantly lower in the ORIF group (79.8%) than in the SR group (92.7%). ORIF was performed by less experienced surgeons and led to a reduced blood loss (ORIF: 538ml vs SR: 839ml), but similar operation duration (147min vs 160min). Patient-related complications were non-significantly increased in the ORIF group (45% vs 33%). There was no significant difference in prosthesis-related complications (22.3% vs 24.4%) and 5-year prosthesis survival (76.6% vs 75.7%) between ORIF and SR respectively. Return to preoperative PMS was non-significantly lower in the ORIF group compared to SR (60% vs 73.4%).

Conclusion: ORIF could be successfully used as a less invasive alternative to SR for Vancouver B2 periprosthetic hip fractures, especially in an older and frailer population. Indeed, ORIF showed similar postoperative complication rates and sufficient prosthesis survival in the context of the patients' life expectancy.

ORALS: A10 TRAUMA

FM129*

Intraoperative 3D-fluoroscopy increases accuracy of syndesmotic reduction in ankle fractures with syndesmotic instability

Silvia Duschek; Anna-Kathrin Leucht; Fintan Aregger; Christoph Meier

Kantonsspital Winterthur

Introduction: Direct visual control and 2D-fluoroscopy is widely used to achieve an anatomic syndesmotic reduction in ankle fractures with syndesmotic instability. However, significant malreduction rates are reported. It was the aim of this study to evaluate the accuracy of conventional syndesmotic reduction and to assess the impact of intraoperative 3D-imaging to improve the quality of syndesmotic reduction.

Methods: Single institution consecutive case series (02/2021 – 12/2022) including all patients undergoing operative treatment for ankle fractures with syndesmotic instability. Syndesmotic reduction was performed following open reduction and internal fixation of the malleolar fractures. Provisional tibiofibular alignment was obtained under visual control and 2D-fluoroscopy. With the ankle held in a neutral position, temporary fibulotibial transfixation was performed with 2 K-wires. 3D-imaging was obtained (Cios Spin, Siemens Healthineers, Forchheim-Germany). Non-anatomical positions of the fibula were devided into anterior, posterior, or rotational malreductions. If reduction was not satisfactory, the reduction was improved and 3D-imaging repeated. Once adequate reduction was obtained, definitive syndesmotic fixation was performed and the K-wires were removed.

Results: A total of 50 patients (mean age 44±16 years, m/f 27/23) were operated for ankle fractures with syndesmotic instability. Intraoperative 3D-imaging confirmed anatomic syndesmotic reduction in 31 patients (62%). In 15 patients (30%) reduction was repeated once, in 4 patients (8%) two additional reduction manoeuvers were necessary to obtain an anatomic result. Thus, a total of 23 malreductions were recorded in a total of 73 reduction manoeuvers (32%). Of these, we observed 16 anterior (70%), 2 posterior (9%) and 5 rotational malreductions (22%).

Conclusions: Syndesmotic reduction under visual control and 2D-fluoroscopy proved to be unreliable with a syndesmotic malreduction in almost one-third of all reduction manoeuvers. With the help of intraoperative 3D-imaging incorrect tibiofibular alignment before definite fixation was identified, reduction corrected and thereby the rate of malreductions reduced.

FM130

118 periprosthetic Vancouver B2 fractures operated with either open reduction and internal fixation or revision arthroplasty. An analysis of complications

David Windischbauer; Henrik Eckardt; Mario Morgenstern; Karl Stoffel; Martin Clauss

Unispital Basel

Treatment of Vancouver B2 fractures is still matter of debate as they, can be treated with ORIF or revision arthroplasty (RA). Complication rates between 14% and 26% after operation for B2 fractures were reported with no difference between ORIF and RA. At our institution frail patients with a periprosthetic fracture (PPFx) that was not multi-fragmentary and could be anatomically reduced were operated with ORIF and retaining the loose stem. Multi-fragmentary fractures, fractures with broken cement-mantle and fractures with severe calcar involvement were operated with RA, usually a non-cemented revision stem with cerclage augmentation. The aim of our study was to compare the complications between ORIF and RA.

From the hospital electronic patient system all surgeries for periprosthetic fracture between 2007 and 2020 was retrieved. Pre-fracture mobilisation, use of walking aids, living situation and cognitive impairment with a diagnosis of dementia and ASA-score were recorded.

Preop radiographs were analysed for prosthesis anchoring, from the intraoperative documentation, the duration of the operation and number of blood transfusions were recorded. PPFx that were not multi-fragmentary and could be anatomically reduced were operated with ORIF and retaining the loose stem. Multi-fragmentary fractures, fractures with broken cement-mantle and fractures with severe calcar involvement were operated with RA.

We reviewed 252 patients with a PPFx after THA operated between 2007 and 2020 119 were classified as B2 fractures (ORIF (n = 62), RA (n = 57)). The mean duration of surgery was 144 min (ORIF) and 151 min (RA, p = 0.2). Transfusion rate was mean 1.2 packed blood cells (ORIF) and 1.7 (RA, p = 0.03). There was no difference between the groups regarding pre-injury mobility, age, ASA-score, living situation or cognitive impairment.

25 PPFx (21%) had to be revised (ORIF 16% vs RA 24%, p = 0.2). Reasons for failure (ORIF vs RA) were infection (n = 6 vs n = 3), symptomatic stem loosening (n = 2 vs n = 2) and refracture (n = 2 vs n = 5) after a new fall and hip dislocation (n = 0 vs n = 4).

This is one of the biggest cohorts of Vancouver B2 fractures presented in the literature. Our results highlight that one in five patients that is operated on for a Vancouver B2 PPFx will undergo revision surgery regardless how the PPFX is stabilised. The most frequent complication was infection followed by refracture after a new fall, dislocation of the hip joint in revision arthroplasty patients and loosening

FM131

Biomechanical evaluation of acetabular stability regarding column fixation in the combined hip procedure with Burch-Schneider cage for a typical geriatric acetabular fracture

Xavier Lannes[1]; Sylvain Steinmetz[1]; Kevin Moerenhout[1]; Cameron Smith[2]; Fabio Becce[1]; Olivier Borens[3]; Alexandre Terrier [2]

[1] CHUV & Université de Lausanne; [2] EPFL - Ecole Polytechnique fédérale de Lausanne; [3] Hirslanden Lausanne, clinique Bois-Cerf

Introduction: The management of acetabular fractures in the elderly remains challenging and total hip arthroplasty (THA) plays an increasingly important role in the acute treatment. There is no consensus regarding column fixation during primary THA for acetabular fractures, especially for the anterior column, which is frequently affected in the elderly. The aim of this study was to evaluate the biomechanical effect of column stabilization during THA with a Burch-Schneider cage (BSC) for a typical geriatric acetabular fracture.

Methods: A finite element model of a hemipelvis was developed from the CT scan of a 78-year-old female. The model accounted for the inhomogeneous bone mechanical properties derived from the CT. We replicated an anterior column-posterior hemitransverse fracture, assuming a planar surface cut with an initial gap of 0.5 mm. Four clinical scenarios were evaluated: BSC with anterior suprapectineal and posterior plates, BSC and

posterior plate, BSC and anterior suprapectineal plate, and BSC alone. A load corresponding to the maximum gait cycle was applied, including body weight and muscle forces. We evaluated the median and interquartile range of the perpendicular, tangential, and full relative displacement (mm) at the (vertical) fracture interface, the volume (cmm) of bone (maximum principal) strain around the screws that exceeded 1%, and the volume of (von Mises) stress of the metal implants exceeding 200 MPa.

Results: The four clinical scenarios are presented in the same order as above. The perpendicular displacement was 0.7 (0.8), 0.8 (1.0), 0.8 (1.1), and 1.9 (3.5) mm, respectively; the tangential displacement was 0.1 (0.5), 0.1 (0.6), 0.1 (0.6), and 0.3 (0.5) mm, respectively; the full displacement was 0.3 (0.8), 0.5 (1.7), 0.5 (1.3), and 1.5 (4.6) mm, respectively. The volume of critical bone was 21, 22, 35, and 127 cmm, respectively; the volume of metal stress was 581, 819, 1147, and 151 cmm, respectively.

Conclusion: Among the four investigated scenarios, three provided comparable results while BSC without column fixation yielded lower results. Posterior column stabilization alone leads to similar results than two-column fixation, and lower volume of critical bone and metal stress than anterior column stabilization alone. Our results suggest that a combined hip procedure through a single posterior approach can achieve good stability, even in the case of anterior column fracture, without anterior column stabilization.

FM132

The role of lactate for sepsis in polytrauma patients, a time related analysis using the IBM Watson Trauma Pathway Explorer®

Philipp Vetter; Cedric Niggli; Jan Hambrecht; Philipp Niggli; Jindrich Vomela; Richard Chaloupka; Hans-Christoph Pape; Ladislav Mica

UniSpital Zürich

Purpose: The Watson Trauma Pathway Explorer® is an outcome prediction tool invented by the University Hospital of Zurich in collaboration with IBM®, representing an artificial intelligence application to predict the most adverse outcome scenarios in polytrauma patients: Systemic Inflammatory Respiratory Syndrome (SIRS), sepsis within 21 days and death within 72 h. The question was how time related lactate values woud be associated with the incidence of sepsis.

Methods: Data from 3653 patients in an internal database, with ongoing implementation, served for analysis. Patients were split in two groups according to sepsis presence, and lactate values were measured at formerly defined time points from admission until 21 days after admission for both groups. Differences between groups were analyzed; time points with lactate as independent predictor for sepsis were identified. The predictive quality of lactate at 2 and 12 h after admission was evaluated. Threshold values between groups at all timepoints were calculated.

Results: Lactate levels differed from less than 2 h after admission until the end of the observation period (21 d). Lactate represented an independent predictor for sepsis from 12 to 48 h and 14 d to 21 d after admission relative to ISS levels. AUROC was poor at 2 and 12 h after admission with a slight improvement at the 12 h mark. Lactate levels decreased over time at a range of 2 [mmol/L] for 6-8 h after admission.

Conclusion: These insights may allow for time-dependent referencing of lactate levels and anticipation of subsequent sepsis, although further parameters must be considered for a higher predictability.

FM133*

The intraoperative dorsal tangential view and the radial groove view of the distal radius to detect dorsal screw protrusion in volar plating: teaching effect and value in clinical practise

David Fässler; Lara Pozzi; Aleksis Doert; Michel Schläppi; Christoph Meier

Kantonsspital Winterthur

Introduction: Dorsal screw tip protrusion (DSTP) with extensor tendon injury is a well-known complication of volar plating for fractures of the distal radius. Different fluoroscopic views such as the dorsal tangential view (DTV) and the radial groove view (RGV) have been recommended to detect penetration of the dorsal cortex. The value of these views depends on their quality and reproducibility. It was the aim of this study to investigate the quality of these views before and after standardized teaching of the involved surgeons.

Methods: All adult patients treated with volar plating for distal fractures of the radius between 10/2019 and 09/2020 were included. Prior to their first case in the study period, all involved surgeons were instructed in a standardized manner how to perform technically correct DTV and RGV. Patients from an earlier period before teaching served as controls. Image quality was rated independently by two investigators regarding the correctness of the views. Intraoperative detection of DSTP based on fluoroscopy was documented and protruding screws were exchanged. The impact of teaching was assessed. Furthermore, the reliability of DTV and RGV to detect DSTP was compared to postoperative ultrasound.

Results: A total of 124 patients were included in the study group, prospectively analyzed and compared to the control group (n = 125). Interobserver agreement for the image quality was 97% for DTV and 98% for RGV, respectively. Image quality significantly improved with teaching ($p < 0.001$). Correct images were observed in 81% vs. 58% for DTV and 81% vs. 53% for RGV, respectively. Intraoperative fluoroscopy detected 24 DSTP in 571 evaluated screws (4.2%). Twenty-three patients (18.5%) with DSTP were identified. Postoperative ultrasound revealed 4 DSTP (0.8-1.2mm; 0.7%) in 4 patients (3.2%) which were intraoperatively missed by DTV and RGV despite adequate image quality.

Conclusion: Teaching surgeons how to perform technically good DTV and RGV leads to a significant improvement of image quality. DTV and RGV are reliable tools to detect DSTP. However, despite correct views, some minor dorsal cortex penetrations may be missed. Thus, early further investigations are recommended in patients with postoperative extensor tendon irritation to prevent later tendon rupture.

FM134

Comparison of Inter- and Intraobserver Reliability of Radiological Assessments for Isolated Fracture of the Greater Tuberosity

Sebastian Wangler; Raphael Kohlprath; Stephanie Erdbrink; Kuenzler Michael; Helen Moser; Michael Schär

Department of Orthopaedic Surgery and Traumatology, Inselspital, Bern University Hospital, University of Bern

Background: Isolated fractures of the greater tuberosity affect young and aging populations and account for up to 20% of all proximal humeral fractures. Current treatment strategies involve conservative or surgical treatments. The amount of fracture displacement represents the crucial factor in decision-making. The present study aimed to compare the inter- and intraobserver reliability of different described radiological measurements for fracture displacement.

Materials and methods: Fifty-one cases of isolated fracture of the greater tuberosity with a complete set of plain radiographs and a CT scan were identified at a tertiary referral center between October 2012 and 2021. Superior and lateral fracture-dislocation was measured in millimeters following the concept described by Neer. Mutch's superior ratio (sGT) and anterior/posterior ratio (apGT), as well as Nyffeler's impingement index (I-Ind), were formed. Fracture morphology was evaluated according to the morphological Mutch classification, and subgroups were identified. Intraclass correlation coefficients and assessment of fracture morphology by three blinded observers were recorded. Lateral and superior fracture dislocation measured in millimeters was correlated to the ratios and impingement index using a multiple linear regression model.

Results: Inter- and intraobserver reliability was excellent for the I-Ind (mean ICC 0.99 and 0.96 respectively), good-excellent for measurement of lateral displacement in millimeters (0.88 and 0.86), moderate-excellent for sGT (0.84 and 0.96), moderate-good for measurement of superior displacement in millimeters (0.75 and 0.78), and poor-good for apGT (0.81 and 0.67). A significant correlation was observed between the measurement of lateral displacement in millimeters and apGT ($p = 0.003$).

Conclusion: Of all analyzed measurement methods for isolated fractures of the greater tuberosity, the impingement index showed the best inter- and intraobserver reliability in our cohort. This finding was also consistent in the analyzed subgroups. Measurement of lateral displacement in millimeters is reliable for minor (<5mm) displaced split fractures (Mutch Type 2) and can significantly predict the amount of posterior fragment dislocation.

FM135*

IBM WATSON Trauma Pathway Explorer© as a Predictor for Sepsis after Polytrauma – Is Procalcitonin Useful for Identifying Septic Polytrauma Patients?

Cédric Niggli

UniversitätsSpital Zürich

IBM and the University Hospital Zurich have developed an online tool for predicting outcomes of a patient with polytrauma, the IBM WATSON Trauma Pathway Explorer®. The three predicted outcomes are Systemic Inflammatory Response Syndrome (SIRS) and sepsis within 21 days as well as early death within 72 hours since the admission of the patient. The validated Trauma Pathway Explorer® offers insights into the most common laboratory parameters, such as procalcitonin (PCT). Sepsis is one of the most important complications after polytrauma, which is why it is crucial to detect it early. This study aimed to examine the time-dependent relationship between PCT values and sepsis, based on the WATSON technology. A total of 3653 patients were included, and ongoing admissions are incorporated continuously. Patients were split into two groups (sepsis and non-sepsis), and the PCT value was assessed for 21 days (1, 2, 3, 4, 6, 8, 12, 24, 48 hours, and 3, 4, 5, 7, 10, 14 and 21 days). The Mann-Whitney U-Test was used to evaluate the difference between the two groups. Binary logistic regression was utilized to examine the dependency of prediction. The Closest Top-left Threshold Method provided time-specific thresholds at which the PCT level is predictive for sepsis. At $p < 0.05$, the data were declared significant. R was used to conduct all statistical analyses. The Mann-Whitney U-test showed a significant difference in PCT values in sepsis and non-sepsis patients between 12 and 24 hours, including post-hoc analysis ($p < 0.05$). Likewise, the p-value started to be significant between 12 and 24 hours in the binary logistic regression ($p < 0.05$). The threshold value of PCT to predict sepsis at 24 hours is 0.7µg/l, and at 48 hours 0.5µg/l. The presented time course of PCT levels in polytrauma patients shows the PCT as a separate predictor for sepsis relatively early. Even later, during the 21-day observation period, time-dependent PCT values may be utilized as a benchmark for the early and preemptive detection of sepsis, which may reduce death from septic shock and other deadly infectious episodes.

ORALS: A71 PAEDIATRIC ORTHOPAEDICS

FM136*

Effect of femoral derotational osteotomy in patients with idiopathic increased femoral anteversion on joint and muscle forces

Nathalie Alexander[1]; Johannes Cip[1]; Reinald Brunner[2]; Enrico De Pieri[2]

[1] Ostschweizer Kinderspital; [2] Universitäts-Kinderspital beider Basel (UKBB)

Increased femoral anteversion is associated with altered lower-limb kinematics and impaired muscle functionality during gait [1,2], while it does not lead to increased joint loading in patients with an in-toeing gait pattern [3]. However, walking straight would require higher muscle forces and would lead to larger co-contractions in the transversal plane [2]. Increased femoral anteversion can be surgically addressed through femoral derotational osteotomy, which was shown to normalize most gait kinematics and kinetics post-operatively [4]. Nevertheless, no information is available on how this surgery affects joint and muscle forces. Therefore, the aim of this study was to analyze the effect of femoral derotational osteotomy on joint and muscle forces in patients with idiopathic increased femoral anteversion compared to controls.

Seventeen pediatric patients with isolated, CT-confirmed increased femoral anteversion (limbs = 25, pre-op age: 13.2±2.2 years, pre-op anteversion: 49.0±7.1°) underwent 3D gait analysis pre and post-surgery. Knee (KCF) and hip (HCF) contact forces as well as hip joint spanning muscle forces were evaluated with inverse dynamics (AnyBody Technology, Denmark). Statistical parametric mapping paired t-tests were used to evaluate pre and post-op differences and two sample t-test to compare post-op results to controls.

Significant improvements in kinematics (hip rotation, foot progression, knee and hip flexion) could be observed pre to post. Absolute KCF and HCF remained unaltered after surgery and did not differ from controls. In terms of muscle functionality, gluteus minimus and deep external rotators muscle forces decreased in mid stance, while adductor muscle forces increased during stance post-op compared to pre-op. Due to an improved knee extension post-op, the rectus femoris muscle force decreased to normal values during mid and terminal stance. Post-op, only deep external rotators muscle forces differed from controls.

This study could show that the femoral derotational osteotomy can restore muscle functionality in addition to normal gait kinematics, while joint loading remains within normative ranges. This knowledge might also be more translated to other conditions where pathologic femoral anteversion is present.

[1] Alexander, et al, 2019, J Biomech,86,167-74.

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FM137

Pemberton-like distal tibial osteotomy for ankle stabilization in fibular hemimelia. Follow-up into skeletal maturity

G. Ulrich Exner[1]; Gerardo J Maquieira[2]; Leonhard E. Ramseier[3]

[1] Orthopädie Zentrum Zürich; [2] FussZentrum Zürich ; [3] Ortho Clinic Zürich

Introduction: Fibular hemimelia is a complex longitudinal malformation of the lower leg with partial or complete deficiency of the fibula resulting into dorso-fibular dislocation of the hindfoot. Typically associated are talo-calcaneal coalition, lacking rays of the foot, tibia procurvata, and longitudinal growth deficiency. It can be associated with proximal femoral deficiency typically combined with congenital deficiency of the anterior cruciate ligament. Many different techniques have been described for stabilization of the foot besides the option of amputation.

We have addressed correction of the deformity of the distal tibial epiphysis by a metaphyseal osteotomy to bend through the physis similarly to the Pemberton acetabular osteotomy. The technique was published with short term results of a maximum of 42 months follow-up (1). Meanwhile the first 4 patient treated have reached skeletal maturity and the long-term results shall be presented herein

Patient and Methods: Three patients with unilateral and one patient with bilateral fibular hemimelia were operated as described (1) at ages 7, 9, 15, and 18 months. Subsequently several other procedures have been performed on all patients mainly consisting in lengthening of the tibia combined with axial and foot alignment corrections.

Results: The Pemberton-like osteotomy lead to stable axial retainment of the hindfoot in all patients without premature closure of the physes. None of the patients would favor to have been treated by amputation inspite of the fact that most of them need adaptations of footwear.

Drawback of the study is lack of comparison with other techniques, rarity and the large spectrum of this malformation complex.

Conclusion: The technique has shown good results with continuing growth of the physis and axial weight bearing maintained at long-term. As the patients are satisfied with the results this method should be considered as an option in the management of fibular hemimelia.

1. Bending osteotomy through the distial tibial physis in fibular hemimelia for stable reduction of the hindfoot. J Pediatr Orthop B 2003; 12:27-32

POSTERS: A01 SHOULDER/ELBOW

P001

Greater Tuberosity Fractures after RTSA: A Matched Group Analysis

Farah Selman[1]; Philipp Kriechling[1]; Lukas Ernstbrunner[2]; Karl Wieser[1]; Paul Borbas[1]

[1] Balgrist Hospital, University of Zurich, Department of Orthopaedics; [2] Royal Melbourne Hospital, Parkville, Australia

Background: Periprosthetic fractures, such as acromial and scapular spine fractures are known complications following implantation of reverse shoulder arthroplasty (RTSA). The entity of greater tuberosity fractures (GTF) has rarely been studied in the literature. The purpose of this study was to analyze the outcome of postoperative greater tuberosity fractures after RTSA compared to a matched control group.

Methods: A total of 1360 RTSAs were implanted between September 2005 and December 2019 in a single shoulder unit of a university hospital and retrospectively reviewed for the incidence of GTF. GTF was diagnosed on X-ray in 3 planes. The GTF group was matched to a control group in a 2:1 manner, according to age, sex, indication, body mass index, and follow-up. Clinical outcome (Constant-Murley score (CS), Subjective Shoulder Value (SSV), and range of motion) with a minimum follow-up period of 2 years were analyzed.

Results: A total of 17 postoperative GTFs were detected and matched with 34 patients with RTSA and no GTF. Patients with GTFs demonstrated inferior clinical and functional outcomes (mean absolute CS 50 ± 19 (p = 0.032); SSV 63% ± 26 (p = 0.022); mean force 1kg ± 2kg (p = 0.044)) compared with the control group (mean absolute CS 62 ± 21; SSV 77% ± 29; mean force 2kg ± 2kg). In terms of postoperative range of motion, the fracture group was significantly worse in external rotation

(17° ± 19° vs. 30° ± 19° (p = 0.029)). Mean flexion, abduction and internal rotation were comparable in both groups (flexion GTF 102° ± 28°, control group 114° ± 27° (p = 0.160); abduction GTF 109° ± 42°, control group 120° ± 39° (p = 0.317); internal rotation GTF 4 ± 2, control group 5 ± 3 (p = 0.138)). The GTFs occurred on the first day up to 9 years postoperatively (mean 24 ± 38 months) and were mostly treated conservatively (12/17, 70%). Five patients were treated surgically with a suture cerclage.

Conclusion: GTF after RTSA is associated with worse clinical outcome scores, lower degrees of external rotation and less abduction strength. Functional range of motion in internal rotation, flexion as well as abduction of the shoulder appears to be unaffected.

P002

Influence of smoking on the healing of conservatively treated displaced midshaft clavicle fractures – a systematic review and meta-analysis

Gilles Dietrich[1]; Alexandre Terrier[2]; Melissa Favre[1]; Jolanda Elmers[1]; Laurie Stockton[1]; Dino Soppelsa[1]; Stéphane Cherix[1]; Frédéric Vauclair[1]

[1] CHUV - Lausanne; [2] EPFL / CHUV

Aims: Tobacco, in addition to being one of the greatest public health threats facing our world, is believed to have deleterious effects on bone metabolism and especially on bone healing. It has been described in the literature that patients who smoke are approximately twice as likely to develop a nonunion following a non-specific bone fracture. For clavicle fractures, this risk is unclear, as is the impact that such a complication might have on the initial management of these fractures.

Methods: A systematic review and meta-analysis were performed for conservatively treated displaced midshaft clavicle fractures. Embase.com, PubMed, and Cochrane Central Register of Controlled Trials (via Cochrane Library) were searched from inception to May 12, 2022, with supplementary searches in Open Grey, ClinicalTrials.gov, ProQuest Dissertations & Theses and Google Scholar. The searches were performed without limits for publication date or languages.

Results: The meta-analysis included 8 studies, 2285 observations, and 304 events (nonunion). The random effects model predicted a pooled risk ratio of 3.68 (95%CI: 1.87 - 7.23), which can be considered significant (p-value = 0.0026). It indicates that smoking more than triples the risk of nonunion when a fracture is treated conservatively.

Conclusion: Smoking more than triples the risk of developing a nonunion in patients with a displaced middle third clavicle fracture treated conservatively. Until now, we have tended not to offer surgical management for patients who smoke with a minimally displaced middle third clavicle fracture, in part because of a higher risk of postoperative complications in these patients, such as infection or wound dehiscence. These are associated with revision surgeries leading to poorer functional outcomes and higher management costs. Since the rate of consolidation after surgery in smokers and non-smokers is almost identical and the risk of post-operative infection is very low, including in smokers, the current issue is to reconsider this management and thus privilege surgery for displaced middle third clavicle fractures in smokers in order to decrease the risk of pseudoarthrosis and subsequent poor functional results.

P003

Suture-bridge vs. Independent Double-row Techniques in Rotator Cuff Tears

Alexandre Lädermann; Joe Chiu

Hôptital de la Tour

Purpose: To compare the surgical time and cost between transosseous-equivalent suture-bridge (TOE-SB) and independent double-row (IDR) repair for medium to massive posterosuperior rotator cuff tears.

Methods: Seventy patients with medium to massive posterosuperior rotator cuff tears receiving arthroscopic repair between December 2016 to December 2020 were prospectively enrolled. Thirty-five of them received TOE-SB and the other thirty-five received IDR repair by a single surgeon. All patients were confirmed to have grade ≤ 2 fatty degeneration in the muscles of the torn tendons. Revision, concomitant subscapularis tear, glenohumeral osteoarthritis, acromiohumeral distance <7 mm, partial repair, partial thickness, or irreparable posterosuperior cuff tear were excluded. Surgical time, hospital stays, number of suture anchor used for the surgery between groups were compared. All repairs were completely defined as repair up to the lateral end of the greater tuberosity footprint.

Results: The IDR technique required much fewer anchors than TOE-SB did to complete the cuff repair. The mean operation time of IDR group was 85.49 ± 18.23 (min), which was shorter than that of the TOE-SB group: 113.9 ± 18.7 (min). No significant difference was found between groups regarding hospital stays.

Conclusions: Both TOE-SB and IDR techniques provided good footprint coverage for moderate to massive posterosuperior rotator cuff tears. The surgical time and number of anchors used were less in the IDR group than in the TOE-SB group.

P004

1 year results after glenohumeral cartilage repair using a bio-absorbable material

Jana Sabrina Jensen[1]; Patrick Vavken[2]

[1] ADUS Klinik; [2] alphaclinic Zürich

Cartilage defects in the shoulder are infrequently seen, but frequently dismissed as clinically not important. However, even focal defects incur an increased risk for further arthritic degeneration and efforts are being made to find solutions This study is a follow-up of 12 patients at one year after arthroscopic glenohumeral cartilage repair using a bio-absorbable material.

1 year results after arthroscopic glenohumeral cartilage repair in patients with clinically symptomatic, MRI confirmed full-thickness cartilage defects of the shoulder. Endpoints were VAS pain (0-10), apprehension, subjective shoulder value (SSV), Rowe Score and quickDash as well as patient satisfaction and defect fill on MRI.

The mean age was 41 years (95%CI 33-48), 58% male. The average Tegner activity was 5 (95%CI 4-6). Mean defect size was 80 mm2 (95%CI 60-99). Mean preop VAS was 4 (95%CI 3-6), mean preop SSV 42% (95%CI 32-52). 42% had no shoulder instability.

There were statistically significant and clinically relevant improvements in all endpoints with VAS by 3 pts (95%CI 2.5-3.5), Rowe 40 pts (95%CI 49-31), quickDASH 25 pts (95%CI 18-32), and SSV by 53% (95%CI 61-45).

Cartilage repair in the glenohumeral joint can be successfully performed in patients with clinically symptomatic cartilage defects. Somewhat different to our expectation, the typical scenario was not a young patient with a traumatic cartilage injury from a shoulder dislocation, but the mid-ager with a broader spectrum of diagnoses.

P006

DEVELOPMENT AND VALIDATION OF A MODEL PREDICTING PATIENT-REPORTED SHOULDER FUNCTION AFTER ARTHROSCOPIC ROTATOR CUFF REPAIR IN A SWISS SETTING

Thomas Stojanov[1]; Soheila Aghlmandi[1]; Andreas Marc Müller[1]; Markus Scheibel[2]; Matthias Flury[3]; Laurent Audigé[2]

[1] Universitätsspital Basel (USB); [2] Schulthess Klinik; [3] Zentrum für Orthopädie & Neurochirurgie, In-Motion

Introduction: Prediction models for outcomes after orthopedic surgery provide patients with evidence-based post-operative outcome expectations. Our objectives were (1) to identify prognostic factors associated with a post-operative shoulder function outcome: the Oxford Shoulder Score (OSS) and (2) to develop and validate a prediction model for 6-month OSS.

Methods: Patients undergoing arthroscopic rotator cuff repair (ARCR) were prospectively documented at a Swiss orthopedic tertiary care center. The first primary ARCR in adult patients with a partial or complete rotator cuff tear were implemented between October 2013 and June 2021 and followed-up 6 months after surgery. Twenty-two potential socio-demographic, health-related and surgical prognostic factors were used for prediction model development. Various linear regression and Tobit models based on three sets of factors were compared in terms of overall performance before and after a bootstrap validation.

Results: A complete-case analysis of 1,310 patients was performed. The mean baseline OSS for the whole population was 29 points (SD: 8.5) and increased to 40 points (SD: 8.1) six months after the surgery. Overall, 159 patients achieved the maximum OSS value at 6 months (12.1%). Based on R squared values after bootstrap validation, the Tobit regression models showed better model performance (R-squared = 0.188) than the classic linear modeling approaches (R-squared = 0.161. After adjustment, there were five factors significantly associated with a poorer 6-month OSS: one (regression coefficient (beta) = -2.5 [-4.3; -0.77]) and two or more pre-operative steroid infiltrations (beta = -1.78 [-3.55; 0.00]), being at least moderately anxious or depressed (beta = -5.4 [-7.16; -3.64]), tendon delamination (beta = -1.19 [-2.34; -0.05]) and the performance of an acromioclavicular joint resection (beta = -2.27 [-3.59; -0.95]). Conversely, increasing age (beta = 0.10 [0.04;0.16]) and a higher baseline OSS (beta = 0.29 [0.23; 0.36]) were significantly associated with a better OSS at 6months post-surgery.

Conclusion: A prediction model for patients undergoing ARCR was developed to provide patients and surgeons with individualized expectations for post-operative shoulder function outcomes. The occurrence of specific adverse events such as repair failure or shoulder stiffness might affect the quality of our predictions.

P007

Rotational axis determination of the ulno-humeral joint: reproducibility and accuracy of an automated algorithm for preoperative 3D-planing

Sylvano Mania; Farah Selman; Franziska Altorfer; Stijn De Joode; Florian Grubhofer; Karl Wieser

Universitätsklinik Balgrist

Background: Preoperative kinematic simulation of the elbow joint has been proposed for prosthesis alignment, ligament reconstruction or resection of impingement-inducing osteophytes. However, its generalization in daily practice remains seldom. The purpose of this study is to propose an easily implementable algorithm to simulate the range of motion of the ulno-humeral joint and to assess its reproducibility and accuracy.

Method: 4 observers placed 20 articular reference points on 3D surface models of 28 elbows. The cartesian coordinates of these points allowed to generate automatically 5 spheres fitting to specific articular surfaces: medial and lateral trochlea humeri (MT and LT), capitellum (CAP), medial and lateral trochlear notch (MED- and LAT NOTCH). 3 rotational axes were defined by joining their centres with a line: MT-LT, CAP-MT and MED-LAT NOTCH axis. A fourth rotational axis, COMB axis, was computed with the mean distance between MT-MED NOTCH and LT-LAT NOTCH. Interobserver average distance between the reference points and the computed sphere as well as the average interobserver 3D angle between the simulated axis were analysed. The dynamic articular congruence of the MT-LT, CAP-MT, COMB axes in relation to the MED-LAT NOTCH axis was assessed by calculating their respective 3D angle variation from 0° to 150° flexion. The number of patients needed to reach stable dynamic articular congruence was assessed.

Results: The computed articular spheres present lower interobserver distances (1.6 - 2.7 mm) in comparison to the reference points (2.4 - 5.3 mm). For MT, CAP, MED NOTCH and LAT NOTCH, these reference points have statistically lower interobserver distances ($p < 0.05$) in comparison to their corre-

sponding spheres. The MT-LT axis has the highest interobserver 3D angle (7.6°) in comparison to CAP-MT (4.8° p <0.01), MED-LAT NOTCH (5.1° p = 0.6) and COMB (5° p = 0.16). The COMB axis has the lowest dynamic articular incongruency (3D angle variation of 7.4°), in comparison to the MT-LT axis (9.6° p <0.01) and CAP-MT (10.6° p <0.01). A stabilisation of the 3D angle variation is seen after 6 patients with the COMB axis, with an average of 4.8°, while the MT-LT and CAP-MT present both a stabilisation after 16 patients with variations of 6.1 and 6.6° respectively.

Conclusion: We provide an algorithm for kinematic simulations of the ulno-humeral joint based on multiple articular references which can thus buffer the observer-induced inaccuracies.

P008

Profiles of the postoperative management of arthroscopic rotator cuff repairs – Analysis as part of a multicentric cohort study

Jan Schätz[1]; Marije de Jong[1]; Thomas Stojanov[2]; Martina Wehrli[1]; Andreas Mueller[2]; Emanuel Benninger[3]; Bernhard Jost[4]; Laurent Audigé[1]

[1] Schulthess Clinic Zuerich; [2] University Hospital of Basel; [3] Cantonal Hospital Winterthur; [4] Cantonal Hospital St. Gallen

Background: Specific rehabilitation protocols exist and vary between clinics. However, little is known about the individual rehabilitation, that patients actually undergo after arthroscopic rotator cuff repair (ARCR). This study seeks to describe the postoperative management after ARCR in Switzerland and identify groups of patients following specific rehabilitation paths.

Methods: As part of a large multicenter Swiss cohort study (ARCR_Pred), characteristics and rehabilitation data were gathered at baseline, six weeks, six months, one and two years after first time ARCR in 942 patients from 19 clinics via patient interviews. Data was categorized and frequencies of the whole sample and clinics were described. A polytomous latent class analysis (poLCA) was applied to the medication-, immobilization- and rehabilitation management to identify patient rehabilitation groups. The association between identified groups and the Constant-Murley-Score and Oxfort-Shoulder Score were explored.

Results: LCA revealed a four-class model for the medication management with a `non-opioid group` (50%), a `non-NSAID/weak opioid group` (27%), a `non-NSAID/potent opioid group` (20%) and a `steroid injection group` (3%). The immobilization management consisted of three classes a `conservative group` (59%), a `delayed progressive group` (28%) and an `early progressive group` (13%). The rehabilitation management had five classes with a `higher frequency group` (40%), a `less therapy group` (25%), a `lower frequency group` (17%), a `early strength group` (12%) and a `watertherapy group` (6%).

Patients treated with steroid injections showed worse Constant-Murley- and Oxfort-Shoulder Scores at six and twelve months. During immobilization the “delayed progressive group” with early passive movements but delayed active movements showed better short-term results at six months and one year. The `early progressive group` with early active movements, however, had some patients at risk for worse outcomes at one and two years.

Conclusions: Despite a common ground, variability existed. Rehabilitation groups could be identified to support recognition in clinical practice and be considered in the evaluation of clinical outcomes. The management with steroid injections shows reduced outcomes at six months and one year. Less immobilization with early movement shows benefits for short-term outcomes, however the role of early active movement must be carefully evaluated.

P009

Assessment of Elderly Patients Outcomes Following Total Elbow Arthroplasty for Post-Traumatic Distal Humerus Fractures: Comparative Study Between Primary Total Elbow Arthroplasty and Secondary Total Elbow Arthroplasty Following Failed Osteosynthesis

Stefano Palladino; Florent Baldairon ; Philippe Clavert

Introduction: The objective of this study was to compare the clinical and radiographic results, as well as the complication rates, of primary total elbow arthroplasty (TEA) for post-traumatic distal humeral fractures with secondary TEA following failed osteosynthesis. The hypothesis was that the results of secondary TEA were not inferior to primary TEA for this indication.

Methods: All patients operated on for primary TEA (Group 1), or secondary TEA following failed osteosynthesis (Group 2), for a traumatic supra and intercondylar fracture of the distal humerus, between January 2004 and December 2020, were included in this retrospective study. They were reviewed for clinical examination (calculation of the Mayo Elbow Performance score (MEPS) and triceps proficiency test) and radiological examination at a minimum follow-up of 24 months. Complications and re-operations were noted in the file. The comparison between the different demographic variables and patient outcomes was carried out using the Wilcoxon test, the Kruskal-Wallis tests, or Fisher's exact test.

Results: A total of sixty patients (54 females and 6 males), with a median age of 80 (71-85) years were included: Forty-five patients in group 1 and fifteen patients in group 2. The mean follow-up was 40.8 (24- 120) months.

The mean time to surgery between osteosynthesis and TEA was 21 months (10 days-7 years).

There was no significant difference between the two groups (90 [85-100] p = 0.486) regarding the MEPS score. There was one patient with triceps insufficiency in group 1.

Complications included four surgical site infections in group 1 and two in group 2 (p = 0.265), and one case of mechanical loosening of the humeral component in group 1 and one in group 2 (p = 0.448).

Conclusion: Secondary total elbow arthroplasty following failed osteosynthesis of fractures of the distal humerus results in good functional outcomes, and a complication rate similar to that of primary total elbow arthroplasty, for this indication.

P010

A Novel Approach for an Arthroscopic Patch Augmented Rotator Cuff Repair – a Biomechanical Validation

Ronja Senn[1]; Bettina Hochreiter[2]; Elias Bachmann[1]; Jess G. Snedeker[3]; Karl Wieser[2]

[1] ZuriMED Technologies AG; [2] Balgrist Universitätsklinik; [3] Institute for Biomechanics, ETH Zurich

Despite many advances in the surgical treatment of rotator cuff tears, including their augmentation using patches, the number of re-tear rates persists high. This study introduces a novel approach for patch augmented rotator cuff repair which integrates a novel technology to generate an areal attachment between the patch and the tendon, recently introduced as Surgical-Fiberlock technology, and an alternative patch to bone fixation. It was hypothesized that the two variations of the novel

patch augmented rotator cuff repair would be biomechanically equivalent to conventional repairs. A total of 24 ovine infraspinatus tendons were repaired ex vivo using four different techniques. The experimental groups consisted of a medial horizontal mattress configuration, with a felt patch either placed below (E1) or above (E2) the suture configuration. The patch was interwoven with the tendon, applying the Surgical-Fiberlock technology, and laterally inserted into the humerus, using patch-integrated all-suture anchors. The first control group (C1) consisted of a conventional patch augmented transosseous-equivalent repair (TOE) using a sutured fixation. Within the second control group (C2) a non-augmented TOE was used. Each specimen was loaded from 10 to 30N for 100 cycles, followed by pull-to-failure testing. Cyclic elongation, gap formation, peak-to-peak displacement, cyclic stiffness, linear stiffness, and ultimate strength were determined. The maximal forces of the repair were significantly greater for E1 (403.06 ± 45.59 N) compared to C1 (203.39 ± 68.26 N) and C2 (210.47 ± 51.53 N), also for E1 compared to E2 (301.77 ± 37.41 N). Additionally, the maximal forces were significantly higher for E2 compared to C1 and C2 ($p < 0.05$). There was a significantly greater cyclic stiffness of E1 compared to C1 and a significantly lower peak-to-peak displacement of E1 compared to C1, and C2 compared to C1 was found ($p < 0.05$). There were no significant differences observed among the groups for gap formation, cyclic elongation, and linear stiffness. Arthroscopic feasibility was demonstrated using a human cadaver shoulder. The enhanced load sharing capacity and increased suture retention strength introduced by the Surgical-Fiberlock technology have led to statistical superiority in some time-zero biomechanical properties. Thus, the establishment of an areal and interwoven fixation between the patch and the tendon should be considered to augment the repair construct.

P011

Comparing clinical and radiological outcomes between anterior and posterosuperior rotator cuff tears: is there a difference?

Mustafa S. Rashid; Alberto Guizzi; Hugo Bothorel; Arash Amiri; Jeanni Zbinden; Tiago Martinho; Alexandre Lädermann

Background / Purpose: There is debate within the shoulder surgery community regarding differences in clinical outcomes and healing rates of various rotator cuff repairs. Whilst some factors have been well studied, such as tear size, fatty infiltration, and age, there is little evidence evaluating the differences in tear location on clinical and radiological outcomes. The aim of this study was to evaluate the influence on tear location on the outcomes of patients undergoing arthroscopic rotator cuff repair.

Methods: Consecutive patients undergoing arthroscopic rotator cuff repair by a fellowship-trained shoulder surgeon between 2018 and 2020 were included. Patients were divided into 2 groups based on tear location (anterior vs. posterosuperior cuff tears). Descriptive statistics included mean and standard deviation. For non-Gaussian continuous data, differences between groups were evaluated using Wilcoxon rank-sum tests (Mann–Whitney U test). For Gaussian continuous data, differences between groups were evaluated using unpaired student t-test. For categorical data, differences between groups were evaluated using Fisher's exact test.

Results: 291 patients were included (205 males; 86 females). The posterosuperior cuff tear group (Group 1, n = 223) were older than the anterior cuff tear group (Group 2, n = 68) (mean age 56.6±9.3 vs 51.7±9.7, $p < 0.001$). Proportions of obesity, smokers, diabetics, patients with hypercholesterolaemia, and repairs on dominant arms were similar in both groups. There was a significantly higher proportion of workers' compensation and traumatic tears in the anterior cuff tear group (25% vs 38%, $p = 0.032$ workers' compensation and 49% vs. 66%, $p = 0.018$ traumatic origin tears). 37% repairs in Group 1 were single row compared to 97% in Group 2 ($p < 0.001$). There was no significant difference in range of motion, pain (VAS), ASES score, Constant score, and SANE score at 12 months between the groups. Repair integrity as determined by Sugaya classification did not differ between the groups. There was no difference on rates of return to work at 6 months (71% Group 1 vs. 85% Group 2).

Conclusions: Despite inherent differences in age, nature of tear origin, and workers' compensation claims between the two groups, the clinical and radiological outcomes of anterior cuff repairs were similar to that of posterosuperior cuff repairs.

P012

Glenoid Bone Loss Reconstruction with a Pediculated Coracoid Autograft during Total Shoulder Arthroplasty: A Technical Note

Tiago Martinho; Alexandre Lädermann

Hôpital La Tour

BACKGROUND: Glenoid bone loss is a difficult problem often faced during total shoulder arthroplasty (TSA) that must be addressed. Several reconstruction methods with free allo- or autografts have been suggested but with heterogeneous results. The coracoid represents an option that is easily and freely available in most cases but has not yet been explored during TSA.

PURPOSE: This technical note aims to describe a method to treat glenoid bone defect with a pediculated coracoid autograft.

SURGICAL TECHNIQUE: The patient is placed in the beach-chair position under general anesthesia and interscalene block. The procedure is performed through a standard deltopectoral approach. During the approach, the coracoid bone is exposed, prepared, and harvested in the same way as in the Latarjet procedure. The graft is temporarily placed under the pectoralis major and protected by a retractor. The surgery continues with preparation of the humerus and glenoid according to the surgeon's habits and the manufacturer's recommendations. The coracoid autograft is recovered and adapted to the size of the defect. We suggest directly impacting the undersurface of the coracoid with the conjoined tendon placed inferiorly into a central defect and anteriorly similar to a latarjet procedure but with the conjoined tendon exiting inferiorly and posteriorly to the subscapularis tendon into an anterior defect. The coracoid may be temporarily fixed with K-wires before impacting the baseplate and secured with screws if necessary, depending on stability.

DISCUSSION: To our knowledge, this is the first article to report the use of the coracoid as a pediculated autograft to treat glenoid bone defects. The present technique is mainly applicable for mild to moderate central and/or anterior defects in primary or revision, anatomic or reverse TSA. In addition to being readily available during the deltopectoral approach and limiting donor site morbidity associated with other graft sources, the coracoid is a vascularized autograft offering a biologic option that could potentially improved osseous integration.

P013

Measurement of the contralateral glenopolar angle in extra-articular scapular neck fractures: Evaluation of 2D and 3D CT reconstructions in 200 shoulders

Xavier Lannes[1]; Sam Kehtari[2]; Nicolas Gallusser[3]; Filippo Gerber[1]; Fabio Becce[1]; Patrick Goetti[1]

[1] CHUV & Université de Lausanne; [2] Spitalzentrum Biel; [3] Hôpital du Valais - Spital Wallis

Introduction: Recent studies have highlighted the usefulness of the glenopolar angle (GPA) in the assessment and clinical decision making of extra-articular scapular neck fractures. A cut-off value of 22° or less represents a relative surgical indication. According to current data, 3D CT measurements are superior to 2D radiographs in assessing the GPA. Normative GPA values are limited in the literature regarding variability with age, sex, or side. This study aimed to compare GPA measurements from 2D versus 3D CT reconstructions and analyze normative values according to patient-specific characteristics.

Methods: We retrospectively reviewed 100 patients (1/1 male/female ratio) who underwent whole-body CT scans in the emergency department of our level I trauma center between January 2017 and June 2018. Exclusion criteria included incomplete CT coverage of the left and right scapulohumeral area, any scapular fracture, or pre-existing pathology of the shoulder girdle. The GPA was measured as previously described in the literature, on both scapulae, in 2D and 3D CT reconstructions, by three independent observers. Patient age, sex, height, weight, and BMI were analyzed.

Results: The mean GPA values in 2D and 3D CT were 37.6±3.7° and 37.9±3.8°, respectively, with a very strong correlation between 2D and 3D measurements (R2 = 0.906). Mean GPA values were significantly higher in 2D (2.3±0.8°) and 3D (2.1±0.8°) in females than in males ($p \leq 0.01$). There were no significant differences regarding age, side, height, or weight ($p \geq 0.162$). There was a good to excellent inter-observer agreement for both 2D and 3D measurements (ICC≥0.857).

Conclusion: Our results concerning mean GPA values and side-to-side symmetry are in line with the current literature. Regarding variability with sex, we found that the GPA is significantly higher in females. To our knowledge, this is the first description of this physiological variation and could play a role in GPA interpretation for treatment decision making. Based on our results, 2D CT and 3D CT reconstructions provide comparable values in assessing the scapular GPA. We recommend the use of the contralateral scapular GPA measurement to aid surgical planning and restoration of normal anatomy in cases of extra-articular scapular fractures.

P014

Grammont Konzept vs. metallische, glenoidale Lateralisierung in der Revisionsendoprothetik

Jan-Philipp Imiolczyk[1]; Florian Freislederer[2]; Laurent Audigé[2]; Victoria Harzbecker[1]; Philipp Moroder[2]; Markus Scheibel[2]

[1] Charité - Universitätsmedizin Berlin; [2] Schulthess Klinik Zürich

Die glenoidale Lateralisierung in der inversen Schulterendoprothetik (RSA) ermöglicht bei ossären Defektsituationenen und Insuffizienz der Rotatorenmanschette scapuläres Notching zu vermeiden und bessere Vorspannung der verbliebenen Sehnen zu gewährleisten.

Ziel dieser Studie war es, die klinischen und radiologischen Ergebnisse der glenoidalen, metallischen Lateralisierung beim septischen und aseptischen Endoprothesenwechsel zu evaluieren.

In diese prospektive Studie wurden Patienten eingeschlossen, die aufgrund einer Wechseloperation mittels RSA mit (Gruppe B) oder ohne (Gruppe A) glenoidale Lateralisierung versorgt worden sind. Einschlusskriterium war ein klinisch-radiologischem Follow-up (FU) von 2 Jahren.

Klinisch wurde der Constant-Murley Score (CS) und Subjective Shoulder Value (SSV), radiologisch wurden mögliche Endoprothesenlockerungen und scapuläres Notching (SN) evaluiert.

In Gruppe A konnten 14 Patienten (weiblich: n = 7; Ø = 65 Jahre) und in Gruppe B 22 Patienten (weiblich: n = 9; Ø = 69 Jahre) eingeschlossen werden. Beide Gruppen wiesen präoperativ vergleichbare Charakteristika, bezüglich Verteilung des Geschlechts, Dominanz der behandelten Schulter sowie präoperativer Schulterfunktion (CS, Schmerz, Außen- und Innenrotation), auf.

Patienten in Gruppe A (Ø CS: 67 Punkte (36-88), Flexion: 150° (80-170), Außenrotation: 13° (0-70)) verbesserten sich in CS, SSV, aktiver Flexion und Abduktion ($p < 0{,}01$) sowie Innenrotation ($p = 0{,}03$) im Vergleich zu präoperativ. Die Innen- ($p = 0{,}56$) und Außenrotation ($p = 0{,}06$) verbesserten sich nicht signifikant.

Die Patienten in Gruppe B (Ø CS: 57 Punkte (32-88), Flexion: 135° (70-180), Außenrotation: 18° (0-80)) verbesserten sich t in CS, SSV, aktiver Flexion, Abduktion ($p < 0{,}01$) und Innenrotation ($p = 0{,}03$) im Vergleich zu präoperativ. Die Außenrotation verbesserte sich nicht signifikant ($p = 0{,}09$).

Es gab keine statistisch signifikanten Unterschiede innerhalb beider Gruppen.

Die Komplikationsrate (A: Infektion n = 1, Glenoidlcokerung n = 1, Instabilität n = 2) (B: periprothetische Humerusfraktur n = 2; periprothetische Glenoidfraktur n = 1; axilläre Parese n = 1) war in beiden Gruppen vergleichbar.

Radiologisch zeigten 5 Patienten SN Grad 1 (A: n = 1; B: n = 4).

RSA liefert zuverlässige klinische Ergebnisse als Revisionsverfahren. Bei glenoidaler Lateralisierung zeigen Patienten eine signifikante Verbesserung in der Innenrotation im Vergleich zu präoperativ. Relativ hohe Komplikationsraten sind jedoch nicht zu vernachlässigen.

P015

Is sling immobilization necessary after open Latarjet surgery for anterior shoulder instability? A randomized control trial

Patrick Goetti[1]; Tiago Martinho; Antoine Seurot; Hugo Bothorel; Alexandre Lädermann[2]

[1] Lausanne University Hospital and University of Lausanne (CHUV); [2] Hôpital de La Tour

Introduction: Recurrent traumatic anterior shoulder instability occurs most commonly in young athletes. The Latarjet procedure enables an early return to sport. Recent research has highlighted the negative effect of immobilization on shoulder rehabilitation, but only few studies evaluated different rehabilitation programs and their potential impact on complication rates, stiffness and time to return to sport. The current reported immobilization periods range from zero to three weeks, with different reported mobilization protocols. The aim of this study was to evaluate the benefit of sling immobilization after open Latarjet procedure for anterior shoulder instability. The hypothesis was that immediate self-rehabilitation without sling immobilization would result in improved functional scores at 6 months compared to patient wearing a sling for three weeks postoperatively.

Methods: We randomized 72 patients with anterior shoulder instability scheduled for open Latarjet procedure into sling and

no-sling groups. Two 1 cm apart 4.0-mm cancellous screws were used to secure the graft. Both groups started the same immediate self-rehabilitation protocol. Patients were evaluated clinically using Rowe score, the Single Assessment Numeric Evaluation (SANE) instability score as well as visual analogue pain scale (VAS) preoperatively and at 1.5, 3, and 6 months. A computed tomography was performed at 6 months to evaluate graft healing.

Results: Both groups had similar preoperative patient characteristics. Both groups had a significant improvement in Rowe score (from 38.8 ± 20.4 to 81.6 ± 17.8, p <0.001), SANE instability score (from 42.5 ± 20.5 to 84.7 ± 13.2, p <0.001) and VAS (from 27.7 ± 21.8 to 13.9 ± 16.1, p <0.001) at 6 months postoperative. There was no difference in functional outcomes between the two groups at 6 months. Mean Rowe score was respectively 80.7 ± 15.9 and 82.6 ± 19.6 in the sling and no-sling group (p = 0.64). Mean SANE instability score was 83.7 ± 13.0 and 85.7 ± 13.6 (p = 0.53) and mean VAS 15.6 ± 14.8 versus 12.2 ± 17.5 (p = 0.38), for sling and no-sling group respectively. Finally, computed tomography evaluation revealed no significant differences regarding bone graft healing between both groups (p = 0.35).

Conclusion: Both treatment groups resulted in excellent early functional outcomes. Absence of sling immobilization did not increase complication rates after open Latarjet. Sling immobilization seems therefore optional after open Latarjet.

P016

Scarf shaped iliac crest allograft to maximise bone contact and primary stability in instable lateral clavicle pseudarthrosis with bone loss: A case study of a surgical technique

Andri Guetg[1]; Michael Stalder[2]

[1] Spitäler fmi AG, Spital Interlaken, Switzerland; [2] Zentrum für Orthopädie Berner Oberland, Switzerland

Introduction: Unstable distal clavicle fractures are associated with high non-union rates if treated conservatively. To address symptomatic pseudarthrosis with substantial bone loss, structural grafts are required. However, biologic and mechanical factors are crucial to obtain osseous consolidation. We present a newly adopted surgical technique of a scarf shaped iliac crest autograft to optimise reconstruction of a hypo-trophic pseudarthrosis of the clavicle.

Methods: Case report of a symptomatic pseudarthrosis after non-operative treatment of a Neer type IIB fracture of the distal clavicle. A bony defect of 20mm at the coraco-clavicular ligament insertion site was reconstructed with a tricortical iliac crest autograft. Inspired by the scarf technic in Hallux valgus correction, a step-osteotomy of the clavicular ends and autograft permitted enhanced bony contact and ideal primary stability, similar to half-lap joints in carpentry with a solid mechanical stability. It also permitted to insert Interfragmentary lag-screws. Neutralization with a plate osteosynthesis and coraco-clavicular cerclage resulted in a reliable construct permitting early mobilisation.

Result: The follow up at 1 year showed a complete bony consolidation and integration of the autograft with maintained stability of the acromioclavicular joint. Free range of motion was observed for the shoulder joint while scapulo-thoracic rhythm was normalized. The subjective shoulder value (SSV) pre-operatively was 40% and 95% at the latest follow-up respectively. No irritation of the hardware was detected.

Conclusion: Surgical treatment of symptomatic clavicular pseudarthrosis with a segmental defect may be challenging. Reconstruction with a scarf shaped bone graft allows reliable primary stability and generates a larger surface area between graft and native bone. This technique may be equally advantageous to address pseudarthrosis with segmental defect for other long bones.

P017

Mid-term outcomes of FUSSI versus SSC repairs: A propensity score-matched analysis

Tiago Martinho; Alexandre Lädermann

Hôpital La Tour

BACKGROUND: FUSSI lesions, for frayed upper edge subscapularis (SSc) lesions with impingement are a rare subtype of SSc tears. It distinguishes itself from the more frequently described insertional tears, as it occurs on the medial upper edge of the tendon and its insertion site remains intact. Suggested treatment consists of arthroscopic middle glenohumeral ligament (MGHL) resection and glenoplasty, to allow proper tendon gliding. However, treatment' results remain still unknown. Thus, the aim of this study was to analyze 1) outcomes of FUSSI lesions' treatment and 2) compare them to insertional SSc repairs.

METHODS: This was a retrospective comparative study of prospective collected data. We retrieved all FUSSI lesions from a rotator cuff database and matched (1:4) to SSc tears using a propensity score based on age, gender, follow-up time, type of rotator cuff injury and etiology of the tear. One surgeon performed all procedures by, either MGHL resection and glenoplasty in case of FUSSI lesions or a single-row repair with a lasso-loop technique in case of SSc tears. One observer assessed all patients preoperatively and at each follow-up. Collected outcome measures included: range of motion, Visual Analogue Scale (VAS) for pain, Subjective Shoulder Value (SSV), American Shoulder and Elbow Surgeons (ASES) score and Constant Score (CS).

RESULTS: 12 FUSSI lesions were identified and matched to 48 SSc tears. In addition to the matching criteria, all preoperative outcome measures were similar between groups (FUSSI vs SSc: anterior elevation (AE): 130 (45) vs 149 (35); external rotation (ER): 39 (20) vs 44 (17); internal rotation (IR); T12 vs L5; VAS pain: 6.4 (1.4) vs 5.7 (1.8); SSV: 45.0 (17.7) vs 43.9 (21.0); ASES: 49.0 (18.9) vs 46.0 (20.0); CS: 52.8 (22.4) vs 48.4 (22.0)). The mean follow-up time was 3.0 (2.4) years in the FUSSI group and 2.7 (1.9) years in the SSc group. The mean age at surgery 58.1 (8.8) years old in the FUSSI group and 56.8 (8.0) years old in the SSc group. Surgery led to a significant improvement in all outcome measures without any significant difference between groups at the end of the follow-up. (FUSSI vs SSc: AE: 154 (23) vs 159 (23); ER: 56 (26) vs 56 (26); IR: T12 vs T12; VAS pain: 1.2 (1.6) vs 2.2 (3.3); SSV: 85.6 (14.3) vs 80.3 (19.9); ASES: 85.7 (14.6) vs 79.4 (20.4); CS: 78.8 (11.9) vs 72.7 (19.7)).

CONCLUSION: The arthroscopic treatment of FUSSI lesions provided good functional outcomes, similar to insertional SSc tears.

P018

Inakzeptabel hohe Lockerungs- und Revisionsrate nach anatomischer Schultertotalendoprothese mit zementierter pegged Polyethylen-Glenoidkomponente

Moritz Kraus[1]; Johanna Illner[2]; Laurent Audigé[3]; Markus Scheibel[4]

[1] Schulthess Clinic, Zurich, Switzerland; Muskuloskelettales Universitätszentrum München, LMU Klinikum München; [2] Schulthess Clinic, Zurich, Switzerland; [3] Research and Development Department, Shoulder and Elbow Surgery, Schulthess Clinic, Zürich, Switzer

Die glenoidale Komponentenlockerung stellt ein ungelöstes Problem nach Implantation anatomischer TEP mit zementierten

PE-Glenoiden (PEG) dar. Ziel dieser Arbeit ist es, Lockerungs- und Revisionsraten (RR) im eigenen Krankengut zu evaluieren und den Einfluss möglicher patienten- oder operationsspez. Risikofaktoren für ein Versagen der Glenoidkomponente (GK) zu identifizieren.

Alle in den Jahren 2012-2019 aufgrund einer prim. Omarthrose mit einer primären anatomischen Schulterendoprothese (Typ Eclipse mit zementierter pegged GK, Arthrex, Naples, Florida) versorgten 154 Patienten (P) wurden anhand eines lokalen Registers und Bildgebungen evaluiert. Die Patienten wurden 6 Wochen, 6 Monate (M), 2, 5 und 10 Jahre (J) postop. klinisch (Constant-Score, DASH, SPADI, SSV und EQ-5D-5L) und radiologisch (Walch-Klassifikation, Positionierung der humeralen und glen. Gelenkkomponenten, Wiederherstellung der humeralen Geometrie, glenohumeraler Abstand (GHA), glen. Zementierung) evaluiert. Falls eine Revision nötig war, wurde dessen Grund und Verfahren ermittelt.

Bei einer mittleren Follow-up Zeit von 87±25 M konnten 127 von 154 P evaluiert werden (5-J-FU-Rate: 82,5%). Die RR betrug 48% (n = 61) bei einer mittleren Time-to-Revision von 65±29 M. Von den nicht revidierten Prothesen sind 27% als glen. gelockert dokumentiert. Beim Vergleich der patientenspez. Faktoren (Alter, Geschlecht, ASA, Walch-Klassifikation, präop. Constant und DASH) sowie den postop. erhobenen radiologischen Parametern ließ sich kein sign. Unterschied zwischen den Gruppen finden (p>0,05). Eine skapuläre Zementpenetration war in der später revidierten Gruppe (RG) bei 54% und in der Vergleichsgruppe (VG) bei 37% nachweisbar (p = 0,057). Die Scores nach 2J. zeigten keine erniedrigten Werte in der RG. Der GHA verringerte sich in der RG um 25±19%, gegenüber 9±8% in der VG nach 2J. (p = 0,3). 5J. postop. ließ sich eine mittlere Reduktion von 58±29% in der RG versus 36±86% in der VG nachweisen (p = 0.072). Revisionsindikationen waren symptomatische Lockerungen der GK (n = 54), sturzbedingte periprothetische Frakturen (n = 2) sekundäre SSC-Rupturen (n = 3) und low-grade Infekte (n = 2).

Prim. patienten- und operationsspezifische Parameter, die für eine Lockerung bzw. Revision nach anatom. TEP mit zementierten PEG prädisponieren, konnten nicht gefunden werden. Hiernach scheinen implantatspezifische Faktoren, wie ein beschleunigter Polyethylenabrieb für die inakzeptabel hohe Lockerungs- und Revisionsrate am naheliegendsten.

P019

Clinical and Radiological Outcome Following Low-Profile Suture Button Stabilization After Acute Acromioclavicular Joint Dislocation

Larissa Eckl[1]; Jonas Pawelke[2]; Doruk Akgün[3]; Philipp Vetter[4]; Marije de Jong[1]; Jan-Philipp Imiolczyk[3]; Philipp Moroder[1]; Markus Scheibel[1]

[1] Schulthess Clinic, Zurich, Switzerland; [2] Experimentelle Unfallchirurgie, Klinik und Poliklinik für Unfall- , Hand- und Wiederherstellungschirurgie, Gießen, Deutschland; [3] Charité Centrum Muskuloskeletale Chirurgie; [4] Univeritätsspital Zürich;

Introduction: Common implants for stabilization of ACJ dislocations are associated with local irritation above the superior implant in up to 39% postoperatively and may require revision surgery. The aim of this study was to assess the clinical and radiological outcome and the revision rate of an arthroscopic-assisted Low-Profile Suture Button (LPSB) stabilization procedure with additional AC cerclage fixation after acute ACJ dislocation.

Methods: This retrospective bicentric study includes patients with acute high-grade ACJ dislocation (Rockwood V). Exclusion criterion was previous surgery to the same shoulder. All patients underwent the same arthroscopic-assisted LPSB stabilization procedure with additional AC cerclage fixation. Primary outcome were Constant Score (CS) and subjective shoulder value (SSV). The Taft Score (TF), Acromioclavicular Joint Instability Score (ACJI) and visual analogous scale (VAS) for pain on palpation above the superior implant were evaluated. Coracoclavicular (CC) difference, ossification, ACJ osteoarthritis, dynamic posterior translation (DPT) and superior button migration were assessed on bilateral a.p. stress- and modified Alexander views. The revision rate was reported.

Results: 50 patients (96% male) with a mean age of 41.2 ± 9.9 years were included. The dominant hand was affected in 66%. 18% had concomitant glenohumeral injuries. The mean time from trauma to surgery was 9.1 ± 4.3 days. After 33.4 ± 9.1 months of follow-up the CS was 89.9 ± 8.2, the SSV was 91.1 ± 12.9, the TF was 10 ± 2.3, the ACJI was 79.1 ± 16.7 and the VAS was 1 ± 1.9. Compared with the uninjured side, the CC distance was increased by 145% preoperatively and by 26% at the final follow-up. Ossification was visible in 86%, ACJ osteoarthritis in 28% and persistent DPT in 36% (26% partial; 10% complete). There was no correlation between persistent DPT and the results of CS (r = 0.01; p = 0.96) and SSV (r = -0.09; p = 0.55). A complete DPT correlated negatively with TF score (r = -0.31; p = 0.03) and ACJI score (r = -0.46; p <0.001) a partial DPT only with ACJI score (r = -0.29; p = 0.04). No relevant implant migration and no implant associated revision event were reported.

Conclusion: The above mentioned technique is associated with excellent clinical and satisfactory radiological results. The subjective patients satisfaction was highly satisfactory and no implant associated revision surgery was required. A persistent DPT showed no correlation to the results of CS and SSV.

P020

Accuracy of two intraoperative measurement methods for humeral stem version in reverse total shoulder arthroplasty

Richard Niehaus[1]; Philipp Kriechling; Leonie Rimann; Karim Eid

[1] Kantonsspital Baden AG

Background: The number of performed reverse total shoulder arthroplasties (RTSA) continously increases worldwide. The impact of component position, including humeral rotation on functional outcome has been investigated in numerous studies. From these studies, recommendations for the rotation of the humeral component, e.g. its retroversion, have been drawn. However, intraoperatively estimated humeral rotation was not verified by exact radiological measurent postoperatively, making these recommendations questionable. In this cadaveric study, we determined humeral rotation (e.g. retroversion) intraoperatively using a new fluoroscopic technique and by postoperative computed tomography (CT).

Methods: Eight Theil's embalmed shoulders from human cadavers were used to study the rotation of the humeral RTSA component. Procedures were performed by three board certified orthopedic surgeons. The stem was implanted in 0°, 10°, or 20° of retroversion according to the orientation of the forearm using the standard aiming guide. Then, an intraoperative fluoroscopic image was adjusted to an exact antegrade view of the stem so that the rotation could be determined by a goniometer oriented parallel the forearm. The postoperative humeral rotation was analyzed using standardized CT planes correlated to the elbow's transepicondylar axis. Subsequently, the planned rotational alignment was compared to the rotation measured by fluoroscopy and by CT.

Results: The planned humeral version using the standard aiming guide differed from the new intraoperative fluorsoscopic method by 3.5 ± 12.8°. Postoperative evaluation by CT scan

revealed no significant deviation from the intraoperative planning using the aiming guide with CT scans (-10° ± 12.0° versus 2.5° ± 12.0, p = 0.069).

Conclusion: The intraoperative planning using an amining guide seems to be accurate by 3.5 ± 12.8°. The use of intraoperative fluoroscopy does not improve precision of implant positioning for rotational alignement. However, sample number might be to small ot draw definitve conclsions.

P021

Proximal Humerus Fractures: Delto-Pectoral ORIF vs Delto-Split MIPO. What is the Best Surgical Approach? A Systematic Review and Meta-Analysis

Lorenzo Massimo Oldrini; Alessandro Sangiorgio; Pietro Feltri; Francesco Marbach; Giuseppe Filardo ; Christian Candrian

Introduction: Proximal Humeral Fractures (PHFs) treatment strategy depends on different aspects: patient characteristics (age and co-morbidity), injury patterns (fracture type, displacement), and different available options about the surgical technique. The aim of this study was to compare the two main surgical approaches to address PHFs stratified for Neer fracture types, to identify which approach gives the best result for each fracture type.

Methods: A literature search was performed according to the PRISMA guidelines in PubMed, Web of Science, and Cochrane databases up to January the 4th, 2022. Inclusion criteria: studies comparing open reduction internal fixation (ORIF) with deltopectoral (DP) approach and minimally invasive plate osteosynthesis (MIPO) with deltosplit (DS) approach of PHFs. Patient's demographic data, fracture type, Constant-Murley Score (CMS), operation time, blood loss, length of hospital stay, complications, fluoroscopy time, and radiological outcomes were extracted. Results were stratified for each type of Neer fracture.

Results: Eleven studies (798 patients) were included in the meta-analysis. No functional difference was found in the CMS between the two groups for each type of Neer (p = n.s.): for PHFs Neer II the mean CMS was 72.5 (SE 5.9) points in the ORIF group and 79.6 (SE 2.5) points in the MIPO group, for Neer III 77.8 (SE 2.0) in the ORIF and 76.4 (SE 3.0) in the MIPO, and for Neer IV 70.6 (SE 2.7) in the ORIF and 60.9 (SE 6.3) in the MIPO. The operation time in the MIPO group was significantly lower than in the ORIF group for both Neer II (p = 0.0461), and Neer III (p = 0.0037) fractures. Overall, the number of complications was similar in both groups, accounting for 28.4% in the DP group and 29.9% in the DS group (p = n.s.). There were 43 re-interventions in the DP group (9.6%) and 49 in the DS group (13.9%). Malreduction was observed in 23 patients in the DP group (5.2%) and 16 patients in the DS group (4.6%). There were 29 non-unions in the DP group (6.5%) and 5 non-unions in the DS group (1.4%) (p = 0.0004).

Conclusion: The MIPO with DS approach demonstrated comparable results to the ORIF with DP approach for all the different Neer fractures in terms of functional results, even in the most challenging Neer IV cases, while showing a shorter operation time than the ORIF group. The ORIF group showed a statistically significant higher rate of non-unions compared to the MIPO group.

P022

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Richard Niehaus; Philipp Kriechling; Leonie Rimann; Karim Eid
Kantonsspital Baden AG

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Results: The planned humeral version using the standard aiming guide differed from the new intraoperative fluorsoscopic method by 3.5 ± 12.8°. Postoperative evaluation by CT scan revealed no significant deviation from the intraoperative planning using the aiming guide with CT scans (-10° ± 12.0° versus 2.5° ± 12.0, p = 0.069).

Conclusion: The intraoperative planning using an amining guide seems to be accurate by 3.5 ± 12.8°. The use of intraoperative fluoroscopy does not improve precision of implant positioning for rotational alignement. However, sample number might be to small ot draw definitve conclsions.

P023

A Monocentric Cohort Study Evaluating Clinical and Patient-reported Outcomes in Stemless Reverse Shoulder Arthroplasty

Janosch Kränzle[1]; Claudio Rosso[2]; Kushtrim Grezda[3]
[1] Universität Basel, Medizinische Fakultät; [2] ARTHRO Medics AG shoulder and elbow center; [3] Royal Medical Hospital

Background: A frequent problem in arthroplasty is generally caused by the stem of the prosthesis as for example bone stock loss, intraoperative and postoperative periprosthetic fractures or periprosthetic infections involving the medullary canal. For this reason stemless reverse shoulder arthroplasty is ideal for bone stock preservation and periprosthetic fracture revision. So far, only limited data are available on the mid-term outcomes of stemless reverse shoulder arthroplasty.

The objectives of this study were to assess the clinical, radiological and patient-reported outcomes of stemless reverse shoulder arthroplasty (slRSA) over a period of at least 2 years of follow-up, together with the evaluation of the incidence of any related complications.

Methods: Between January 2016 and October 2020, data of all stemless reverse shoulder prostheses were collected. Patients were seen at 6 weeks, 6, 12 and 24 months postoperatively. Clinical data, radiological data and patient-reported outcomes measures (PROM) were assessed with validated questionnaires (UCLA, ASES, Quick-Dash, VAS pain, Subjective Shoulder Value, Constant Score). All patients had a minimum follow-up of 2 years. Sample-size analysis was performed for a minimally clinically important difference (MCID) in the ASES score of 21 points.

Results: During the observation period, 25 patients with 26 prostheses fulfilled the inclusion criteria. The mean age was 70.1 years. From the preoperatively to the latest follow-up significant improvement of the ASES (55.9±19.9 vs. 85.6±10.7), SSV (44.3±18.7 vs. 85.3±10.4), Quick-Dash-Score (40.6±22.0 vs. 17.8±13.9), VAS pain score (4.6±3.2 vs. 0.9±1.2), in the flexion of ROM (66±53. vs. 154±22) and as well as in the absolute (44.1±18.7 vs. 83.1±10.1) and relative CS (62.1±27.8 vs. 111.9±13.3) was noted. Radiologically no component-related revision has been observed.

Conclusions: With 30 points of improvement in the ASES score, the MCID of 21 points was met. SIRSA seems to be a good option with comparable mid-term results to stemmed reverse shoulder prosthesis.

P024

Biologische Augmentation mit subakromialer Bursa bei arthroskopischer Rotatorenmanschettenrekonstruktion – postoperative Befunde mittels Doppler-Sonographie

Florian Freislederer; Daniela Brune; Stefan Diermayr; Marco Etter; Ralph Ringer; Christian Jung; Laurent Audigé; Markus Scheibel

Schulthess Klinik Zürich

HINTERGRUND: Subakromiales Schleimbeutelgewebe könnte eine wichtiges Rolle zur Heilung der Rotatorenmanschettensehne beitragen. Unser Ziel war es, die postoperative Morphologie, insbesondere Vaskularität und Neovaskularitätsbefunde, nach Bursaaugmentation bei arthroskopischer Rotatorenmanschettenrekonstruktion zu untersuchen.

METHODEN: Seit Juni 2019 werden Patienten mit einem U-förmigen posterosuperioren Rotatorenmanschettenriss (SSP / ± ISP, ± SCP Tear Lafosse ≤ 1 (no repair) mit Retraktion ≤ 2 nach Patte und fettiger Infiltration ≤ 2 nach Goutallier, welche mittels arthroskopischer Rekonstruktion versorgt wurden, in diese prospektive Beobachtungsfallserie aufgenommen und mittels ultrasonographischen (US) Doppler-Signal die Vaskularität und Sehnenintegrität untersucht. Nachuntersuchungen fanden 3, 6, 12 und 24 Wochen statt. Wir testeten, ob es einen statistisch signifikanten Unterschied in der Bursa-Augmentationsgruppe zwischen Baseline und 6-Monats-Follow-up gab, indem wir den Wilcoxon-Rank-Test für kontinuierliche Variablen und den Fisher-Test für kategorische Variablen verwendeten. Alle Analysen waren explorativ mit einem Signifikanzniveau von p = 0,05.

ERGEBNISSE: Bei 19 Patienten (männlich 58%, mittleres Alter 60 Jahre) wurde eine Bursaaugmentation erfolgreich durchgeführt. Zwischen Baseline und 6 Monaten wurde kein signifikanter Unterschied in der Vaskularisierung der Bursa (p = 0,347) und Sehneninsertion (p = 0,201) beobachtet. Bis zu 6 Wochen postoperativ nahm das Dopplersignal in der Bursa- und Sehneninsertionsregion zu. Schmerzen während Aktivitäten zeigten einen signifikanten Unterschied (p = 0,001) zwischen Baseline (M: 5,4; SD: 2,5) und 6-Monats-Follow-up (M: 2,6; SD: 2,5). Der SSV verbesserte sich nach 6 Monaten von 60,1 (SD: 20,9) auf 80,6 (SD: 15), ebenso wie der Oxford Shoulder Score von 33,8 (SD: 10,4) auf 42 (SD: 4,4). Beide mit signifikantem Unterschied von p = 0,001 bzw. p = 0,004. Der mittlere Constant-Murley-Score betrug zu Studienbeginn 59,7 (SD: 15,3) und stieg nach der Operation auf 74,4 (SD: 8,7). Es gab keinen Fall von postoperativer Schultersteife. 2 partielle SSP Läsionen wurden nach 6 Monaten beschrieben.

FAZIT: Bei keinem der Patienten mit Bursaaugmentation kam es zu einer vollständigen Reruptur der Rotatorenmanschette Die frühe postoperative Phase zeigte eine verbesserte Blutversorgung im Sehnenansatzbereich der Rotatorenmanschette nach Bursaaugmentation, obwohl es nach 6 Monaten keinen signifikanten Unterschied gab.

P025

Outcome of revision radial head arthroplasty with deliberate underlengthening of a cemented bipolar prosthesis

Tiago Martinho[1]; Roger Van Riet[2]

[1] Hôpital La Tour; [2] Hôpital AZ Monica

PURPOSE: This study aimed to report the clinical and radiographic outcome of revision radial head arthroplasty (RHA) with an underlengthened stem.

HYPOTHESIS: Our hypothesis was that this treatment strategy would lead improved outcomes.

METHODS: This was a retrospective study. All patients undergoing revision radial head arthroplasty associated with significant capitellar wear were eligible. One experienced elbow specialist performed all revision surgeries with a cemented bipolar implant intentionally placed 2mm short of the standard position, based on the lesser sigmoid notch. Collected data before surgery and at follow-up included: range of motion, Mayo elbow performance score (MEPS), Visual Analogue Scale (VAS) for pain and x-rays.

RESULTS: Of 14 eligible patients, 2 were lost to follow-up and 12 were finally analyzed. The mean follow-up time was 28 months. The mean age at surgery was 50 years old. Surgery allowed a significant improvement of the flexion-extension arc (108° to 122°), pronation-supination arc (130° to 151°) and all PROM's. At the end of follow-up, the mean MEPS was 89 and the mean VAS for pain was 2. X-rays at last follow-up showd no radiolucencies, no signs of loosening and no failure of the snap-on mechanism. 25% (3/12) of patients had asymptomatic heterotopic ossifications.

CONCLUSION: Revision RHA with a bipolar implant cemented with 2mm of underlengthening in patients with concomitant capitellar erosion showed good short-term outcomes.

POSTERS: A02 HAND

P026

Unusual giant cell tumor of the tendon sheath invading the dorsal capsule of the wrist

Marie-Aimée Päivi Soro

CHUV

Giant cell tumor of the tendon sheath is the second most common soft tissue tumor of the hand after ganglion cysts. However it is most commonly located in digits as a painless, slow-growing mass on the volar surface of fingers.

Dorsal masses to the wrist are usually caused by arthrosynovial cysts. We hereby present an unusual case of giant cell tumor of the tendon sheaths appearing on the dorsum of the carpus. A 28-year old woman presented to our hand center with a history of a mass on the dorsum of her wrist present for several years but growing since 9 months. The mass was located between the 4th and 5th compartments. It was painless, with a hard consistence and mobile towards deep and superficial layers. MRI showed a mass of 31 x 7 x 22mm forcing back the extensor tendons leaving a footprint on the carpal bones without cortical lysis invading the dorsal capsule of the wrist. It extended from the dorsum of the trapezoid, capitatum, hamatum and lunatum with extrinsic compression of the dorsal cortex of the capitate.

The patient underwent surgical excision of the mass with the whole dorsal capsule of the wrist including the dorsal intercarpal ligament (DIC) and dorsal radiotriquetral ligament (DRC). Histopathology confirmed the diagnosis. The DIC and DRC were not reconstructed for fear of bony invasion of the tumor. The patient was immobilized in a forearm cast for 1 month after surgery.

Despite some stiffness in her wrist with a flexion-extension of 35°-0-55°, she resumed all her activities 6 months after surgery including high intensity sport (crossfit). The control MRI did not show any recurrence up to date (1 year, 9 months).

Those unusual cases pose a challenge to the surgical team, having to choose between potential instability or risk of bony invasion. In our case, the patient evolved very favorably and this might help other colleagues who encounter the same challenge.

P028

A cadaveric study examining the accuracy of wireless Handheld guided ultrasound injections versus blind injections in the Flexor Tendon Sheath

Ceyran Hamoudi; Antoine Martins; Thibault Willaume; Pierre-Antoine Debordes; Philippe Liverneaux; Sybille Facca

Centre Hospitalier Universitaire de Strasbourg

Introduction: Handheld Ultrasound (HHUS) is gaining popularity among clinicians owing to its size, ease of use, low cost, and portability. Although their use for procedural guidance could have several advantages in hand surgery, treating common pathologies, such as trigger finger, other surgeons may wonder about the added benefits. This cadaveric study aimed to examine the hypothesis of increased accuracy of wireless HHUS-guided injections versus blind injections into the flexor sheath.

Methods: Our series included 20 fresh cadaveric hands with 80 long fingers randomly assigned to two groups. Ten hands in group A were blinded to the flexor tendon sheath (FTS), and ten hands in-group B were blinded to the ultrasound-guided injection with HHUS. Methylene blue was injected, and anatomical dissection was performed in all injected anatomical pieces to assess the infiltration accuracy (accurate, moderately accurate, and inaccurate) according to the dye's anatomical location and diffusion pattern. Statistical analysis was performed, and P <0.05 was taken to indicate a significant difference.

Results: One long finger was excluded because of a severe Dupuytren contracture. In group A, blind injections of FTS (n = 39) were accurate in 84.6% of patients (n = 33/39). In group B, ultrasound-guided FTS injections (n = 40) were accurate in 90% of patients (n = 36/40). Our study did not reveal any superiority in accuracy when using ultrasound guidance (P = 0.3528).

Conclusions and perspectives: HHUS-guided FTS injections were not more accurate than blind injections performed by an experienced hand surgeon. These findings suggest that blind injections can be used as routine practice when performed by experienced operators to treat trigger finger. However, using HHUS may offer other advantages in hand surgery practice. Ultimately, choosing to perform an HHUS-guided -injection versus blind injection to treat trigger finger depends on the surgeon's experience and preference for a particular technique.

P029

Hand-held ultrasound guided injections versus blind injections in trapezo-metacarpal joint: a cadaveric study

Ceyran Hamoudi; Antoine Martins; Thibault Willaume; Pierre-Antoine Debordes; Philippe Liverneaux; Sybille Facca

Centre Hospitalier Universitaire de Strasbourg

Introduction: Symptomatic trapeziometacarpal osteoarthrosis can be treated with ultrasound-guided injections in the early stages. The goal of this study was to compare the accuracy and reliability of handheld ultrasound (HHUS) guidance and blind injection of the trapeziometacarpal joint (TMJ) in a cadaveric model.

Methods: Our series included 20 fresh cadaveric hands with 20 TMJs, randomly assigned to two groups. Ten TMJ were assigned to group A for blind injection and ten TMJ in-group B for HHUS-guided injection. Methylene blue was injected, and anatomical dissection was performed in all injected anatomical pieces to assess the anatomical location and diffusion of the dye. Statistical analysis was performed, and P <0.05 was taken to indicate a significant difference.

Results: Two thumbs were excluded from the study because of an existing trapeziectomy. In group A (n = 10), blind injections were accurate in 70% of cases (n = 7/10). In group B (n = 8), HHUS-guided injection was 80% accurate (n = 6/8) (p = 0.99).

Conclusions and perspectives: HHUS-guided injections of the TMJ joint were not more accurate than blind injections performed by an experienced hand surgeon. Nevertheless, additional studies with larger sample sizes and comparative studies with conventional cart-based machines are necessary to evaluate this new, readily available device.

P030

Posttraumatic Ulnar Translocation of the Carpus: a Rare Pattern of Radiocarpal Instability

Alina Malov; Jospeh M Schwab ; Moritz Tannast; Thomas Mészáros

Department of orthopedic surgery, HFR Fribourg, Villars sur Glâne, Switzerland

Introduction: Posttraumatic ulnar translocation of the carpus (PTUT) is a rare pattern of radiocarpal instability. Initial wrist x-ray may show minimal ulnar translocation of the carpus which may lead to this injury being missed on presentation. Because

poorer outcomes are directly related to delay in both diagnosis and treatment, clinicians must maintain a high index of suspicion. We report a case of PTUT in a 54-year-old male diagnosed 5 weeks after the initial injury.

Case Report: A 54-year-old right-handed male presented following a bicycle accident in which he sustained a hyperextension injury of his left wrist. Initial examination revealed wrist swelling and tenderness to palpation over the scaphoid tubercle. Conventional wrist x-rays were interpreted as normal. Four weeks after trauma the patient reported persistent pain despite treatment with cast immobilization. MRI of the wrist revealed a rupture of the radio-scapho-capitate (RSC) and long and short radio-lunate (LRL and SRL) ligaments. An x-ray of the contralateral healthy side was taken and compared to the initial injury x-ray. This comparison clearly showed an increased lunate uncovering index of 53% on the injured side, and the diagnosis of PTUT was made. Five weeks after initial injury the patient underwent open repair of the RSC, LRL and SRL ligaments with bone anchors and radio-carpal transfixation with K-wires. The wrist was immobilized in a cast for 8 weeks, and the K-wires were removed at 9 weeks.

Outcome: At 1.5 years follow-up the patient denied any wrist pain in his daily activities and sports. The Cooney and Patient-Related-Wrist-Evaluation scores were 85 and 19 points, respectively. Examination of the treated wrist revealed a total wrist range of motion of 85% in comparison to the contralateral side. Likewise, grip strength was 72% of the uninjured side. The lunate uncovering index on the radiographs remained stable at 41%.

Conclusion: PTUT occurs after high-energy trauma to the wrist. A careful assessment of the initial x-ray, with high suspicion for PTUT, is mandatory to make the diagnosis in a timely manner. A radiograph of the contralateral wrist is helpful to compare the lunate uncovering index of the normal side to the injured side. MRI is necessary to confirm the diagnosis and exclude other ligamentous injuries. After diagnosis, early open repair of the RSC, SRL and LRL with radio-carpal transfixation, followed by immobilization in a cast, delivers the best outcome.

P031

Plate-removal incidence and complications after volar plate synthesis for distal radius fractures: why hardware is removed? A systematic review and meta-analysis

Luca Pacchiarini; Lorenzo Massimo Oldrini; Pietro Feltri; Giuseppe Filardo ; Christian Candrian

Introduction: *Distal Radius Fractures (DRFs) are one of the most common types of fractures, representing up to 18% of all fractures in the elderly population. The surgical approach is one of the main treatments, yet studies on the rate of complications following surgery are lacking in the literature. This meta-analysis and systematic review aimed to quantify the rate of complication and re-interventions in patients treated with volar plate for distal radius fractures, and analyze if there were predisposing factors or types of patients who have more risk.*

Methods: A comprehensive literature search was performed on the Pubmed, Web of Science and Wiley Cochrane Library database up to April 04, 2022. Studies describing volar plates complications and hardware removal were included. A systematic review and meta-analysis were performed on complications and rate of re-intervention. Assessment of risk of bias and quality of evidence was performed with the "Down and Black's Checklist for measuring quality".

Results: One-hundred studies including 15510 patients (15510 fractures) were included. The number of complications was 2154 in 2055 patients (13.5% of all patients); the most frequent was carpal tunnel syndrome (CTS), representing 14.5% of all complications. Ninety-five studies reported the number of reinterventions, being 1770 with a re-intervention rate of 8.5%. Seventy-five studies reported the reason of re-intervention; the most-common was patient' will (3.3%), pain (1.2%), CTS (1.1%), and device failure (1.0%).

Conclusions: The main result of this study is that the complication rate after DRFs is 13.5%, with the main complication being CTS (14.5%), followed by pain and tendinopathy. The reintervention rate is 8.5%, mainly due to the patient's willing, and all these patients had plate removal. Correct positioning of the plate and correct information to the patient at the time of surgery can reduce the number of hardware removal operations, reducing costs and the risk of complications due to the VLP for the distal radius fractures.

POSTERS: A03 SPINE

P032

Posterior stabilization with polyetheretherketone (PEEK) rods and transforaminal lumbar interbody fusion (TLIF) with titanium rods for single-level lumbar spine degenerative disease in patients above 70 years of age

Edwin A. Li; Maria Kamenova; Jehuda Soleman; Oliver Fiebig; Arne Mehrkens; Stefan Schären

Universitätsspital Basel

Background: Given the lack of guidelines regarding the operative management of elderly patients needing lumbar spine fusion for degenerative disease, it is often difficult to balance between invasiveness respecting the fragile spine and geriatric comorbidities.

Aim: To compare reoperation rates and clinical outcome in patients above 70 years of age undergoing Transforaminal Lumbar Interbody Fusion (TLIF) with titanium rods or posterior stabilization with Polyetheretherketone (PEEK) rods for the treatment of one-level lumbar spine degenerative disease.

Methods: Retrospective review of baseline characteristics, reoperation rates as well as the clinical and radiological outcomes of patients, older than 70 years, undergoing posterolateral fusion with PEEK rods (n = 76, PEEK group) or TLIF with titanium rods (n = 67, TLIF group) for a single-level lumbar degenerative disease from 2014 to 2020. Additional subanalysis on the patients above 80 years of age was performed.

Results: Our results showed similar reoperation rates and outcomes in the TLIF and PEEK groups. However, intraoperative blood loss, administration of tranexamic acid, and operation time were significantly higher in the TLIF group. In patients older than 80 years, reoperation rates at first follow-up were significantly higher in the TLIF group, too.

Conclusion: According to our results, posterior stabilization with PEEK rods is less invasive and was associated with significantly lower blood loss, administration of blood products and shorter operation time. Moreover, in patients above 80 years of age reoperations rates were lower with PEEK rods, as well. Nevertheless, the benefits of PEEK rods for foraminal stenosis still have to be investigated.

P033

Transoral unilateral lag screw osteosynthesis for unstable Atlas burst fracture – case report and operative technique

Christian Tinner; Fabian Aregger; Moritz C. Deml

Introduction: Atlas ring fractures accounting for 1.3% of all spinal fractures are mostly treated conservatively. In several cases depending on the type of fracture, grade of comminution, fracture location and associated ligamentous lesions surgical treatment is indicated. Surgical stabilization often ends up in a posterior C1-2 or C0-2 fusion limiting movement, especially craniocervical rotation. The ideal treatment strategy would involve internal fixation of the reduced fracture fragments without restricting the range of motion (ROM) in the upper cervical spine.

Case Report: We report on a 55-year-old female suffering from polytrauma with multiple spinal and extremity injuries. An unstable atlas burst fracture with signs of C1/2 instability was treated minimally invasive with transoral lag-screw technique to preserve movement and obtain fracture union.

Conclusions: Transoral lag-screw osteosynthesis of unstable anterior atlas ring fractures is a potential treatment option in selected cases in order to preserve rotational mobility in the upper cervical spine after spinal trauma.

P034

Implantation of C2 prosthesis with dorsal fusion C0-C4 due to pathologic C2 fracture

Laurin Feuerstein[1]; Michal Ziga[2]; Roman Schwizer[3]; Thomas Forster[3]; Benjamin Martens[3]

[1] Kantonsspital St.Gallen; [2] Kantonspital St.Gallen; [3] Kantonsspital Sankt Gallen

Background: Pathological destruction of the axis vertebra leads to a highly unstable condition in an upper cervical spine. As surgical resection and anatomical reconstruction of the second cervical vertebrae represents a life threatening procedure, less radical approaches are preferred and only few cases of C2 prosthesis are described in literature.

Case Description: The focus of this case report is a 21-year-old man with a pathological fracture of C2 managed primarily surgically with the C1-C3 dorsal fusion. Due to the progression of giant cell tumor and destruction of the axis vertebra, C2 prosthesis through anterior approach and dorsal occipito-cervical fusion C0-C4 were performed.

Postoperative infection was managed surgically with a 2-staged dorsal debridement, ostheosynthesis material change and autologous bone graft. After a 4 week-intravenous therapy with the ceftriaxone in combination with the amoxicillin/clavulanate, followed by 12 week per oral therapy with amoxicillin/clavulanate in combination with ciprofloxacin, the complete recovery of the infection was achieved. Radiotherapy was initiated 2 months after the last revision surgery and the patient showed a good clinical outcome with stable construct at a 1 year follow-up.

A review of literature of all reported C2 prosthesis cases was performed.

Conclusion: C2 prosthesis allows a more radical resection in pathological processes involving the axis vertebra. Combined with the posterior fusion, immediate stability is achieved. Anterior surgical approach is through a highly unsterile oral environment which presents a high-risk of postoperative infection.

P035

Titanium coated Polyether-ether-ketone – Cages versus full Titanium

Cages for stand-alone 1- or 2- level ACDF

Franziska Altorfer; Christoph J. Laux; Dimitri Graf; Mazda Farshad; José Miguel Spirig

Balgrist Universitätsklinik

Anterior cervical discectomy and fusion (ACDF) combines decompression and placement of an intervertebral spacer aiming to restore foraminal height and to promote fusion. Different types of material have been tried over the years to improve radiological and clinical outcomes. To combine the benefits of each material, titanium-coated PEEK (TCPEEK) cages were developed. These are PEEK cages, which are provided with a plasma-sprayed layer of titanium. TCPEEK cages showed in biomechanical studies a high potential for better osteointegration. Therefore, the purpose of this retrospective study was comparing two commonly used types of implants Titanium (TTN) and Titanium-Coated polyether-ether-ketone (TCPEEK)

in their clinical and radiographical results of one or two-level ACDF.

A total of 45 discs were operated on in 29 patients using TTN or TCPEEK cages. Patients were retrospectively analyzed in the years 2017-2018 for their cage type and radiologically evaluated on their fusion status and subsidence based on a postoperative X-ray. Clinical outcome was assessed with the Neck-Disability-Index (NDI) preoperatively and at the last follow-at least 12 months post-surgery.

A total of 45 patients including 16 patients in the TTN group and 29 patients in the TCPEEK group were enrolled. The mean follow-up was 2.4 years (0.98 years). Radiologically confirmed fusion was achieved at follow-up in 63.8% (37 out of 58) of all operated levels having a fusion rate for TTN of 47.6% (10 out of 21) and 73% (27 out of 37) for TCPEEK (p = 0.09). The overall subsidence rate (>1mm) of all operated levels was 76% (44 of 58 levels), being 66% for TTN an 81% for TCPEEK cages. Median subsidence was 3.5 mm (0-6mm) with no difference between both cage types (TTN 4.0mm (0-6mm), TCPEEK 1.0mm (1-5mm)), (p = 0.89).

Subsidence over 3mm was seen in 52% of all operated levels (30 of 58). This refers to 57% of TTN cages (12 of 21) and 49% of TCPEEK cages (18 of 37). For the clinical outcome no significant difference in the preoperative and postoperative median NDI was seen for the two cage groups.

This retrospective study shows that both TTN and TCPEEK cages show clinically satisfactory results. There is no clinical or radiological benefit for TCPEEK cages compared to TTN cages.

P036

Titanium trabecular 3D electron beam melting (EBM) printed cervical cages to promote rapid healing in cervical fusion: From bench to bedside. A prospective study

Nermine Habib; Renato Almeida Gondar; Adrian May; Julien Galley; Daniele Valsecchi; Vera M Stetzelberger; Gianluca Maestretti

Cantonal Hospital, University of Fribourg

Purpose: Anterior cervical discectomy and fusion is a widely implemented procedure in treating degenerative cervical disc disease. Porous trabecular titanium has an open-cell metal structure with a low modulus of elasticity similar to human subchondral and cancellous bone leading to better load transfer and minimizing the stress-shielding phenomenon. In vitro studies on PTT cages, manufactured by the electron beam melting technology, showed excellent results with the ability to trigger osteogenic differentiation. A great capacity for osteoinduction and bone regeneration is also suggested by the results of these in vitro studies. However, in vivo osteointegration and osteoinduction capabilities remain unknown.

Objective: Determine the radiological fusion rate, the clinical outcome associated with the use of titanium trabecular 3D EBM printed cervical cages, as well as the difference in fusion rates and clinical scores when comparing the number of operated levels.

Methods: We performed a prospective analysis of 26 consecutive patients with a mean follow-up of 28 months; suffering from degenerative cervical spine conditions and benefiting from one- to three-level ACDF.

Specially designed 3D printed cages made of PTT and modeled by CAD/CAM technology by means of EBM are implanted with or without an anterior plate support depending on the pre-operative findings and presence or absence of myelopathy. Fusion rates and grade are assessed via CT scan at 3 months. The VAS pain score and NDI are recorded preoperatively and at 3, 6 months, and 1, 2 years postoperatively.

Results: The CT scan results at 3 months showed signs of bony growth through the cage in 72% of the patients and 96% of the patients in the 6-month x-rays. The average radicular and axial VAS pain scores showed an improvement of 83% and 81% consecutively. The NDI scores also improved by 76%.

A comparison between the rates of fusion in patients with 1, 2 or 3 operated levels showed no significant difference. A comparison between the postoperative clinical scores in patients with 1, 2 or 3 operated levels also showed no significant difference.

Conclusion: Special designed 3D EBM-printed PTT cages allow the bone matrix to adhere and grow in the cage to stabilize the implant rapidly. The cells prove to colonize the central cavity of the cage early, improving the bone fusion as early as three months postoperatively, confirming the data obtained by recent in vitro studies.

P037

A novel approach for thoracic wall reconstruction using a 3D-printed prosthesis with hinged fixation to the vertebral column

Dionysios Tsinas[1]; Sahand Imani[2]; Randolph Gray[3]; Michael Harden[3]

[1] Department of Orthopaedic Surgery, Inselspital; [2] Royal North Shore & Westmead Hospitals, Sydney Australia; [3] Royal North Shore Hospital

Study Design: Technical case report.

Objective: To describe a new surgical technique for thoracic wall reconstruction using a custom-made expandable prosthesis manufactured with three-dimensional (3D) printing technology.

Summary of Background Data: Malignant tumours can arise from the thoracic wall and vertebral column. Complete tumour resection improves patient survival but remains technically challenging. An ideal surgical approach aims to establish appropriate tissue margins, address thoracic wall defects, and preserve pulmonary mechanics.

Methods: A 54-year-old man was diagnosed with a large pleura-based mass arising from the left hemi-thorax with extension into the posterior paraspinal region. A two-stage procedure was performed. Stage one established the medial margins of the tumour which was attached to the vertebral bodies from T6 to T9. Stage two consisted of resection of the tumour including the lateral vertebral bodies T6-9 and 5th to 10th ribs. The chest wall defect was reconstructed using 3D printed structural prosthesis attached laterally to the residual T5-10 ribs and medially to the spinal instrumentation via a mobile articulation. No post-operative complications or respiratory sequela were noted at 18 month follow up.

Conclusion: Utilising a 3D-printed prosthesis articulating with spinal instrumentation to repair the composite defect of the chest wall can optimise respiratory function and maintain normal breathing mechanics.

P038

A rare para-aortic cement leakage after kyphoplasty – A case report

Fatos Ramadani; Cristina Goga; Daniele Valsecchi; Markus Menth; Gianluca Maestretti

HFR - hôpital fribourgeois

Intro: Vertebral compression fractures are frequent and challenging in their treatment. Pain management remains difficult and, in some cases, needs operative treatment with percutaneous kyphoplasty or vertebroplasty. One of the most frequent

complications is cement leakage. The incidence of this complication remains widely discussed in the literature, with the rate going from 2.6% to 70% in some studies. The majority of the leakages are harmless and do not need any intervention. The cases with treatment indications have been mainly found in pulmonary or cardiac embolisms. We present a rare case of a local cement leakage with an indication for removal.

Case: We present the case of a 76 years woman with acute back pain. The investigation found compression fractures from T12 to L3. Initial conservative treatment with a pain killer and mobilization was performed. The follow-up shows the persistence of the pain despite opioid use and the progression of the fracture on the level T12 and L1 leading to kyphosis. An indication for percutaneous kyphoplasty with Tektona™ for T12 and L1 and mono pedicular vertebroplasty for L2 and L3 was made. Intraoperatively we noticed a leak of cement anteriorly. The postoperative CT scan shows a critical amount of cement in contact with the aorta. After a discussion with the colleague from the vascular surgery and due to the risk of developing a pseudo aneurysm, we decided to perform with the vascular surgeon a left lateral lumbotomy and remove the cement. The postoperative evolution was good, without any complications.

Discussion: Percutaneous kyphoplasty and vertebroplasty remain efficient treatments for vertebral compression fracture. The major complication described in the literature remains a leakage of the cement. The classification of the leakage is based on the localization of the leakage, and three main types have been described: through the basivertebral vein, the segmental vein, and the cortical defect. Most leakage, especially in cortical defects, remains harmless and requires no treatment. In our case, the combination of the location near the aorta and the volume of cement gives an indication for cemental removal in order to avoid late complications.

Conclusion: Most cement leakages are harmless and do not need any investigation or treatment. However, some cases remain rare and interdisciplinary discussions (vascular surgeon, cardiologist, pneumology) are needed in order to prevent any long-term complications.

POSTERS: A04 HIP

P039

The history of the straight stem in hip arthroplasty

Hanna Wellauer[1]; Roman Heuberger[2]; Emanuel Gautier[1]; Moritz Tannast[1]; Hubert Steinke[3]; Peter Wahl[4]

[1] HFR - Hôpital Cantonal Fribourg; [2] RMS Fondation, Bettlach; [3] Institut für Medizingeschichte der Uni Bern; [4] Kantonsspital Winterthur (KSW)

Introduction: Since the middle of the 20th century, total hip arthroplasty (TEP) has become a very successful treatment method for all end stages of hip joint disease. Charnley's "low friction torque arthroplasty" was the beginning of an extensive development up to the models currently available. This review presents the major developments of regular straight stems in hip arthroplasty.

Material and methods: With the help of the often sparse written documentation and in collaboration with various engineers from the individual prosthesis companies, the most important steps in the development of the straight stems were recorded. This makes it possible to trace the origins of the prosthesis models that are still successful today.

Results: Figure 1 shows the development and ancestry of the most common types of stems in Europe today. Many developmental steps were not well documented at the time or are not known.

Discussion: Charnley's hip TEP was based on the successful solution of the problem of anchoring the prosthesis components to the bone with polymethyl methacrylate (PMMA) bone cement. In the field of cemented anchorage of the stem, two principles have emerged over the years that have good long-term revision rates: the principle of force closed ("taper-slip") and the principle of shape closed ("composite-beam"). The former requires a polished surface, a conical shape and a complete cement mantle, which is best achieved with the help of a centralizer. The latter requires absolute stability under physiological loading, which is best achieved with a collar or proximal cortical contact and a rough surface. Müller's straight cement stem evolved into a family of uncemented stems. Many of these designs were later redesigned for cemented fixation. However, this led to hybrid fixation designs.

Uncemented stems rely on osteointegration for long-term stability. Sufficient primary stability and a rough surface are mandatory for osteointegration of the implant. The primary stability depends on the design of the stem and can be ensured in various ways: sharp edges or flutes, proximal support, a collar or flanges. Many modifications of successful designs however appeared to be associated with less good outcomes, underscoring the importance of design details often not recognized.

P040

An unconventional solution for persistent lateral hip prosthetic friction syndrome (LHPFS) after revision total hip arthroplasty with excessive proximal femoral bone loss: a case report

Matthias Wittauer; Karl Stoffel

Universitätsspital Basel (USB)

Introduction: In patients with proximal femoral bone stock deficiency long taper fluted diaphyseally fixed uncemented stems provide a good solution to achieve mechanical stability. Stress shielding and bone loss can lead to friction between the femoral prosthetic shoulder of the stem and the overlying soft tissue. This can cause symptoms similar to greater trochanteric pain syndrome despite loss of the greater trochanter. Being a fairly rare problem in hip revision surgery it is not yet recognized as a proper entity by the orthopaedic literature and recommendations for operative solutions are scarce.

Case Report: We report on a 77-year old male patient, who presented with excessive bone loss at the area of the greater trochanter (Gruen zones 1 and 2) after several hip revision surgeries resulting in a persistent friction syndrome caused directly by the rough surface and sharp edges of the prosthetic shoulder of a well fixed Wagner revision stem. We performed revision surgery by fixing a cement block around the proximal lateral shaft, which created a round seal. To further smoothen the surface and to allow adherence of soft tissue, a polyester patch was attached on the cement seal. Finally, a distal Z-plasty was performed to lengthen the iliotibial tract. Twelve months postoperatively, the patient reported a reduction of subjective pain of 50%. The initial VAS for pain was reported 9, in the follow-up appointment the subjective pain was reduced to a score of 4. Harris Hip Score improved from 45 points preoperatively to 75 points postoperatively.

Discussion: In the experience of the authors the combination of excessive femoral bone loss in Gruen zones 1 and 2 with a long taper fluted diaphyseally fixed uncemented stem can lead to a friction syndrome at the proximal iliotibial band overlying the prosthetic shoulder. The current literature does not provide a definition for this medical entity even though it is a recurrent problem in hip revision surgery with excessive bone loss. The authors therefore propose the term "Lateral hip prosthetic friction syndrome" (LHPFS) to describe this medical condition.

Our proposed new technical option was able to improve patient satisfaction and reduce pain by creating a cemented shield around the irritating metal stem combined with a lengthening plasty of the iliotibial band. Further studies are needed to evaluate if this operative solution is able to provide long long term satisfaction in patients suffering from LHPFS.

P041

Case report: Ankylosing posttraumatic hip osteoarthritis with functional leg length reduction

Christof Hunkeler; Patric Scheidegger; Christoph Schwaller

Solothurner Spitäler AG / Kantonsspital Olten

Introduction: Ankylosing posttraumatic hip osteoarthritis is a rarely described occurrence in orthopaedic literature. There is no standardized diagnostic or therapy scheme. The object is to present a patient with a posttraumatic osteoarthritis of the left hip with an ankylosing formation resulting in a functional leg length difference because of an adducted malposition.

Method: Our 72 years old female patient consulted us with a symptomatic left leg shortening of 3.5cm with episodes of back pain. She has a history of a left acetabulum fracture after an accident over 40 years ago and a hereditary disease osteogenesis imperfecta. Flexion in the hip was possible up to 70° with loss of rotation possibilities. Radiologically a massive hip osteoarthritis with ankylosing deformities and pelvic obliquity with a consecutive scoliosis (Cobb-angle: 23°). The orthoradiogram showed a balanced leg length with an acetabulum-high ankle joint distance of each 740mm. A CT-scan showed a healed multifragmentary acetabulum fracture. Subsequently a functional radiograph of the vertebrae in a comfortable stance with crossed legs pictured reversal of scoliosis. After demonstrating the radiological findings to the patient, we discussed the therapy possibilities and decided to implant a partial cemented hip arthroplasty despite the clarified fracture risk of osteogenesis imperfecta.

Results: Postoperatively our early-mobilized patient discharged with only paracetamol after 7 days. In our 6-week consultation the pelvis aligned horizontally in a standing position, hip flexion was 80° and internal/external rotation was 10°/15°. A comfortable stance without increasing shoe insert was possible. Radiograph showed a balanced leg length.

Discussion/Conclusion: Even though our surgery was a great success with a happy patient, a preoperative MRI could enhance performance by giving a better soft tissue overview. The decision to implant a cemented stem due to the osteogenesis imperfecta in a 72-year old woman with only little pain could present difficulties in a possible stem revision if implant failure would occur.

P042

Re-articulation 72 years later after Girdlestone resection arthroplasty due to tuberculous coxitis in childhood

Andrej M. Nowakowski

Kantonsspital Baselland

Introduction: Tuberculous coxitis accounts for about 15% of all osteoarticular tuberculosis cases and is the second most common after spinal tuberculosis. In extensive cases, Girdlestone resection arthroplasty is an option for primary surgical treatment followed in the course of time, with total hip arthroplasty (THR) to increase function. However, the remaining bone stock is generally poor.

Case Presentation: A 76-year-old male patient was admitted to our department with a painful hip, who had previously been treated with Girdlestone at the age of five years after being diagnosed with tuberculous coxitis. After an intensive and very detailed evaluation of treatment options, the decision fell upon re-articulating with a total hip arthroplasty, even though primary surgery lay seven decades back. An acetabular reinforcement ring and a PE low profile cup were inserted, cemented with less inclination to avoid or reduce hip instability. A fissure around the implant (Wagner cone stem) was secured with numerous cerclages. Postoperatively the patient suffered a prolonged delirium.

Result: Ten months after surgery the patient was satisfied with the result and reported a meaningful improvement in his daily quality of life. His mobility increased significantly, represented by his ability to climb stairs without being in pain or needing walking aids. Today, two and a half years after THR surgery, the patient still reports being satisfied and pain free.

Conclusion: Despite transient complications postoperatively, we are happy to report a very satisfactory clinical and radiologic outcome after ten months. The today 79- year-old patient reports having a higher quality of life since re-articulation of his Girdlestone situation.

P043

Degeneration of the acetabular labrum and medial retinaculum of the hip with associated pseudotumor in symptomatic FAI

Alexander Frank Heimann[1]; Jospeh M Schwab [1]; Emanuel Gautier[1]; Edouard Stauffer[2]; Julien Galley[1]; Moritz Tannast[1]

[1] HFR Fribourg Cantonal Hospital and University; [2] ProMed medical laboratory SA

Background: While various tumors of the hip joint have been described, to date there is no description of pseudotumors of the acetabular labrum and/or medial retinaculum in patients with symptomatic femoracetabular impingement (FAI).

Purpose: We report the clinical, radiologic, macroscopic, and histologic presentation of these lesions. In addition, we outline appropriate treatment and discuss possible pathomechanisms.

Study Design: Multiple Case Report/Small Case Series (Level of Evidence IV).

Methods: We performed a retrospective analysis of all cases treated at our institutions and review outcomes.

Results: Three young adult patients presenting with FAI and tumor-like lesions of the acetabular labrum and/or medial retinaculum were reviewed. Presenting findings were groin pain, decreased internal rotation, and positive FADIR on clinical examination. MRI revealed a well-demarcated intra-articular lesion adjacent to the labrum or medial retinaculum. One case showed a diffusely enlarged labrum with cystic foci. All three patients underwent surgical hip dislocation with tumor resection and FAI-correction. The lesions were directly adjacent to the area of impingement and appeared grossly as flat, lobular, and whitish tumors. Histological analysis revealed fibromatosis-like degeneration. No evidence of malignancy was seen in any of the cases. During the mean follow-up period of 2.3 years, all patients were free of recurrence.

Conclusion: In symptomatic FAI patients, pseudotumors of the acetabular labrum or medial retinaculum may be encountered. Repetitive trauma at the impingement site with entrapment of the labrum/retinaculum seems to be the most likely cause. Treatment for these lesions includes tumor resection and correction of the underlying pathologic impingement.

P044

Influence of acetabular and femoral morphology on pelvic tilt – a study in 400 patients

Alexander Frank Heimann; Valerie Murmann; Jospeh M Schwab ; Moritz Tannast

HFR Fribourg Cantonal Hospital and University

Background: The relationship between pelvic tilt and pre-arthritic conditions of the hip joint are not well understood.

Purpose: 1) To investigate the relationship between pelvic tilt and previously described subgroups of acetabular and femoral morphology in patients with symptomatic hip pain and 2) to evaluate the influence of age and sex on pelvic tilt in this cohort.

Study Design: Cross-sectional study. Level of evidence III.

Methods: Medical records of 377 patients (408 hips) that were treated for symptomatic hip pain at our tertiary referral centers for hip preservation surgery between 2011 and 2015 were reviewed. Pelvic tilt was determined on AP pelvis radiograph for all patients using the previously validated software HipRecon. Patients were then divided into twelve different morphologic subgroups based on radiographic hip parameters. The pelvic tilt for each subgroup was compared to a control group of asymp-

tomatic patients. We then performed a stepwise multiple regression analysis to assess the overall and within-group influence of the variables age and sex on pelvic tilt.

Results: The mean pelvic tilt of the control group was 1,1 ± 3,0° (range -4,9° to 5,9°). None of the seven femoral pathomorphologic subgroups had a statistically significant different mean pelvic tilt in comparison to the control group. In the five acetabular morphologic subgroups, there were two pathomorphologies with a statistically significant different pelvic tilt: Acetabular retroversion (mean pelvic tilt 3,3 ± 3,0° [range -2,2° to 10,1°] and Overcoverage (mean pelvic tilt 3,7° ± 3,2° [range -1,2° to 13,2°]).

Stepwise regression analysis showed a significant influence of sex on pelvic tilt (men with a mean pelvic tilt of 0,4 ± 3,0° [range -6,9° to 13,2°] and women with a mean pelvic tilt of 3,2 ± 3,1° [range -6,8° to 11,7°]). Age did not show any significant influence on pelvic tilt.

Conclusion: Pelvic tilt does not seem to be associated with different femoral pathomorphologies. It also does not to seem to be age-dependent. The observed differences between some of the acetabular pathomorphologies in comparison with the control group, as well as the observed differences between genders, while statistically significant, are relatively low and of questionnable clinical importance.

P045

Biomechanical properties of the ligamentum teres in young patients undergoing surgical hip dislocation

Vera M Stetzelberger[1]; Haruki Nishimura [2]; Justin FM Hollenbeck[2]; Justin R Brown [2]; Alexander Garcia[2]; Marc J Philippon [2]; Moritz Tannast[1]

[1] Cantonal Hospital Fribourg HFR, University of Fribourg; [2] The Steadman Clinic

Introduction: Lesions of the ligamentum teres (LT) are highly prevalent in young patients with hip pain. The origin of the lesions and basic function of the LT are not known. While it is assumed to provide stabilization to the hip joint, solid data about the biomechanical features are lacking. More information regarding structure and tensile properties would allow conclusions to be drawn on novel pathomechanisms and potential surgical treatment of LT tears.

Aims: to determine (1) ultimate load to failure, stiffness, tensile strength, and elastic modulus of fresh frozen ligaments from patients undergoing surgical hip dislocation compared to other ligaments of the human body. (2) if demographic, anatomic and degenerative factors are associated with different biomechanical properties.

Methods: IRB approved study on intraoperatively harvested LTs of 41 consecutive patients undergoing surgical hip dislocation for joint preservation. Exclusion of patients with previous surgeries, post-traumatic, avascular necrosis, slipped capital femoral epiphysis and Perthes. The ligament was thoroughly transected at its origin on the fossa acetabuli and at the insertion area on the fovea capitis. Storage at -20° C. Specimens were mounted to a materials testing machine (Instron Electropuls 10,000, Norwood, MA, USA) via custom clamps that minimized slippage and likelihood of failure at the clamp. Force-displacement/stress-strain curves were generated. Ultimate failure load, tensile strength were measured; stiffness (N/mm) and elastic modulus (MPa) were determined by calculating the slope of the linear portion of these curves.

Results: (1) The mean ultimate load to failure of the LT was 126 N, compared to values from the literature of 351 N for the iliofemoral and 136 N for the ischiofemoral ligaments. (2) Younger age, female gender, and excessive femoral torsion were associated with significantly higher load to failure rates (p = 0.01; 0.04; 0.04 respectively), whereas degenerative changes on the fossa acetabuli and fovea capitis with lower rates (p = 0.02; 0.03 respectively).

Conclusion: The LT is significantly weaker compared to other stabilizing ligaments. This suggests that the LT has rather a proprioceptive and nociceptive than a stabilizing function. The tensile properties of the LT depend on a variety of factors, the LT being stronger in young, female patients, and weaker in presence of associated degenerative lesions of the fossa acetabuli and fovea capitis.

P046

Does the false profile view really show anterior cover?

Tobias Koller; Clemens Reisinger; Martin Beck

Orthopädische Klinik Luzern

Introduction: To quantify the anterior acetabular coverage of the femoral head, the Lequesne's vertical-center-anterior edge (VCA) angle is used on the false profile view. The lateral coverage is determined by Wiberg's lateral-center-edge (LCE) angle. The anterior delimitation of the acetabular roof is defined by the end of the sclerotic line on the false profile view and the lateral delimitation of the acetabulum is defined by the end of the sclerotic line on the AP view. To our knowledge the exact anatomic location of the points used for measurement on the acetabular rim are not knows.

Method: Six hips from three cadaver pelvises (3 male and 3 female) were investigated. The anterior and lateral points of interested were identified radiographically using fluoroscopy and marked with 1mm ceramic bullets. Standard false profile views and AP pelvic views in neutral inclination and rotation were taken to check the correct location of the ceramic bullets. A CT of each pelvis was performed to locate the ceramic bullets and define the exact anatomic location of the measurement points with the o'clock position. 6 o'clock was defined as the midpoint between anteroinferior and the posteroinferior rim edges. Values were normalized for a right hip.

Results: The mean clockface location for the VCA was 1:33 (range, 1:15 to 1:40) and for the LCE 0:38 (range, 0:20 to 0:50).

Discussion: Surprisingly, the point used for measuring the VCA is much more lateral on the acetabular rim than expected and therefore its use to assess anterior cover has to be questioned. The LCEA is slightly posterior to the 12 o'clock position and remains a useful tool to quantify the lateral coverage. The discrepancy to other studies in the literature is that this study identifies and measures the end of the weight bearing zone, while others used the extremes of the bony acetabulum.

P047

Direct Anterior Approach for Total Hip Arthroplasty using a Modified Winged Charnley Retractor

Alexander Vacariu-Seelig; Andrej M. Nowakowski

Kantonsspital Baselland

Purpose: In total hip arthroplasty (THA), the direct anterior approach (DAA), using the Charnley retractor frame allows a good view of the deep situs. The approach is described as being minimal invasive and muscle sparing, enabling patients to recover faster with less initial post-operative pain. However, some reports have described lesions to the musculus tensor fasciae latae (TFL) during THA due to the sharp edges of the Charnley retractor, increasing soft tissue harm. The muscle sparing advantage of performing the direct anterior approach for THA would herewith be mitigated. Therefore, we modified the lateral

hook by adding small "wings" to protect the surrounding soft tissue and to be in line with the raison d'être of performing the anterior approach.

Material/Methods: A CAD Modell was successively adapted before an illustrative model was produced. The second prototype developed was a custom-made titan hook, which was tested intraoperatively for a DAA in THA. Results were considered pleasing and thus a definitive instrument was manufactured.

Results: Intraoperative comparison of the original vs. the modified retractor demonstrated that the adapted Charnley hook with the winged borders, showed less damage to the TFL in its first applications via DAA and thus less muscle impairment.

Conclusion: The wings of the modified Charnley retractor are able to protect the soft tissue during THA, thus reducing intraoperative muscle lesions when compared to using the conventional Charnley retractor with its sharp edges. Especially in the setting of a teaching hospital with residents or young consultants operating via DAA or with low-volume surgeons this modification has a positive effect on postoperative outcomes.

P048

Prospective clinical and radiographic 10-year results of Fitmore short-stem total hip arthroplasty

Jana Felicitas Schader[1]; Caroline Thalmann[1]; Katharina Sophia Maier[2]; Tom Schiener[2]; Karl Stoffel[3]; Arno Frigg[2]

[1] Kantonsspital Graubünden; [2] Universität Basel; [3] Universitätsspital Basel

Introduction: Short stems were introduced to total hip arthroplasty (THA) to preserve bone stock, transmit more load to the proximal femur and enable minimal invasive approaches. With a follow-up of 10 years, this study is a long-term study reporting survival, as well as clinical and radiographic outcomes of the Fitmore short hip stem.

Methods: 80 primary THA (78 patients; male 61% / female 39%; age 61±10 years) were prospectively evaluated from preoperative to 10 years postoperative. The parameters were clinically thigh pain, EQ-5D, Harris Hip Score (HHS), Oxford Hip Score, and radiographically cortical hypertrophy (CH), bone condensation, cortical thinning, radiolucency, reactive lines, calcar rounding, calcar resorption, subsidence and varus/valgus position.

Results: After 10 years, there was a survival rate of 99% (1 revision because of aseptic stem loosening). HHS had improved from 59 to 94 and Oxford Hip Score from 22 to 43. CH rate after 1 year was 69% and after 10 years 74%. In the first year, radiolucency was found in 58% and in 17,5% after 10 years. Subsidence after 1 year was 1.6 ± 1.55mm and 5.0 + 3.10mm after 10 years.

Conclusion: The Fitmore short hip stem showed an excellent survival as well as clinical and radiographic outcomes in the long-term follow-up of 10 years.

P049

Resurfacing Hip Arthroplasty is a Safe and Effective Alternative to Total Hip Arthroplasty in Young Patients: A Systematic Review and Meta-Analysis

Alessandro Bensa[1]; Michele Palazzuolo[2]; Stefan Bauer[3]; William G. Blakeney[4]; Giuseppe Filardo[1]; Martin Riegger[1]

[1] EOC (Ente Ospadaliero Cantonale) - Ospedale Regionale di Lugano; [2] Ospedale Regionale di Locarno La Carità (EOC); [3] Ensemble Hospitalier de la Côte (EHC) Morges Hospital; [4] Royal Perth Hospital, Australia

Introduction: This systematic review and meta-analysis of randomized controlled trials (RCTs) aimed at comparing resurfacing hip arthroplasty (RHA) and total hip arthroplasty (THA) in terms of rate of complications, revisions, functional outcomes, blood loss, operative time, and metal ions levels.

Methods: The search was conducted on three databases (PubMed, Cochrane and Web of Science) updated until October 13, 2022. Inclusion criteria were RCTs written in English language, with no time limitation, comparing RHA and THA.

Results: Among the retrieved 4748 articles, 18 RCTs were eligible for a total of 776 patients (mean age 53.1 ± 5.0). A meta-analysis was performed. RHA reported significantly lower blood loss compared to THA ($p < 0.001$), but longer operative time ($p < 0.001$). No statistically significant difference was found between RHA and THA in terms of complications (12.08% and 16.24%, respectively), revisions (6.32% and 6.14%, respectively).

Conclusion: Both RHA and THA provide excellent clinical results in a population of young and active patients. Functional outcomes were not significantly different between the groups. Moreover, no significant difference in metal ion levels was found. These findings provide evidence concerning the safety and clinical effectiveness of RHA. Because of its bone-preserving properties, the lack of drawbacks and good outcome, RHA appears to be a valid alternative to THA in young and active patients.

P050

The Optimal Targeted Combined Anteversion to Avoid Anterior Dislocation in Total Hip Arthroplasty Through the Direct Anterior Approach

Dimitris Dimitriou; Christoph Zinde; Elin Winkler; Frédéric Cornaz; Peter Mazel; Patrick Zingg

Balgrist Universitätsklinik

Background: Component malposition in total hip arthroplasty (THA) could lead to dislocation, early implant failure, and revision surgeries. The importance of combined anteversion (CA), defined as the sum of acetabular and femoral component anteversion, in preventing THA dislocation has been widely accepted. However, the surgical approach might affect the targeted CA of THA components, and consequently different "safe zones" might be necessary depending on the surgical approach. The aim of the present study was to evaluate the optimal targeted CA to avoid anterior dislocation in primary THA performed through the direct anterior approach (DAA)

Methods: Consecutive patients who underwent a primary THA through the DAA from January 2015 to December 2019 for primary or secondary hip osteoarthritis were identified. Exclusion criteria were THA through a surgical approach other than the DAA, revision hip arthroplasties, hemiarthroplasty, hip resurfacing, dual mobility components, constrained THA, or patients with severe neuromuscular disorders. A total of 1176 THAs in 1147 patients (males: 593, females: 554) with an average age of 63 ± 13 (range: 24 to 91) years and BMI of 29 ± 10 (range: 15 to 48) kg/m2 were identified. A 28 mm femoral head was used

in 796, whereas a 32 mm head in 380 cases. Medical records including outpatient clinic notes, operative reports, and hospital records for readmission were reviewed for dislocation. The postoperative radiographs were assessed to measure the acetabular inclination and CA using a previously validated radiographic method.

Results: An anterior dislocation occurred in 19 patients at an average of 7 ± 7.8 (range: 1 to 32) weeks postoperatively, whereas no posterior dislocations were observed. The average CA in patients with and without dislocation was 66 ± 8 (range: 48 to 83) ° and 45 ± 11 (range: 12 to 78) °, respectively (p <.001). In 5/19 (26%) of the patients a THA was performed for a secondary osteoarthritis and 17/19 (89%) had a 28 mm femoral head. The receiver operator curve analysis demonstrated that a CA≥60° yielded a sensitivity of 93% and specificity of 90% for predicting an anterior dislocation in the present cohort. A CA≥60° was associated with a significantly higher risk of anterior dislocation (OR = 111, p <.001) following a primary THA through the DAA compared to patients with a CA <60 points.

Conclusion: The optimal targeted CA in primary THA performed through the DAA should be less than 60°.

P051

Can abnormal femoral torsion be accurately assessed on anteroposterior pelvis radiographs?

Matthieu Hanauer; Alexander Frank Heimann; Vera M Stetzelberger; Hanna Wellauer; Joseph Michael Schwab; Moritz Tannast

HFR Fribourg Cantonal Hospital, University of Fribourg

Introduction: Since the concept of femoroacetabular impingement (FAI) was first described in the literature in 2003, new knowledge of this pathomorphology has emerged. In particular, femoral torsion has been established as the third pillar of FAI directly influencing surgical treatment and outcomes. Its assessment is mandatory in the diagnostic workup of symptomatic hips.

We asked: Can abnormal femoral torsion be assessed on standardized anteroposterior (AP) pelvis radiographs?

Methods: We retrospectively reviewed a consecutive series of 580 symptomatic hips (527 patients) that presented to the outpatient clinic of two tertiary centers with extensive expertise in joint-preserving hip surgery. As part of the routine diagnostic workup, all patients underwent standardized AP pelvis radiographs and either CT or MRI imaging of the symptomatic hip, including slices of the distal femur. We excluded all patients with posttraumatic deformity of the proximal femur or acetabulum, or sequelae of pediatric hip disease.

We defined three parameters at the level of the proximal femur visible on AP pelvis radiographs: (1) the "V-sign", an overlap of the lateral border of the ischium and the femoral neck and/or head, (2) ratio A: the ratio of the width of the lesser trochanter to the width of the femoral shaft at the same level, and (3) ratio B: the ratio of the width of the greater trochanteric double contour to the width of the greater trochanter at the level of the insertion of the obturator externus tendon. We used simple logistic regression analysis as well as a stepwise multiple logistic regression to compare the three calculated parameters with the patients' femoral torsion measured on CT/MRI according to Murphy.

Results: Simple regression analysis demonstrated no statistically significant correlation between femoral torsion and either the "V-sign" (p = 0,1424) or ratio B (p = 0,684). A statistically significant, but weak correlation for ratio A (r = 0,19, p = 0,001) was identified. Stepwise multiple regression analysis did not reveal any statistical significance between femoral torsion and any combination of our parameters.

Conclusion: Abnormal femoral torsion cannot be accurately estimated on AP pelvis radiographs using any of the three parameters in this study. We therefore continue to recommend additional imaging modalities such as a CT scan or MRI including slices of the distal femur to accurately measure femoral torsion in symptomatic FAI patients.

P052

Direct subtrochanteric derotation osteotomy through lateral subvastus approach using a 5.0mm-130°-LCP (Synthes®) for femoral torsion abnormalities in adults

Sophie Wolf; Jörg Bucher; Richard Friedrich Herzog

LUKS Wolhusen

Excessive femoral torsion can lead to ischiofemoral impingement with deep gluteal or groin pain exacerbating in extension/external rotation. It can induce intra-articular pathologies (labral tears, chondrolabral separation) and further proceed to osteoarthritis. Correction is indicated in symptomatic patients who typically have a femoral antetorsion of more than 30°. There are different operative techniques, e.g. endomedullary nailing methods, propagating a minimal invasiveness. However the abductors can be harmed and rotatory precision is difficult to control. Conversely there are open procedures bearing the reputation of increased invasiveness. We have optimized such technique and see a wide number of advantages. In this illustrated description, we demonstrate our technique with a subvastus approach using the 5.0mm-130°-LCP pediatric hip plate by Synthes for fixation.

The patient is in supine position with the operated leg in the extension bearing. Lateral skin incision is followed by a subvastus approach where the M. vastus lateralis is incised in an L-shape at its origin. The plate is placed preliminary and the locking neck screws are predrilled under fluoroscopic control. Height of osteotomy is defined at the distal portion of the lesser trochanter. The rotational correction is marked with k-wires placed in the planned angle, one each proximal and distal to the osteotomy. The plate is removed and the osteotomy is done in two steps to maintain control of the distal femur, starting at the lateral half. The plate is refixed with the locking screws and held against the distal femur with a wire cerclage. After medial completion of the osteotomy the distal femur is rotated under slight extension until the K-wires are parallel. The plate is fixated with eccentric drilled cortical screws resulting in interfragmentary compression. The M. vastus lateralis is attached at its origin via fascial sutures, followed by layered wound closure.

We believe this is a safe method with several advantages: A short skin incision is used and the subsequent subvastus approach is muscle-sparing. Via direct access to the osteotomy site derotation can be performed very precisely with excellent reproducibility. Interfragmentary compression is applied, resulting in excellent fixation and early consolidation which is further promoted by performing the osteotomy in cancellous bone at the lesser trochanter. The patients tolerate the procedure well and report a high satisfactory rate.

P053

RM Pressfit Vitamys: The 10-Year Follow-up

Zinedine Zwahlen; Martin Beck; Ralf Baumgärtner; Björn-Christian Link; Pascal C Haefeli

LUKS Luzern Orthopädie/Trauamtologie

Introduction: The RM Pressfit vitamys is an uncemented, titanium particle coated, isoelastic monoblock cup made of vitamin E blended highly cross-linked polyethylene. Long-term data has not yet been published. We addressed the following questions: (1) What are the clinical and (2) radiographic outcomes ten years after implantation, and (3) what is the revision rate?

Methods: This prospective observational study has investigated all consecutive cases of total hip replacements in which the RM Pressfit vitamys cup was used between September 2009 and November 2011 at one hospital. It was implanted in 162 hips, 82 in men and 80 in women. The mean age was 67.2 (standard deviation [SD] 9.5) years, and the mean BMI was 27.3 (SD 4.7) kg/m2. In 152 (93.8%) cases primary or secondary osteoarthritis was the indication for surgery. Anchoring screws were used in two cases. Data regarding patient demographics, surgery, and hospital stay were collected. We evaluated preoperative and follow-up data at six weeks, one, five, and ten years. Complete follow-up consisted of Harris Hip Score (HHS), pain and satisfaction on a visual analogue scale (VAS), radiographic evaluation, complications, and revision rate.

Results: At ten-year follow-up (mean 120.5 months, range 118 – 126 months), 99 cases were available for clinical and radiographic evaluation. (1) Mean HHS after ten years was 94.8 (SD 9.9), rest pain 0.2 (SD 0.6), load pain 0.5 (SD 1.5) and satisfaction 9.5 (SD 1.1). Mean improvement compared to preoperative values was +33.7 (SD 16.8), -3.3 (SD 2.7), -6.0 (SD 2.4), and +5.7 (SD 2.6) respectively. (2) In the radiographic evaluation after ten years, no loose cups were detected, but acetabular lucent lines were observed in five cases and acetabular osteolysis in one case. (3) The cumulative revision rate at ten-year follow-up was 2.0% (95%CI 0.0 - 4.2%). One cup was reorientated and fixed with screws three days after primary implantation. One cup was revised due to a psoas impingement after approximately two years. One stem was revised due to an extraarticular impingement between trochanter major and pelvis three years after implantation. No adverse events in possible relation to the cup were reported.

Conclusion: At the ten-year follow-up, the RM Pressfit vitamys cup continues to show promising long-term results with good clinical and radiographic outcomes and a low revision rate.

P054

Optimys short stem in primary total hip arthroplasty: a 5-year analysis of 268 cases

Victoria Teufel; Rolf Hess; Jonathan Spycher; Sergio Thomann; Christian Brand ; Lilianna Bolliger; Martin Beck

Introduction: The Optimys prothesis is an uncemented short stem, designed for bonepreserving primary minimally-invasive total hip arthroplasty (THA). A total of 21118 Optimys stems were used for THA within in the last 10 years (2012-2022). The aim of this study was to look at the long-term outcome regarding the overall patient satisfaction, as well as radiological signs of loosening and revision rates of the Optimys short stem in comparison with comparable uncemented stems used for THA.

Methods: 265 patients (268 THA) were included. 30 patients were lost to follow-up (17 deaths, 3 location change, 10 unclear). The data was collected prospectively in the SIRIS Register, statistical analysis was carried out through the SwissRDL. The radiographic analysis concerning shaft migration and radiolucency was carried out visually by an external from the study independent orthopedic surgeon. The Harris-Hip Score as well as WOMAC-Score were used for evaluation of patient satisfaction 5 years after primary implantation.

Results: Shaft subsidence was predominantly seen within the first 6-12 weeks after primary implantation. In total 8 revisions were necessary, out of which 5 included a revision of the femoral stem (3 periprosthetic fractures, 1 femoral loosening, 1 infection). The cumulative revision-rate 5-years postoperative was at 2.3% (CI 1.0-5.1), while the Kaplan-Meier revision-rate of other uncemented stems lies at 3.8% (CI 3.7-3.9). The mean HH-Score was at 91.8 points, leading to a mean improvement of 39.06 points. Similar satisfactory outcomes were depicted using the WOMAC-Score with an overall decrease from 45.6 points at baseline to a mean of 3.8 points 5 years postoperative.

Conclusion: After initial migration, the Optimys shaft achieves secondary stabilization with a low rate of further shaft subsidence or migration, suggesting a low-risk for secondary, aseptic loosening. The HHS and WOMAC-Score show a high improvement in patient satisfaction. The cumulative revision rate of the Optimys shaft can be compared to other, established short stem shafts. Nevertheless, further workup to evaluate the long-term outcome of the Optimys shaft remains necessary.

POSTERS: A05 KNEE

P055

Planned realignment osteotomies ahead of knee arthroplasty (TKA) for pronounced joint malalignment in Hereditary Multiple Exostoses (HME) disease

A case report

Tim Schmid; Pascal A. Schai

[1]Luzerner Kantonsspital Wolhusen

Introduction: Patients with HME are subjected to early knee arthritis for disease-induced joint malalignment impeding arthroplasty supply. We report the case of a 54 year old male patient with advanced left knee osteoarthritis due to 22° varus deformity of the distal femur (mLDFA 108°) and 19° valgus deformity of the proximal tibia (mMPTA 106°). The treatment strategy was to strive for a near normal joint line through femoral and tibial osteotomies, preparing for later knee arthroplasty according following principles:

- Correct mechanical alignment of knee arthroplasty
- Preservation of osteoligament structures
- Lowest level of arthroplastic constraint
- Avoidance of revision components in primary TKA

Methods: Initial double level correction with simultaneous medial closing wedge osteotomy of the proximal tibia and medial opening wedge osteotomy of the distal femur inserting the tibial wedge into the femoral osteotomy gap was performed. Residual distal femur alignment (mLDFA 100°) required a second femoral correction step with closing wedge osteotomy of the distal lateral femur, resulting in femoral and tibial joint lines (mMPTA 88°, mLDFA 91°) within standard boundaries.

Results: Due to progressive knee arthritis refractory to conservative treatment knee arthroplasty was indicated. With favourable alignment and MRI confirmed structural integrity of the collateral ligament structures, non-constrained knee arthroplasty was considered suitable. TKA via anteromedial approach with tuberosity osteotomy for quadriceps contracture was performed, using navigational support to correct for residual arthritic varus deformity (9.5°), and primary arthroplasty components and fixation technique. According to long standing radiograph imaging at 3 months follow-up, correct tibiofemoral alignment and joint line orientation were approved.

Conclusion: The aim of axial realignment by means of correction osteotomies about the knee joint enabling consecutive implantation of a primary TKA was achieved. Given the favourable clinical and radiographic results, the presented treatment strategy is recommended for patients with knee arthritis in HME disease or other sequelae with severe leg malalignment requiring knee arthroplasty. This may in turn result in optimal functional results and longest possible survival of the arthroplastic knee joint.

P056

A Decreased Tibial Tuberosity-Trochlear Groove Distance is Associated with Lateral Patellofemoral Joint Degeneration after Implantation of Medial Fixed-bearing Unicompartmental Knee Arthroplasty – A Minimum 5 Year Follow-up

Octavian Andronic; Marco Rohner; Näder Helmy; Christoph Kellner; David Alexander Graf

Bürgerspital Solothurn

Purpose: The influence of lateral patellofemoral osteoarthritis (PFOA) in medial unicompartmental knee arthroplasty (UKA) is controversial. Our aim was to identify radiographic factors that may lead to progressive PFOA after implantation of a fixedbearing medial UKA and their impact on patient-reported outcomes (PROMs).

Methods: A retrospective consecutive cohort of patients undergoing medial UKA with a minimum follow-up of 60 months between September 2011 and January 2017 was identified. All UKAs had a fixed-bearing design with cemented femoral and tibial components. PROMs included documentation of the Oxford Knee Score (OKS). The following radiographic parameters were evaluated on conventional radiographs and CT scans: patella tilt angle, patella congruence angle, Caton-Deschamps index, medial and lateral patellofemoral degeneration (Kellgren-Lawrence Classification (KL)), mechanical anteroposterior axis, femoral torsion, tibial tuberosity to trochlear groove distance (TTTG), anteroposterior translation of the femoral component. A hierarchical multiple regression analysis and Partial Pearson correlation analysis (SPSS) were used to evaluate for predictors of progression of lateral PFOA.

Results: Forty-nine knees allowed PFOA assessment and had an average follow-up of 62 months (range 60 – 108). Twenty-three patients did not exhibit any progression of lateral PFOA. Twenty-two progressed with 1 stage, whereas 4 had progressed 2 stages according to the KL classification. TTTG negatively correlated with progressive lateral PFOA ($r = -0.436$, $p = 0.01$). Progression of lateral PFOA did not correlate with OKS at last follow-up ($p = 0.613$).

Conclusion: In our cohort, a decreased TTGT correlated with radiographic progression of lateral PFOA after medial fixed-bearing cemented UKA. PFOA however did not influence PROMs at a minimum of 5 years postoperatively.

Keywords: Knee Arthroplasty; Unicompartmental Knee Arthroplasty; Unicondylar Knee Replacement; Partial Knee Arthroplasty

P057

Pseudoaneurysm of the superolateral genicular artery following ACL outside-in reconstruction: a rare case report

Carmen Castroviejo; Olivier Siegrist; Lampros Gousopoulos

Hôpital du Valais (RSV) – Centre Hospitalier du Valais Romand

Introduction: Intra and post-operative complications of arthroscopic reconstruction of the anterior cruciate ligament (ACL) are rare. We here report the case of a pseudoaneurysm of the superolateral genicular artery following ACL reconstruction (ACLR) through an outside-in drilling technique.

Presentation of the case: A 25-year-old patient sustained an ACL rupture to her left knee. ACLR was performed as described above. Four weeks after surgery, she presented to our clinic

with a painful pulsatile 4x3cm mass on the lateral femoral condyle, confirmed on computed tomography angiography to be a pseudoaneurysm of the superolateral genicular artery. Treatment consisted of two US-guided embolizations with thrombin at 24 hours interval. Short- and long-term follow-up demonstrated satisfactory evolution and absence of sequelae.

Discussion: Arterial pseudoaneurysms are caused by trauma to the arterial wall, mainly of iatrogenic nature. Above 3 cm in size, they typically do not resolve spontaneously and US-guided embolization with thrombin is vastly accepted as first choice treatment. Although not the same entity as acute trauma to the artery causing wall disruption and bleeding, we suggest to routinely deflate the tourniquet, if any is used, before skin closure to visualize and treat any identified vascular lesion.

Conclusion: Pseudoaneurysm of the superolateral genicular artery is a rare complication of arthroscopic ACL + ALL reconstruction using an outside-in drilling technique. A painful pulsatile mass on the lateral femoral condyle may be the only symptom of vascular injury. Similar treatment as for other traumatic/iatrogenic pseudoaneurysms may be used successfully.

P058

Pathologic periprosthetic fractures around stable knee arthroplasty. Observations on two patients, one with tibial, one with femoral fracture

Pascal A. Schai[1]; Gerardo J Maquieira[2]; Erich Wilms; Natasha Forster[3]; G. Ulrich Exner[4]

[1] Luzerner Kantonsspital Wolhusen; [2] FussZentrum Hirslanden; [3] Swissparc AG; [4] Orthopädie Zentrum Zürich

Introduction: The goal of treating Periprosthetic Fractures (PF) is to retain a stable endoprosthesis and bone healing. In Pathologic Periprosthetic Fractures (PPF) the underlying pathologic process deserves consideration including chemotherapy, radiotherapy or curative resection (e.g. solitary renal carcinoma metastasis). Healing of pathologic fractures is generally compromised.

In tibial PF around stable knee arthroplasty (TKA), osteosynthesis is performed mostly using locking plates. For femoral PF options are plating or intramedullary nailing. Occasionally replacement by megaprosthesis may be an option.

Patient and Methods: F, 83 years, plasmacell myeloma, proximal tibia fracture and impending fracture through distal osteolysis, stable TKA implanted 10 years ago. Locking nail stabilization was attempted; however reaming led to perforation of the dorsal cortex and impossibility to pass the nail over the isthmus. The long plate implanted instead led to skin slough and infection with pseudomonas aeruginosa. Following removal of the plate, extensive debridement, angioplasty and antibiotic treatment, infection was controlled. Stabilization then was achieved with a short plate for the proximal and by an arthrodesis nail for the distal fracture.

F, 80 years, distal femoral fracture, multiple metastases of unknown primary, TKA 10 years ago. Stabilization of the fracture by a retrograde nail followed by radiotherapy allowed immediate weight bearing.

Results: At one year f/u the patient with tibial fractures walks short distances with full weight bearing. The patient with femoral fracture was mobilized immediately postoperative. 6 weeks after percutaneous radiotherapy callus formation developed. Presently she is under immune therapy and asymptomatic from the vertebral and skull metastases.

Conclusion: Intramedullary nailing of long bone metastases is the accepted standard method allowing less invasive procedures and immediate radiotherapy. However possible intramedullary tumor distribution need be considered, especially in radioresistant pathologies (e.g. renal cell carcinoma) and those accessible to local resection and other reconstructive means.

The newer shape of retrograde nails facilitate insertion through the intercondylar box of the femoral knee replacement components. The patient with the tibia lesion taught us to consider 'off-label' use of implants to avoid wound problems related to plate osteosynthesis of the distal tibia in fragility fractures.

P059

Patient-reported, clinical and functional outcomes 2-years after ACL repair and InternalBraceTM augmentation- comparable to gold standard ACL reconstruction and healthy controls?!

Sebastian Müller; Linda Bühl; Corina Nüesch; Geert Pagenstert; Annegret Mündermann; Christian Egloff

Klinik für Orthopädie und Traumatologie, Universitätsspital Basel, Basel, Schweiz; Department of Biomedical Engineering, Universität Basel, Basel, Schweiz; Department Klinische Forschung, Universität Basel, Basel, Schweiz

Introduction: To date, scientific evidence for the functional benefit of primary ACL repair with InternalBraceTM augmentation (IB) compared to gold standard ACL reconstruction (ACL-R) and healthy controls is not readily available.

Methods: In this comprehensive, comparative study 29 patients 2 years after IB, 27 sex- and age- matched patients 2 years after ACL-R (hamstring autografts) and 29 matched healthy controls (CTR) were included. No demographic differences were noted between groups (female:male, IB/CTR 13:16; ACL-R 13:14; mean age IB/ACL-R/CTR: 36.8/37.0/37.0 years; body mass index: 25.5/24.5/23.1 kg/m2). Patient reported outcome was assessed using the IKDC, ACL-RSI and Tegner Activity Scale (TAS) scores. Surgery time and passive range of motion (ROM) was recorded. Isokinetic muscle strength was measured using a dynamometer, and hamstring-quadriceps-ratio (H/Q-ratio: flexors/extensors) calculated for each limb.

Results: The IKDC was (median and 25;75 percentiles) IB: 85.0 [75.9;92.5], ACL-R: 82.0 [75.9;87.4] and CTR: 97.7 [96.6;100.0] (IB vs. ACL-R: p = .033). The ACL-RSI was IB: 75.6 [56.3,87.9], ACL-R: 74.2 [61.7;88.3] and CTR: 95.6 [89.1;100.0] (IB vs. ACL-R: p = .091). IKDC and ACL-RSI for both patient groups remained below levels of controls (all p <.05). Postoperative TAS at final follow-up was 4.0 in both patient groups as well as in matched controls (all groups: p = .33). Surgery time, including concomitant surgeries, was significantly shorter after ACL-IB (81 minutes) compared to ACL-R (97 minutes, p = .02). The only significant differences for ROM were found for ACL-R compared to CTR (ACL-R operated: 142° vs. CTR non-dominant leg: 153°, p <.001). Isokinetic muscle strength was comparable between patient groups where IB had better postoperative restoration of extensor muscle strength than ACL-R. Consequently, H/Q-ratios of the operated extremity for IB (median and 25;75 percentiles 0.61 [0.58; 0.70]) compared to ACL-R (0.69 [0.58; 0.81]) revealed ratios closer to CTR (0.55 [0.48; 0.63]). However, differences between IB and ACL-R were not significant (p = .21).

Conclusion: Two years after surgery, patients treated with IB showed good to excellent patient reported, clinical and functional outcomes that were comparable (with a tendency towards superiority) to those in patients after ACL reconstruction. Hence, after careful patient selection, IB should be considered as valuable first-line treatment alternative for proximal ACL tears.

P060

The influence of the weight-bearing state on three-dimensional (3D) planning in lower extremity realignment – analysis of novel vs. state-of-the-art planning approaches

Sandro Hodel; Tabitha Roth; Florian Haug; Fabio Carrillo; Lazaros Vlachopoulos ; Sandro F. Fucentese; Philipp Fürnstahl

Balgrist University Hospital

The use of 3D planning to guide corrective osteotomies of the lower extremity is increasing in clinical practice. The use of computer-tomography (CT) data acquired in supine position neglects the weight-bearing (WB) state and the gold standard in 3D planningnvolves the manual adaption of the surgical plan after considering the WB state in long-leg radiographs (LLR). However, this process is subjective and dependent on the surgeons experience. A more standardized and automated method could

The purpose of this study is to validate a new, standardized approach to include the WB state into the 3D planning and to compare this method against the current gold standard of 3D planning. Our hypothesis is that the correction is comparable to the gold standard, but shows less variability due compared to the more subjective hybrid approach.

Three surgical planning modalities were retrospectively analyzed in 43 legs scheduled for MOWHTO between 2015 and 2019. The planning modalities included: 1) 3D hybrid (3D non-weight-bearing (NWB) CT models after manual adaption of the opening angle considering the WB state in LLR, 2) 3D NWB (3D NWB CT models) and 3) 3D WB (2D/3D registration of 3D NWB CT models onto LLR to simulate the WB state). The pre- and postoperative hip-knee-ankle angle (HKA) and the planned opening angle (°) were assessed and differences among modalities reported. The relationship between the reported differences and BMI, preoperative HKA (LLR), medial meniscus extrusion, Outerbridge osteoarthritis grade and joint line convergence angle (JLCA) was analyzed.

The mean (std) planned opening angle of 3D hybrid did not differ between 3D hybrid and 3D WB (0.4 ± 2.1°) (n.s.) but was higher in 3D hybrid compared to 3D NWB (1.1° ± 1.1°) (p = 0.039). 3D WB demonstrated increased preoperative varus deformity compared to 3D NWB: 6.7 ± 3.8° vs. 5.6 ± 2.7° (p = 0.029). Patients with an increased varus deformity in 3D WB compared to 3D NWB (>2 °) demonstrated more extensive varus alignment in LLR (p = 0.009) and a higher JLCA (p = 0.013).

Small intermodal differences between the current practice of the reported 3D hybrid planning modality and a 3D WB approach using a 2D/3D registration algorithm were reported. In contrast, neglecting the WB state underestimates preoperative varus deformity and results in a smaller planned opening angle. This leads to potential under correction in MOWHTO, especially in patients with extensive varus deformities or JLCA.

P061

Higher eccentric hamstring muscle fatigue in soccer match participation of young female players

Sebastiano Nutarelli[1]; Jacopo Emanuele Rocchi [2]; Manuela Salerno [3]; Alessandro Sangiorgio[1]; Luca Deabate[1]; Giuseppe Filardo [1]

[1] Ente Ospdealiero Cantonale EOC; [2] University of Rome Foro Italico, Rome, Italy; [3] IRCCS Istituto Ortopedico Rizzoli, Bologna, Italy

Background: Hamstrings (HS) strength deficits and imbalance have been identified as risk factors for sustaining an ACL injury and muscular strains, with HS injuries being the most prevalent muscle injuries in all-level soccer players. Aim of this study is to investigate and quantify HS eccentric strength before and after a soccer match in both men and women soccer players.

Hypothesis: Soccer players will show decreased eccentric HS strength following a soccer game, especially female players.

Study design: cohort observational study

Methods: Sixty-four healthy men and women semi-professional football players aged from 14 to 25 years old participated in this study. The HS eccentric strength (mean and absolute peak torque, and total work) was measured with an automatic device during the execution of the Nordic hamstring exercise (NHE test) before and after a 90-minute soccer match, with the concurrent measurement of the anterior-knee laxity (AKL) quantified with an arthrometer.

Results: Mean and absolute eccentric HS peak torque significantly decreased by 24.5 Nm (SD 49.1 - p <0.005) and 21.9 Nm (SD 49.2 - p <0.0005) in females, whereas their male peers significantly improved by 19.9 Nm (SD 40.5 - p = 0.01) and by 20.9 Nm (SD 46.1 - p = 0.02), respectively. HS total work in females significantly decreased by 831.1 J (SD 1149.6 - p <0.0005) compared to the males' reduction of 235.3 J (SD 1471.2). Both the pre- vs post-match inter-gender mean and absolute eccentric HS peak torque changes were statistically significant (p <0.0005), as well as the variations of the HS total work (p = 0.007). The pre- vs post-match AKL difference and the dominant vs non-dominant limbs comparison of the strength parameters showed no statistical difference. Younger female players (14-19 years old) present a statistically significant higher decrease in mean and absolute peak HS eccentric strength compared to older female players and males.

Conclusions: Eccentric strength and work of HS present differences based on the athlete's gender, as measured performing the NHE test. Mean peak, absolute peak, and total work showed more fatigability in females compared to their male peers. The subgroup of the 14-19 years old female players experienced the highest reduction in strength parameters.

Clinical relevance: These gender-specific findings should be considered in managing athletes to prevent HS and ACL injuries.

P062

Tibia fracture following transposition tibial tubercule osteotomy. Case report

Nisrine Hussein; Jaroslaw Czekaj
rHNE Pourtales

Introduction: The tibiale tubercule osteotomy (TTO) and its transposition is a valid bonny procedure in treatment of recurrent patellofemoral instability. Regardless of its successful outcomes, rare post operative complications such as fractures of the tibia may still occur with prevalence reported around 1%. Several factors may play here a role, but mostly the surgical technique. The fractures mostly occur at an average of 8 weeks after surgery.

Méthodes / Résultats: We wish to present a case of young patient who presented a bilateral recurrent patellofemoral instability and was treated with bilateral MPFL reconstruction associated with transposition tibial tubercule osteotomy in one surgical session. The direct postoperative period was uneventful with immediate full weight bearing.

Ten months (43 weeks) after the surgery, the patient presented a proximal transverse tibial shaft fracture while dancing, with no history of particular trauma. The open reduction and plate osteosynthesis was performed, followed by uneventful fracture healing.

Conclusions & perspectives: The complications following the tibial tubercule osteotomy procedure are rare but can influence dramatically the postoperative rehabilitation in young and active patients.

While most case report series in literature conclude that proximal tibial fractures occur at an average of 8 weeks, there have been a handful of cases describing this complication beyond 25 weeks post surgery without a traumatic event, as illustrated in our case.

The meticulous surgical technique regarding the size and shape of osteotomy, type of distal cut and fixation method is essential for prevention of bonny complications.

P063

Cost analysis of distal femoral replacements for revision TKA and primary fracture treatment: A losing game

Kimberley Wyss; Kay-Bernd Lanner; Andreas Ladurner; Karlmeinrad Giesinger
Kantonspital St. Gallen

Introduction: Primary total knee arthroplasty (pTKA) is a high frequency standard procedure in orthopedics and provides good, reliable results in end stage osteoarthritis. Remuneration schemes for pTKA are therefore well established, repeatedly analyzed and adjusted. Remuneration schemes for revision total knee arthroplasty (rTKA) and distal femoral replacements (DFR) for complex revisions or primary fracture treatment are less developed, as these interventions represent a small minority. DFR procedures are generally reserved for universities and large teaching hospitals.

This study analyzes the costs of DFR performed for rTKA and primary fracture treatment of complex fractures around the knee in the elderly.

Methods: Data from patients with DFR procedures who were operated at our institution between 2017 and 2022 were collected. Inclusion criteria were rTKA, periprosthetic fractures and direct fracture treatment of complex fractures. DFRs for tumor surgery were excluded. The analysis included overall costs and the implant costs, case mix index (CMI), and length of hospital stay.

Results: Data from 11 DFR procedures were analyzed. Diagnoses for DFR were: 4 periprosthetic fractures, 4 periprosthetic infections (after multiple revisions) and 3 cases of primary fracture treatment. Mean patient age was 75.6 years. Two patients needed ICU treatment during their stay. The average cost of total hospital stay, including the DFR implant, was 69'999 CHF. The average amount for the implant cost alone was 20'852 CHF. The average remuneration according to Swiss DRG amounted to 49'092 CHF, corresponding to 70 percent of the average cost for the hospital. Out of 11 DFR procedures 2 needed to undergo revision within one year after implantation. The average length of hospital stay was 21 days. The average CMI in this patient group was high with 4.18.

Conclusion: DFR procedures are relatively rare, especially outside tumor surgery. However, DFR procedures are reliable solutions for the above indications allowing immediate weight bearing in this elderly population. Despite the very small patient sample presented here, it is safe to say that the costs for the hospital are poorly compensated with the current Swiss DRG. As these procedures are limited to universities and large teaching hospitals, these institutions carry the financial burden.

P064

Comparative outcome after total knee arthroplasty for posttraumatic versus primary knee osteoarthritis

Stefanie Waldburger; Karlmeinrad Giesinger; Thomas Schöfl; Andreas Ladurner
Kantonsspital St. Gallen KSSG

Introduction: Total knee arthroplasty (TKA) is the gold standard treatment for endstage osteoarthritis (OA). Literature shows higher revision rates for TKA for posttraumatic knee OA compared to primary knee OA . However, literature is scarce regarding differences in postoperative improvement assessed with patient-reported outcome measures (PROMs) to better inform patients preop.

Method: We performed a retrospective data analysis from our local TKA register including data from patients who were operated at our institution between 2006 and 2021. Reasons for TKA were identified and grouped by history of a previous fracture (fracture patterns of the proximal tibia and distal femur, validation from medical charts and from pre-op radiographs). After identification of the posttraumatic group propensity score matching (age, sex, BMI) was performed to create a matched comparator group with TKA after primary OA (ratio 1:2). Postoperative improvement was compared in these two groups using EQ-5D, WOMAC Score and satisfaction.

Result: We identified 51 patients with OA after fractures to 102 patients out of 1354 with primary OA. In the posttraumatic OA group were 37 proximal tibia fractures, 10 distal femur fractures and 4 patients with a combination of both fractures. After matching the two groups, there was no statistically significant difference in age($p = 0.61$), sex($p = 0.95$) and BMI($p = 0.56$). The WOMAC Score improved from 77.3 preop to 41.2 at one year postop in the posttraumatic OA group. In primary OA the WOMAC Score improved from 75.2 to 36.1 (n.s., $p = 0.13$). EQ-5D showed very similar results preop and one year postop ($p = 0.78$). Patients' overall satisfaction at one year follow up was significantly better in the primary OA group ($p = 0.02$).

Conclusion: We present data on a propensity-matched cohort study comparing PROMs between a primary and posttraumatic TKA group at one year follow-up. We found no inferior results regarding postop improvement measured with the WOMAC score and EQ5-D. However, patient satisfaction was still significantly lower in the posttraumatic OA.

P065

Individual specific identification (correlation) of Femoral and Tibial Anterior Cruciate Ligament Footprint using specific novel MRI sequences: CLASS

Grégoire Thürig; Marc Barrera Uso; Stefan Blümel; Elisab Alonso Domenech; Alina Malov; Raul Panadero Morales; Daniel Petek

HFR - Hôpital Cantonal Fribourg

Introduction: The anatomy of the anterior cruciate ligament (ACL) has been extensively studied. Still, anatomical reconstruction remains challenging because of individual footprints (FP) variation. Moreover, well-accepted methods do not necessarily hit the proper ACL locations. Using MRI Compressed Lateral and anteroposterior Anatomical Systematic Sequences (CLASS), it is possible to precisely determine the ACL centroid FP and calculate the variability of the distribution metrics. This study aimed to provide quantitative data on the centroid ACL FP using CLASS images, to evaluate its reliability and reproducibility, and the correlation between the different measurements.

Methods: Anonymized MRIs of the knee joint were analyzed. Two senior orthopaedic knee surgeons identified the FP using the multiplanar reformation tool. An ad-hoc software allowed a volumetric 3D image projection on a 2D anteroposterior and lateral view (CLASS) with the previously defined anatomical femoral and tibial FP.

Following parameters were measured: coronal ratio of tibial FP medial to lateral, sagittal ratio of tibial footprint anterior to posterior, sagittal ratio of femoral FP high to low, sagittal ratio of femoral FP deep to shallow, femoral intercondylar notch roof angle, tibial slope, sagittal articular surface and Blumensaat's line-angle, coronal articular surface and ACL-angle and sagittal articular surface and ACL-angle. Intraobserver reliability and interobserver reproducibility for footprint identification and for the measurements was assessed using intraclass correlation coefficient, including 95% confidence intervals. The correlation coefficient between the above-mentioned parameters has been calculated using 2-tailed Spearman's rho.

Results: 82 MRI scans of the knee were assessed.

The identified centroid FP and the measured parameters showed an "almost perfect" reliability and reproducibility. All measurements showed an "almost perfect" reliability and reproducibility, except for the tibial slope measurement, which demonstrated a "substantial" reproducibility.

Conclusion: This study showed that both the identification of both femoral and tibial FP according to the CLASS method and the measurements of the various parameters are reliable and reproducible. Furthermore, the data suggests a variability of locations of ACL footprints among the population. These individual specific footprints could therefore help preoperative planning to allow a precise ACL reconstruction.

P066

Accurate ACL tunnel placement using 3D surgical guides planned and printed at the point of care – A cadaveric feasibility study

Sophie C. Eberlein; Silvan Hess; Frank Michael Klenke; Andreas Hecker

Universitätsspital Bern, Inselspital

Introduction: Anterior cruciate ligament reconstruction (ACLR) failures are associated with misplacement of the bone tunnels in up to 88%. The aim of this study is to evaluate the accuracy of outside-in ACL tunnel placement performed with 3D printed guides planned and printed at the point of care.

Methods: 3D models of 10 human specimens (femur and tibia) were reconstructed based on CT scans. ACL tunnel aiming guides were designed and virtually fitted to the proximal tibial and distal femoral metaphyseal cortices. Surgical guides were printed using a biomedically certified resin on a 3D printer. A guide wire was inserted into the lateral distal femur and the medial proximal tibia through the respective guide. The wire was overdrilled with a 6mm cannulated drill penetrating the knee joint. Postoperatively, CT scans were acquired to compare the drilled bone tunnel to the planned tunnel. Deviations from the plan are given as mean (± SD) in millimetres.

Results: Median deviations from the preoperative planning were 2.66mm (± 1.62mm) for femoral tunnels and 2.49mm (± 0.99mm) for tibial tunnels.

Conclusion: This study shows accurate ACL tunnel placement using 3D guides planned and printed at the point of care. Applied to a clinical setting, this technique has the potential to reduce complications due to misplacement of bone tunnels significantly.

P067

Custom TKA combined with custom coronal alignment requires less ligament releases than conventional TKA

Carsten O. Tibesku[1]; Tarik Aït-Si-Selmi[2]; Michel Bonnin[2]

[1] KniePraxis Prof. Dr. Tibesku; [2] Ramsay Santé, Hôpital Privé Jean Mermoz, Centre Orthopédique Santy

Background: To compare rates of collateral ligament releases and patellofemoral releases in two comparative cohorts of either conventional or custom total knee arthroplasty.

Methods: Between 01.07.2020 and 30.06.2022 two cohorts of 160 patients in each group received either a CT based PS custom TKA with preservation of constitutional alignment within predetermined limits of 85° to 95° for FMA and TMA, and 175° to 183° for HKA, or a conventional TKA. All surgeries were done by the same surgeon and the necessity and degree of soft tissue releases were recorded. Patient characteristics were compared by the use of preoperative radiograms and clinical scores (KSS, Oxford Score, FJS-12).

Results: In the conventional group, 14 (9%) knees required a lateral retinacular release, 14 (9%) a release of the MCL, and 21 (13%) a release of the ITB, and one knee a release of the LCL. In the custom group, 5 (3%) knees required a lateral retinacular release, 5 (3%) a release of the MCL and, 23 (14%) a release of the ITB, none (0%) a release of the LCL. Lateral retinacular releases and MCL release were of higher degrees in the conventional group.

Conclusion: Custom TKA with a strategy of custom coronal alignment can reduce the percentage and degree of soft tissue releases. The similarly high rate of ITB releases in both groups probably results from the limited ability to assess proper ITB tension. These findings support the theoretical benefits of custom TKA which provides an accurate preoperative planning strategy to achieve both improved implant shape and fit as well as personalised alignment.

P068

Custom total knee arthroplasty combined with personalised alignment grants 94% patient satisfaction at minimum follow-up of 2 years

Carsten O. Tibesku[1]; Lampros Gousopoulos[2]; Andreas Dobbelaere[2]; Salvatore Ratano[2]; Louka Bondoux[2]; Tarik Aït-Si-Selmi[2]; Michel Bonnin[2]

[1] KniePraxis Prof. Dr. Tibesku; [2] Ramsay Santé, Hôpital Privé Jean Mermoz, Centre Orthopédique Santy

Purpose: The purpose was to report detailed patient-reported outcome measures (PROMs) and satisfaction rates for computed tomography (CT)-based custom TKA at minimum follow-up of 2 years. The hypothesis was that custom TKA combined with 'personalised alignment' would yield equivalent or better PROMs compared to values reported in systematic reviews and meta-analyses on off-the-shelf (OTS) TKA.

Methods: Of an initial cohort of 150 custom TKAs, four died (unrelated to surgery), one required a revision, and five refused participation, leaving 140 patients for analysis. Patients completed pre- and post-operative PROMs (Oxford Knee Score (OKS), Forgotten Joint Score (FJS), Knee injury and Osteoarthritis Outcome Score (KOOS), Western Ontario and McMaster osteoarthritis index (WOMAC)) as well as overall level of satisfaction. Proportions that attained a patient acceptable symptom state (PASS) were calculated for OKS and FJS. Clinical findings were compared to the average scores reported for PROMs in recent systematic reviews and/or meta-analyses on OTS TKA. Descriptive statistics were used to summarise the clinical findings as means, standard deviations (SD) and ranges, or numbers and percentages.

Results: At mean follow-up 33.5 ± 4.5 months, 94% (135/143) were either satisfied or very satisfied. Proportions that achieved PASS were 89% for OKS (120/135), and 85% for FJS (118/139). Median OKS, WOMAC and KOOS Symptoms and Pain scores were all within the 4th quartile of medians reported in systematic reviews and/or meta-analyses.

Conclusions: At a minimum follow-up of two years following custom TKA combined with 'personalised alignment', 94% of patients were either satisfied or very satisfied, and the PASS criteria were achieved in 89% for OKS and 85% for FJS, all of which compare favourably to published outcomes of OTS TKA. Direct comparisons to the literature may not be appropriate, however, considering the heterogeneity of patient demographics and alignment techniques. Randomised controlled trials with sufficient statistical power are needed to corroborate these findings and generalise them to unselected TKA patients.

P069

Avulsion fracture at the femoral origin of the superficial medial collateral ligament: a possible complication of percutaneous pie crusting release during knee arthroscopy

László Tóth; Dominic Mathis; Michael T. Hirschmann; Julian Röhm

KSBL Bruderholz

Introduction: Arthroscopy of the posteromedial compartment of the knee is a challenging procedure if the medial joint space is narrow. To avoid iatrogenic damage of the cartilage various release techniques of the medial stabilizing ligamentous structures are established. A common technique is the percutaneous pie crusting of the femoral origin of tight ligamentous fibers of the superficial medial collateral ligament (sMCL) through repeated puncture by using a needle.

Methods: This is a case report of a 27-year-old male patient who suffered from a medial bucket-handle tear in combination with anterior cruciate ligament (ACL) re-rupture. In a two-stage arthroscopic procedure, first the meniscus was addressed. Due to insufficient joint space a percutaneous pie crusting release of the femoral origin of the sMCL, approximately 1.5 cm posterior and slightly distal to the medial epicondyle was carried out. Simultaneously to the release a slight valgus and external rotation force was applied. At the moment of a puncture, an audible popping in combination with advanced opening of the medial joint space appeared. Postoperative radiographs showed a minimally displaced avulsion fracture of the medial epicondyle. After 6 weeks of partial weight bearing in a hinged brace a complete bony healing was observed with no clinical evidence of medial instability.

Results: The repeated puncture of the proximal origin of the sMCL, the simultaneously applied valgus and external rotation force in addition to posttraumatic condition could cause significant weakening of the surrounding soft-tissue and cortical bone increasing the possibility of an avulsion fracture. In the literature there is no consensus whether the percutaneous pie crusting release of the sMCL causes significant residual laxity or subjective instability or bracing is needed. However, in this case, due to the staged ACL reconstruction with medial meniscal repair, the iatrogenic osseous avulsion of the sMCL should be treated carefully with adequate bracing for at least 6 weeks or until clinical or radiographic consolidation of the avulsion fracture is achieved.

Conclusion: In the development of avulsion fracture of the femoral origin of the sMCL during knee arthroscopy the pie crusting release could be an additional risk factor. Surgeons should consider the possibility of this rare complication in case of a sudden medial joint space opening intraoperatively. A minimal displaced fragment can be treated conservatively.

P070

Cortisone as infiltrative treatment for knee osteoarthritis: evidence against placebo. A systematic review and meta-analysis

Jacopo Albanese[1]; Alessandro Bensa[1]; Angelo Boffa[2]; Davide Previtali[1]; Christian Candrian [1]; Giuseppe Filardo [1]

[1] EOC (Ente Ospadaliero Cantonale) - Ospedale Regionale di Lugano; [2] IRCCS Istituto Ortopedico Rizzoli, Bologna, Italy

Introduction: Cortisone injective therapy represents one of the most popular options in the treatment of knee osteoarthritis. However, a significant debate recently questioned the real benefit of this approach. The present study aims at evaluating the most updated and complete evidence quantifying at short- and long-term the pain improvement generated by cortisone injection compared to placebo injection in this category of patients.

Methods: The search was conducted on three databases (PubMed, Web of Science and EMBASE) on June 13, 2022. Inclusion criteria: randomized controlled trials (RCTs) comparing cortisone and placebo injection in patients affected by knee osteoarthritis reporting pain values from 0 to 10 based on the Visual Analogue Scale (VAS). The Risk of Bias was evaluated using the Downs and Black's "Checklist for Measuring Quality".

Results: Among the 27 identified studies on the topic, only five RCTs present the required characteristics to be included, including 440 patients. A statistically significant improvement of VAS was detected comparing baseline and short-term values (<6 weeks) both in patients treated with cortisone injection ($p < 0.001$, mean difference = 3.31) and in patients treated with placebo injection ($p < 0.001$, mean difference = 1.33). The long-term (<6 weeks) comparison produced the same result (respectively $p < 0{,}001$, mean difference = 2.39 e $p = 0.035$, mean difference = 0.65). The comparison of the two treatments

demonstrated statistically significant difference of pain improvement in favor of cortisone injection both at short-term (p <0.001, mean difference = 1.98) and at long-term follow-up (p <0.001, mean difference = 1.74). In both cases the mean difference between the two types of treatment reached the Minimal Clinically Important Difference (MCID) value of 1.37 points.

Conclusion: Both cortisone infiltrative treatment and placebo induced an improvement in terms of pain at short- and long-term follow-up in patients affected by knee osteoarthritis. Cortisone generated a superior improvement compared to placebo: in particular, this difference of improvement resulted to be higher than the MCID and therefore should be clinically perceivable by the patient. Even if the results confirm the clinical benefit, the evidence supporting the use of one of the most common treatments for osteoarthritis remains extremely limited and based on a small number of patients evaluated in few high level studies.

P071

Excessive Femoral Torsion Is Not Associated With Patellofemoral Pain Or Instability If TKA Is Functionally Aligned And The Patella Denervated

Gabriele Cirigliano; Andreas Flury; Armando Hoch; Sandro Hodel; Nathalie Kühne; Stefan M. Zimmermann; Lazaros Vlachopoulos ; Sandro F. Fucentese

Balgrist Universitätsklinik

Introduction: Recent data suggest that individual morphologic factors should be respected to restore preoperative patellofemoral alignment and thus reduce the likelihood of anterior knee pain. The goal of this study was to investigate the efect of exces sive femoral torsion (FT) on clinical outcome of TKA.

Methods: Patients who underwent TKA and complete preoperative radiographic evaluation including a long-leg radiograph and CT scan were included. 51 patients showed increased FT of >20° and were matched for age/sex to 51 controls (FT <20°). Thirteen patients were lost to follow-up. Thirty-eight matched pairs were compared after a 2 year follow-up clinically (Kujala and patellofemoral score for TKA) and radiographically (FT, frontal leg axis, TT-TG, patellar thickness, patellar tilt, and lateral displacement of patella). Functional alignment of TKA was performed (hybrid-technique). All patellae were denervated but no patella was resurfaced.

Results: There was no signifcant diference between clinical scores two years after surgery between patients with normal and excessive FT (n.s.). Kujala score was 64.3 ± 16.7 versus 64.8 ± 14.4 (n.s.), and patellofemoral score for TKA was 74.3 ± 21 versus 78.5 ± 20.7 (n.s.) for increased FT group and control group, respectively. There was no correlation between preoperative FT and clinical scores. Other radiographic parameters were similar between both groups. No correlations between clinical outcomes and preoperative/postoperative frontal leg axis or total leg axis correction were found (n.s.).

Conclusion: If the leg axis deformity is corrected to a roughly neutral alignment during cemented TKA, including patellar denervation, then excessive FT was not associated with patellofemoral pain or instability.

P072

A New Measurement Method For Posterior Condylar Offset Of The Knee – Predictive Factor For Secondary Patellar-Revision After Total Knee Arthroplasty

Jesco Bamberger; Vilijam Zdravkovic; Henrik Behrend

Kantonsspital St. Gallen KSSG

Introduction: Anterior Knee pain is one of the most common postoperative impairments after total knee arthroplasty (TKA). Alterations in joint-line height and tibial slope are well known for their impact on TKA-outcome, however the role of the posterior condylar offset (PCO) is less well understood. The aim of this study was to introduce a new simple PCO measurement method on conventional radiographs, and to determine the predictive value of PCO for the need of secondary revision due to patello-femoral pain syndrome after TKA.

Methods: We analyzed lateral radiographs before and after computer navigated primary TKA (n = 190, control group) as well as after patello-femoral revision surgery (n = 22, revision group) performed at our institution between 2010 and 2020. We defined and measured the effective tibial length relative to fibular head (ETL), the effective femoral length relative to the Blumensaat line (EFL), the condylar radius (CR) and the posterior condylar offset relative to the anatomical femoral axis (PCO). The values for ETL, EFL and PCO were normalized over CR. Statistical methods included multivariate recursive partitioning and logistic regression.

Results: 190 patients of the control group (mean age 69,7 years [range 44 to 91 years]; 102 [53%] female) and 22 patients of the revision group (mean age 73,4 years [range 57 to 89 years]; 12 [54%] female) were included in the study. After the normalization over CR, only preoperative ETL was significantly different (p = 0.038) between the two groups. However, postoperative ETL was equalized (p = 0.946). In the logistic regression model the only predictive variable for patella-femoral problems requiring revision was postoperative PCO (p = 0.0156). Recursive partitioning revealed that posterior offset (normalized on condylar radius) should not exceed 1.237.

Conclusion: Only the PCO was found as a single independent radiographic parameter to predict patello-femoral revision. In patients with anterior knee pain after TKA our PCO-measurement-method could help in decision making concerning patello-femoral-revision.

P073

Case Report: Proximal tibiofibular joint instability. A forgotten cause in revision total knee arthroplasty?

Michaël Matos; Gregoire Thürig; Marc Barrera Uso; Stefan Blümel; Dario Giunchi; Daniel Petek

HFR - Hôpital Cantonal Fribourg

Introduction: Proximal tibiofibular joint instability (PTJI) associated with total knee arthroplasty (TKA) is a rare entity. It may result in chronic knee pain and is in most cases not properly diagnosed. Treatment options for PTJI are variable and include closed/open reduction with reconstruction, fibular head resection or arthrodesis. We present the case of a 73 year old patient with persistent nonspecific anterolateral knee pain after revision TKA. Implantation of an unicompartimental knee arthroplasty was performed 13 years ago and converted 4 years later into a TKA. Due to persistent pain, revision of the TKA was performed 6 years afterwards, and again of the tibial component 1 year later without benefit. All tissue probes have been negative.

Method: Patient history revealed increasing pain after long distance walking irradiating into the ankle. Clinical examination

presented a subluxation type of PTJI. No neurological deficits were present. CT-scan showed an osseous lysis around the tibial component. Scintigraphy showed a hypercaptation of the tibial component. Densitometry did rule out osteoporosis. Knee puncture was negative.

Result: Under anaesthesia, PTJI was confirmed in comparison with the contralateral side and by direct visualization. During surgery, PTJI could also be confirmed and treated by arthrodesis of proximal tibiofibular joint. As the patient had already 5 prosthetic exchanges, the authors choose a hinged implant for knee joint reconstruction. The patient reported pain relief after the last surgery.

Conclusion: Proximal tibiofibular joint instability is uncommon. We present a case report of a multi-operated TKA and proximal tibiofibular arthrodesis. This is an effective option for treating patients with this pathology. PTJI should be considered as an uncommon cause of anterolateral/lateral knee pain in TKA.

P074

Hip abductor muscle strength in patients receiving total or unicompartmental knee arthroplasty for knee osteoarthritis or avascular necrosis: a systematic review and meta-analysis

Roman Stocker[1]; Matthias Wittauer[1]; Florian Halbeisen[1]; Corina Nüesch [1]; Peter Kvarda[2]; Annegret Mündermann [1]; Petros Ismailidis[1]

[1] Universitätsspital Basel; [2] Kantonsspital Baselland

Introduction: Impaired hip abductor muscle strength may indirectly lead to changes in knee kinematics and can be a reason for pain or functional limitation after total or unicompartmental knee arthroplasty (TKA/UKA). The purpose of this study was to evaluate and quantify hip abductor muscle strength deficits after TKA/UKA and to investigate the presence of external factors that influence hip abductor strength after TKA/UKA.

Methods: A comprehensive literature search was performed in Embase, Medline, SportDiscus, Web of Science and Scopus. Clinical studies reporting hip abductor muscle strength before and after primary TKA/UKA for knee osteoarthritis or avascular necrosis were included in this analysis.

Results: Fifteen studies with 835 patients met our inclusion criteria. Compared with preoperative values, patients had a mean strength deficit of 19.1% (95% confidence interval (95% CI) [-31.4, -6.9]) at up to 2 months postoperatively, a deficit of 11.2% (95% CI [-32.7, 10.2]) 2–6 months postoperatively and an increase of 18.4% (95% CI [2.7, 34.1]) at more than 6 months postoperatively.

In cases of unilateral disease, patients had a mean abductor strength deficit of 11.5% (95% CI [-16.2, -6.9]) preoperatively, 23.2% (95% CI [-27.6, -18.8 %]) at 0–2 months postoperatively, 10.8% (95% CI [-23.1, 1.6]) at 2–6 months postoperatively and no strength deficit 0.0% (95% CI [-4.6, 4.6]) more than 6 months postoperatively compared with the contralateral healthy side.

Conclusion: Hip abductor strength is reduced preoperatively in patients receiving TKA/UKA, continues to decreases in the immediate postoperative period and gradually increases thereafter. These results suggest that abductor muscle function improves after TKA/UKA. Caution should be used in interpreting these because of considerable heterogeneity and a lack of high-quality evidence.

POSTERS: A06 FOOT

P075

Do we really need for Akin's osteotomy fixation in open hallux valgus surgery?

Enrique Adrian Testa[1]; Annamaria Porreca[2]; Alberto Ruiz Nasarre[3]; Daniel Poggio Cano[4]; Fernando Alvarez Goenaga[3]; Gerardo Ledermann[5]; Albert Baduell[4]; Pablo Ruiz Riquelme[6]

[1] EOC (Ente Ospedaliero Cantonale) - Ospedale Regionale di Bellinzona e Valli; [2] "G. d'Annunzio" University of Chieti-Pescara; [3] Hospital San Rafael; [4] Hospital Clinic of Barcelona; [5] Hospital Clinico La Florida; [6] Universidad Finis Terrae

Purpose: The main objective is to describe the postoperative angle changes of correction in patients with hallux valgus in whom Akin osteotomy was performed without fixation. The secondary objective is to describe complications associated with surgery or follow-up and re-operations.

Methods: Single-center retrospective cohort study by one surgeon. Patients older than 18 years without previous hallux surgery operated with open technique and Akin osteotomy without fixation during the years 2011 and 2018 were included. Five preoperative and postoperative radiological measurements were analyzed until union was completed. Evaluation of peri- and post-operative complication rates.

Results: 222 patients met inclusion criteria (196 women, 26 men, mean age 60.5 [20–85] years), with 286 feet (147 left, 139 right). There was a mean difference of 7.0 degrees between pre- and post-operative 3 month DASA (distal articular set angle) and mean 12.0 degrees IPOA (Inter Phalangeal joint Oblique Angle) (p <0.001). There were 86 cases (30%) with unintentional lateral cortical involvement. All cases achieved union, but delayed consolidation was observed in 5.9% (17 / 286) of cases. Hyperextension of the distal fragment was observed in 7 cases (2.4%). Of the 286 surgeries, 8 (2.7%) required reoperation, but only one case required Akin reosteotomy for hypocorrection. Good to excellent agreement was observed for inter- and intraobserver correlation for all parameters considered. There was a mean difference of 7.0 degrees between pre- and post-operative 3 month DASA (distal articular set angle) and mean 12.0 degrees IPOA (Inter Phalangeal joint Oblique Angle) (p <0.001). There were 86 cases (30%) with unintentional lateral cortical involvement. All cases achieved union, but delayed consolidation was observed in 5.9% (17 / 286) of cases. The mean time to union in these cases was 22.1 (18.5 - 25.8) weeks. Hyperextension of the distal fragment (malunion in plantar flexion) was observed in 7 cases (2.4%), however none were symptomatic or required reintervention. Of the 286 surgeries, 8 (2.7%) required reoperation, but only one case required Akin reosteotomy for hypocorrection.

Conclusions: In this series the absence of internal fixation of Akin osteotomy did not influence consolidation or planned correction and was associated with low complication rates. The results are encouraging; however, we believe that further studies are needed to confirm the data

P076

Safety bone corridor for osteosynthesis of the navicular bone in patients with different foot phenotypes. Evaluation of 3D printed models

Pablo Ruiz Riquelme[1]; Daniel Poggio Cano[2]; Ricardo Vega Crokker[2]; Magdalena Castro Cruz[3]; Mireia Gamundi Lopez[4]; Ferran Fillat Goma[4]; Enrique Adrian Testa[5]

[1] Clinica Las Condes; [2] Hospital Clinic of Barcelona; [3] Universidad Finis Terrae; [4] Parc Tauli Hospital Universitari; [5] EOC (Ente Ospedaliero Cantonale) - Ospedale Regionale di Bellinzona e Valli

Purpose: The navicular bone has a complex three-dimensional morphology. Few intraoperative tools exist to predict osteosynthesis position and none consider plantar aspect of the navicular. The aims are to describe a navicular's bony corridor run in different phenotypes feet.

Methodology: Observational cohort study. Patients >18 years, neutral/cavus/flat feet, with CT study were included. 3D-CT reconstructions were performed to assess navicular and bony corridor volume, coronal and axial corridor angulation.

Results: 63 navicular bones were evaluated, 62% female. Median age 52 years. Cavus 42%, flat 35% and neutral 22% feet. Median navicular's bone volume and bone corridor was 10980 mm3 and 3063.3 mm3 respectively. Median medial-lateral screw angulation in coronal plane +16.99º and axial plane +6.09°.

Conclusion: This study describes a navicular´s bone corridor for the position of medial-lateral osteosynthesis that could help in the treatment of the navicular pathology.

P077

Can sural nerve injuries be prevented in posterior leg approaches? Cadaveric evaluation of new method of surface anatomical landmarks, sural nerve and posterior approaches

Pablo Ruiz Riquelme[1]; Daniel Poggio Cano[2]; Yury Postnikov[2]; Ricardo Vega Crokker[2]; Gerardo Ledermann[3]; Xavier Sala Blanch[2]; Ruben Garcia Elvira[2]; Enrique Adrian Testa[4]

[1] Universidad Finis Terrae; [2] Hospital Clinic of Barcelona; [3] Hospital Clinico La Florida; [4] EOC (Ente Ospedaliero Cantonale) - Ospedale Regionale di Lugano

Purpose: The sural nerve has variable morphology and proximal formation. Sural nerve risk injury and clinical complications for patients, has been described with posterior approaches such as in Achilles surgery and ankle fractures. To avoid its damage, several studies have tried to predict its course by metric units and non-person-proportional distances, but these are influenced by the patient's height, body mass index and leg length. Recently, an alternative method unaffected by these factors has been described. The aim is to describe the anatomical relationship between a new method guided by a surface reference line, the sural nerve, and the most common posterior leg approaches.

Methods: Descriptive cadaveric study performed on 14 legs. The surface reference line (from the medial femoral condyle to the fibula) was traced, nine points and four zones of this line were marked on distal half leg, describing their relationship and distance to sural nerve and four posterior leg/ankle approaches. The sural nerve crossing area with the line was also evaluated. Data were analyzed and described with median and interquartile ranges for quantitative variables and description of absolute and relative frequencies for categorical variables.

Results: There were six female and eight male specimens, median age of 85 (55 - 95) years. The nerve had smaller distance in the central quadrants (Zone B-C) and crosses mainly in Zone C with respect to the line. Posteromedial and medial paracentral approaches pass away from sural nerve. Central and posterolateral approaches have risk of injuring the sural nerve in the proximal and distal quadrant (Zone D and A) respectively, it is suggested to identify the nerve in these areas.

Conclusions: This cadaveric study defines safety zones for posterior leg approaches. It evaluates the application of a new method of superficial anatomical references, proportional to each individual, which allows predicting the sural nerve path. This simple, fast and reproducible method could be a potential tool to reduce the risk of nerve iatrogenic injury.

P078

How can I enhance the corrective power of my Akin osteotomy? Trigonometric analysis and identification of factors to achieve it

Enrique Adrian Testa[1]; Alberto Ruiz Nasarre[2]; Daniel Poggio Cano[3]; Annamaria Porreca[4]; Fernando Alvarez Goenaga[2]; Albert Baduell[3]; Ruben Garcia Elvira[3]; Miquel Dalmau Pastor [5]; Pablo Ruiz Riquelme[6]

[1] EOC (Ente Ospedaliero Cantonale) - Ospedale Regionale di Bellinzona e Valli; [2] Hospital San Rafael; [3] Hospital Clinic of Barcelona; [4] "G. d'Annunzio" University of Chieti-Pescara; [5] University of Barcelona; [6] Clinica Las Condes

Purpose: The Akin osteotomy was introduced almost a century ago as an adjunctive procedure to hallux valgus surgery to modify the deforming forces of the extensor and flexor hallucis longus by means of a medial subtraction wedge in the first phalanx (F1). The aim of this study is to evaluate trigonometrically the corrective power of the Akin osteotomy and the factors influencing it.

Methods: Radiographic observational study of 186 feet in 100 patients. Five levels of osteotomy were defined in the proximal aspect of F1 by evaluating the width variation from metaphysis to diaphysis. Three osteotomy angles were calculated according to Carnot's theorem for these five points, evaluating different subtraction wedge thicknesses, corresponding to 2, 3 and 4 mm. The relationship of DASA (distal articular set angle) and IPOA (interphalangeal joint obliquity angle) with the corrective power of the osteotomy was evaluated. He also evaluated the distance between the cut line and the joint.

Results: We observed a great variability of correction power of the osteotomy correcting between 5.9° to 18.4°. Influencing factors are the width of the F1 base which varied between 12.6 to 23.2 mm, with less correction in the metaphyseal area. The inclination of the medial cortex in the axial plane, correcting more as it is more vertical. The height at which the osteotomy is performed, correcting more as it is more distal. The flatness of the bade of the subtraction wedge. The DASA and IPOA radiographic angles did not have a strong correlation with the calculated correction angles. In addition, the depth of the first metatarsophalangeal joint was 3.7 (2.3 - 7.9) mm.

Conclusions: The corrective power of subtraction osteotomy is influenced by factors such as the width of the F1 base, the medial cortical tilt in the axial plane, the height at which the osteotomy is performed from proximal to distal and of course the width of the base of the subtraction wedge. The data suggest not performing the osteotomy less than 10 mm from the joint line to reduce the risk of intra-articular damage. The DASA and IPOA radiographic variables are not reliable in deciding the size of the subtraction wedge according to this method of calculation.

P079

All fluoroquinolones present the same risk of Achilles tendon complications. A systematic review and meta-analysis

Alessandro Sangiorgio[1]; Martina Sirone[1]; Federico Maria Adravanti[1]; Enrique Adrian Testa[1]; Martin Riegger[1]; Giuseppe Filardo[2]

[1] Service of Orthopaedics and Traumatology, Department of Surgery, EOC, Lugano, Switzerland; [2] Faculty of biomedical sciences, Università della Svizzera Italiana, Lugano, Switzerland

Introduction: The association of fluoroquinolones intake and Achilles tendinopathy (AT) or Achilles tendon rupture (ATR) is widely documented in the literature and led to a growing cautiousness in their prescription. However, only few studies in the literature stratified the risk of tendon damage for each molecule. The purpose of this study was to document Achilles tendon complications for the most prescribed fluoroquinolones molecules.

Materials and Methods: A literature search was performed on three databases (Pubmed, Cochrane and Web of Science) from inception up to 16 October 2022. Inclusion criteria: studies of any level of evidence, written in English, documenting the incidence of AT and/or ATR after fluoroquinolone consumption and stratifying the results for each type of molecule. Predisposing factors were investigated as well.

Results: 11 studies (33,615 patients) were included. Levofloxacin was the most prescribed molecule, being administered to 20,554 patients (61.1%), Ciprofloxacin was administered to 7,992 patients (23.8%), and other fluoroquinolone molecules were administered to 5,069 patients (15.1%). Mean fluoroquinolones treatment duration was 13.9 ± 3.9 days. Overall, AT and ATR occurred in 196 patients: 49 patients treated with Levofloxacin, 105 treated with Ciprofloxacin, and 42 treated with other molecules. The prevalence of AT and ATR was 1.62% (95% C.I. 0.45 – 3.17, SE 0.03) for Levofloxacin, 4.05% (95% C.I. 1.47 – 7.22, SE 0.03) for Ciprofloxacin, and 2.16% (95% C.I. 0.43 – 4.46, SE 0.03) for the other molecules. Every one-to-one comparison among all the molecules showed no statistically significant difference (p = n.s.). Many of the included studies reported a higher incidence of AT/ATR in elder patients that were concomitantly taking corticosteroids.

Conclusions: The main finding of this systematic review and meta-analysis is that all the fluoroquinolones molecules taken into account showed the same risk of causing AT and ATR, without any statistically significant difference. Independent risk factors for AT and ATR during fluoroquinolones treatment are patient's age, renal failure, organ transplantation, immunodeficiency, and concomitant corticosteroids use.

P080

Angioleiomyoma an underestimated entity – systematic review of the literature

Michaël Matos; Sergio Soares; Moritz Tannast; Angela Seidel

HFR - Hôpital Cantonal Fribourg

Angioleiomyoma is a benign tumour, that arises from the smooth muscle. While some authors consider angioleiomyoma to be a vascular malformation derived from arteriovenous anastomoses, others suggest a hamartomatous origin. However, their exact etiology remains unclear. It accounts for 70 to 80% of all benign mesenchymatous tumors and they are commonly located at the lower extremities. They are most frequently found in middle-aged women. Angioleiomyoma is usually presented as a painful solitary lesion in the subcutaneous tissue. It can cause nerve irritation or bone erosion in the surrounding

areas. Incidence, mortality, and disability-adjusted life years related to leiomyomas have increased over the past years.

Due to the lack of evidence in the literature, the aim of this systematic review was to evaluate and systematize the up-to-date pre-operative work up and to analyse the prognosis of foot and ankle's angioleiomyoma.

This systematic review was designed in accordance with PRISMA 2020 guidelines. Pubmed and Google Scholar were the databases used for the research of the keywords "angioleiomyoma" AND "foot" OR "ankle". 1512 studies were identified with the initial search. Of these, 55 studies (only containing case reports and case series) fully met the inclusion criteria and underwent further analysis.

Almost one fourth of patients (22.22%) were not submitted to any preoperative investigation and the possible diagnosis of angioleiomyoma was not thought of before surgery by any of the surgeons. MRI and aspiration biopsy are key diagnostic tools as they reflect angioleiomyoma's unique characteristics. The process of clinical diagnosis is difficult, and it is rarely thought of before surgery and histologic analysis, which contributes to the surgery's delay. As these tumors have well-defined limits, a total excision is the best procedure. In toto surgical excision is mandatory for a few reasons. First, to relieve the pain of symptomatic patients. Furthermore, surgical excision will allow a precise pathological examination and bring to light the final diagnosis. Finally, it might avoid recurrence as there is a slight risk for malignant evolution which has a poor prognosis (5-year survival rate ranges 20-35%, if transformation to angioleiomyosarcoma).

Angioleiomyoma cannot be neglected as diagnostic delay or mistreatment increases morbidity and the potential risk of malignant transformation.

P081

Patient reported outcome measures after dorsal closing wedge calcaneal osteotomy and removal of Haglund exostosis via central tendon splitting approach in patients with Haglund exostosis associated heel pain

Thomas Rutishauser; Anika Stephan; Pascal Rippstein; Vincent A. Stadelmann ,

Schulthess Klinik

Introduction: Dorsal closing wedge calcaneal osteotomy (DCWCO) is a valuable option to treat patients with recalcitrant Haglund exostosis associated heel pain since Achilles tendon detachment can be avoided. However, if pronounced local calcifying degenerative Achilles tendon alterations are present, the Achilles tendon central splitting approach might be considered to debride the tendon insertion and remove the Haglund exostosis. To date no study comparing the results of both techniques exists.

Methods: 126 patients (68 males and 58 females [mean age 51.9 years and 47.5 years respectively])were treated with DCWCO between January 2016 and December 2019 and 35 patients (14 males and 21 females [mean age 57.3 years and 54.0 years respectively]) were treated with a central tendon splitting approach between November 2018 and Mai 2019. All patients were followed 24 months postoperatively. Besides postoperative adverse events rates the Foot Function Index (FFI), Global treatment outcome (GTO) and Symptom specific well being (SSWB) scores were obtained. We will add data from the patients' pre-surgery and follow-up x-rays, specifically the x/y-ratio as a measure of lever arm change of the Achilles tendon.

Results: FFI pain and dysfunction was better in the DCWCO group after 12 months. However, no significant difference could be seen after 24 months.

Based on the GTO for 72.2% of the DCWCO patients and 60% of the central splitting group patients the procedure helped or helped a lot. 67.4% vs. 57.1% were satisfied or very satisfied after 24 months. 15.1% vs. 14.3% postoperative adverse events occurred. The x/y-ratio did not show significant differences.

Conclusion: This is the first study comparing DCWCO with Achilles tendon central splitting approach for treatment of patients with Haglund exostosis associated heel pain. SSWB and GTO was slightly higher in the DCWCO group after 24 months. Functional improvement and pain reduction was significantly better within the first year of follow-up in DCWCO but did not differ at 2 years follow-up. Both treatment options showed a similar amount of Achilles tendon lever arm shortening postoperatively.

P082

What to expect 10 years after sustaining a pilon tibial fracture? Quality of life and patient reported outcome

Seraina Rietschi[1]; Krause Fabian[2]; Moritz Tannast[1]; Angela Seidel[1]

[1] HFR Fribourg Cantonal Hospital, University of Fribourg; [2] Orthopädie Sonnenhof - Bern

Introduction: Pilon fractures account for 0.4% of all fractures. Long term patient reported outcome is rare in the literature, but frequently asked by the patients just initial after the injury. The goal of the case series is to provide physicians and patients detailed information about the function of the ankle after sustaining a pilon fracture.

Methods: A registry search was performed to look for all patient operated because of a pilon fracture in the local hospital between 2007 and 2014. In total 52 patients were eligible. Patient were contacted to complete a 22item questionnaire including the EFAS score – a validated patient reported outcome score and the SF-12 score – a quality of life score. Additionally, a radiograph of the ankle was obtained.

Results: 30 of 52 patients (57%) completed the questionnaire at an average 10.3 years after the initial trauma. Of the 22 patient which were not available for the study 9 patients (17%) had died, 4 (8%) could not be contacted because the address was not available anymore and 9 patients (17%) did not want to participate in the study. Of the available patients, there were 22 male and 8 female patients. 8 patients sustained an open fracture. The initial AO classification was the following: 4 B2, 1 B3, 1 C1, 6 C2 and 18 C3. A temporary external fixator was used in 21 (70%) of patients. The definitive fixation was delayed by a mean of 10 days. 17 of the 30 patients had a complication which needed revision surgery in 11 cases. 3 revision surgeries were due to a free flap skin coverage. 3 patients (10%) reached an endpoint and received an ankle fusion at 4.5 years after the trauma.

For the remaining 27 patients with follow up of 10.4 years the mean EFAS score is 14.63 and 6.3 for the sport questions, the mean SF physical component 43.97 and the mean SF mental component 59.70. The Kellgren-Lawrence score 2.8.

Conclusion: Sustaining a pilon tibial fracture is a life changing event and patients have to accept a limited function of the ankle afterwards.

P083

Clinical outcome of the isolated excision of symptomatic accessory navicular bone in a large series at a single institution

Valentina Longhino; Philipp Friederichsen; Pascal Rippstein
Schulthess Klinik

Background: The accessory navicular bone is the one of the most common accessory ossicle and it can be found in 4% to 21% of the general population. It is the result of failed ossification of the navicular bone, which normally takes place between 9 to 11 years of age. In symptomatic individuals, when conservative treatment fails, isolated surgical excision is frequently performed and has been shown to be associated with good results in several small series. Aim of the present study is to present the outcome of this procedure performed in a large series at a single institution.

Methods: We retrospectively evaluated the results of 100 consecutive patients who underwent this procedure at our institution from 2001 to 2022. Primary outcome was determined as the clinical improvement in terms of comparison of the preoperative and postoperative AOFAS- and VAS-scores. Secondary outcome evaluated the ability to resume daily activities and sports.

Results: There were 75 women and 25 men with a mean age of 36 years (range 18-69) at time of surgery. Average follow up was 9 months (range 3-43). Both the AOFAS- and VAS-scores improved significantly. Furthermore 69 patients denied any limitation during daily activities and sports, 9 had minimal complaints and 22 did not improve.

Conclusions: Our study confirmed, based on large series at single institution, the value of the isolated surgical excision in case of symptomatic accessory navicular bone in terms of clinical improvement including objective and patient's reported data.

P084

ENDOSCOPIC TENOLYSIS OF THE FLEXOR HALLUCIS LONGUS (FHL) IN THE TREATMENT OF HALLUX VALGUS

Nabile HIMER; Christopher Tzioupis[1]; Soufiane Diaby[2]; Jacques Vallotton[1]
[1] Hirslanden, Clinique Bois-Cerf, Centre de chirurgie orthopédique, Lausanne; [2] ISPPC

Introduction: Hallux valgus is the most common forefoot problem in adults. Various causes are cited as factors predisposing to this deformation, with the Functional Hallux Limitus caused by the retrotalar tenodesis effect of the FHL being one of them. Endoscopic tenolysis of the FHL, concomitantly with hallux valgus treatment, has shown very promising results in restoring the biomechanics of the foot.

Methodology: This is a monocentric retrospective cohort study conducted within the orthopedic and

traumatological center of the Ouchy center in Lausanne, including patients with hallux valgus treated with Scarf osteotomy, associated with endoscopic tenolysis of the FHL between 2001 and 2021. Following the inclusion criteria 40 patients were studied before and after their Scarf osteotomies and bilateral tenolysis of the FHL.

Results: The average age of the patients was 55.8 years at the time of the intervention. All patients had a pre and postoperative clinical and radiological assessment as well as a gait analysis. Subtalar dysfunction was present in 100% of cases before surgery and persisted only in 8 people postoperatively. Pain under the head of the 1st metatarsal was present in 34 of the patients preoperatively and in 9 postoperatively

(AOFAS). Plantar hyperkeratosis of the foot between the 2nd and 5th metatarsals was significantly improved from 75% preoperatively to 0% postoperatively. The improvement of the podiatric imprint of the pre and postoperative gait analysis was 100%, with a reduction in the load on the heads of M1/M2 for 70% of the patients. Concerning the radiological results, the metatarsophalangeal deformity (HVA and

IMA angle) was corrected at a statistically significant level ($p < 0.001$).

Conclusion: The Scarf osteotomy associated with a bilateral tenolysis of the FHL is a reliable, safe and reproducible technique, resulting to a substantial clinical functional improvement and a restoration of foot biomechanics.

P085

Osteochondral lesions of the talar dome. The gout as a cause? A case report and literature review

Vanesa Redzepi; Thierry Molteni; Eric Ngassom Leumessi; Claire-Anne Saugy
EHC - Hôpital de Morges

Introduction: The osteochondral lesions of the talar dome (OLT) are common, although the exact incidence is not known. Most of them are associated with traumatism but very rarely with intraosseous gouty deposits.

Methods: We first reported the uncommon case of a young man who presented a gouty osteochondral lesion of the medial talar dome. We secondary reviewed the literature reporting gouty OLT in order to better characterize this rare entity.

Results: A 27-year-old male, slightly overweight (BMI 28.4 kg/m2), with a history of untreated hyperuricemia and familial hypercholesterolemia, presented to our outpatient orthopedic unit in January 2022. He complained about atraumatic and fluctuating left ankle pain, evolving for 2 years, and refractory to conservative treatment. On clinical examination, the ankle was painful and swollen with a decrease in joint amplitudes. The imaging (X-rays, MRI) showed a 13 x 13 x 10 mm posteromedial OLT. The patient was treated with medial malleolus osteotomy, local curettage, microfractures, osteochondral autograft and autologous matrix-induced chondrogenesis. The histopathological analysis showed uric acid crystals. The full weight-bearing ambulation without cast immobilization was allowed 8 weeks after surgery. In the meantime, passive and active-assisted ankle motion exercises were started.

Conclusion & Perspectives: The gouty OLT is a rare primomanifestation of the gout that mainly concerns men under 40 years old with predisposing factors such as untreated hyperuricemia, overweight, hyperlipidemia, dietary factors, etc. The imaging often shows large medial OLT associated with subchondral cysts and sclerotic rims. The histopathological analysis allows to identify the exact etiology of the OLT. Due to the scarcity of this diagnosis, no consensus has been reached concerning treatment. But surgery should be combined with medical treatment and management of the comorbidities.

P086

Economic differences in traditional-open versus minimally-invasive hallux valgus surgery: a matched-pair analysis of 112 cases

Andreas Toepfer [1]; Salomé Häni[2]

[1] Kantonspital St.Gallen; [2] Spitalregion Fürstenland Toggenburg - Spital Wil

Introduction: Modern percutaneous hallux valgus correction is gaining increasing popularity and has demonstrated to be able to minimize the surgical morbidity and maximize surgical efficiency without compromising safety. Minimally-invasive Chevron and Akin osteotomy (MICA) represents the third-generation percutaneous hallux valgus surgery which is characterized by an extra-articular osteotomy, stable internal fixation and a high potential for correction. Potential benefits include reduced surgery duration, reduced morbidity, less pain and quicker recovery compared to traditional open procedures.

The advantages of the procedure have been evaluated repeatedly in respect to patient satisfaction, radiological correction results, surgery-associated complications and postoperative use of pain medication. So far, no research has been performed analysing economic factors comparing MICA to traditional open hallux valgus surgery.

Patients and Methods: In a matched-pair analysis, 56 cases of traditional open hallux valgus correction (group A) were compared to 56 cases of MICA (group B). All surgeries were performed between January of 2016 and 2023. Bilateral surgeries and cases with additional surgical procedures (e.g. Hammer toe correction) were excluded to improve comparability. Matching criteria included age, sex, BMI and the degree of deformity. Economic criteria to be evaluated included length of hospital stay, duration of surgery, and cost of implanted hardware. Group A consisted of 5 male and 51 female patients, aged 52.7y (SD14.7), with a mean BMI of 25.4 (SD 3.78), a mean IMA of 13.5° (SD 3.9) and HVA of 28.8° (SD 8.5). Group B consisted of 6 male and 50 female patients, aged 53.2y (SD 4.7), with a mean BMI of 24.5 (SD 3.95), a mean IMA of 16.7° (SD 2.6) and HVA of 33.7° (SD 7.0).

Results: Mean duration of hospital stay (4.1 vs 1.4d) and surgery duration (73.4 vs 38.4min) differed significantly between group A and B. Implant costs for group A ranged between 27.6 and 1114.7 CHF (mean 258.0 CHF, SD 290.7). For group B, implant costs were consistent with 443.7 CHF per case.

Conclusion: MICA is able to reduce the length of hospital stay and the duration of surgery significantly, decreasing the financial burden of elective forefoot surgery. The costs for three cannulated headless screws for MICA are higher than the average implant used for traditional open hallux valgus correction.

P087

What to expect 10 years after bi-malleolar ankle fracture fixation?

Pedro Nogueira; Sérgio Soares; Amal Chidda; Joseph Michael Schwab; Moritz Tannast; Angela Seidel

HFR Fribourg Cantonal Hospital and University

Background: Ankle fractures are some of the most common injuries seen in the emergency department and the most common traumatic bone injuries of the lower limb. The goal of treatment is to achieve an anatomical reduction and appropriate stabilization. The present study aimed to evaluate the long term clinical-functional and radiological results of bi-malleolar fractures sustaining surgery.

Methods: From 2007 and 2014, all patients who underwent surgery after sustaining a tri and bi-malleolar fracture were contacted to complete a 22-item questionnaire which included EFAS and SF-12 score concerning their quality of life and patient-reported outcome. Furthermore, the ankle osteoarthritis (OA) was assessed by the Kellgren and Lawrence (KL) classification on ankle radiographs.

Results: Out of 418 eligible patients, 56 patients with bimalleolar fracture could be included. From this patients 19 (34%) had a syndesmotic lesion. 61% of all patients were women, 22 male (39%), 13 were smokers (23%) and 6 patient had DM (11%). Syndesmotic lesion correlated with a worse EFAS score (p = 0.02), EFAS-sport score (p = 0.01) and SF-12 physical component (p 0.01). Dislocated fractures were a total of 30% and were associated with a higher degree of OA (p = 0.017). The overall complication rate was 7%. Secondary surgery was performed in 59% , 1 due to non-union and the other for hardware removal.

Conclusion: After sustaining a bi-malleolar fracture comprising a syndesmotic lesion a worse outcome is expected as well as dislocated fractures lead to a higher degree of ankle osteoarthritis.

P088

Steroid use for chronic superficial peroneal nerve neuropraxia in ankle sprain: a case series

Philipp Friederichsen; Valentina Longhino; Pascal Rippstein

Schulthess Clinic Zurich

Abstract: Background: Persistent pain on the dorso-lateral aspect of the foot after inversion-supination ankle trauma can be due to neuropraxia of the superficial peroneal nerve. The exact incidence is unclear; only a few cases have been described so far. There is often spontaneous recovery. Surgical release of the nerve is recommended in cases of persistent symptoms.

Methods: We reviewed cases treated at our clinic from January to June 2022 with persistent symptoms associated with persistent superficial peroneal nerve neuropraxia who did not improve after 3 months. Diagnosis was based on clinical criteria. The patients were treated with one or two local subcutaneous steroid injections in the area where the superficial peroneal nerve penetrates the fascia cruris. Pain was recorded using a visual analogue scale Differences in the VAS score at each consultation.

Results: 7 patients were identified. (All showed the typical clinical symptoms (hypoesthesia in the innervation area, Tinel's sign in the area where the nerve penetrates the fascia cruris, diffuse pain on the dorso-lateral aspect of the foot)). All 7 patients were almost or completely free of symptoms at 4 months after the last local infiltration. Surgery was not necessary.

Conclusion: The results of this case series suggest that local infiltration around the superficial peroneal nerve could be an effective treatment concept for superficial peroneal nerve neuropraxia after ankle sprain. In addition, it is a low side-effect and cost-effective treatment method.

Level od Evidence: Level IV, Case series

P089

Significant Early Loss of Correction in Modified Lapidus Compared to Original Lapidus for Hallux Valgus

Tunku Naziha; Antoine Acker; Laura Peurière; Nils Reymond; Lisca Drittenbass; Victor Dubois-Ferrière; Mathieu Assal

Centre Assal de Médecine et de Chirurgie du Pied

Introduction: The Lapidus procedure (first tarsometatarsal joint (TMT 1) fusion) is an established treatment for correcting hallux

valgus with 1st ray hypermobility. The original Lapidus (OL) technique involves fusing the TMT1 joint and the base of the 1st metatarsal base to the second. In contrast, the modified Lapidus (ML) technique involves fusing only the TMT1 joint. This study aimed to investigate whether the ML procedure results in an early loss of correction.

Methods: This retrospective study analyzed the outcomes of 45 feet in 40 patients with hallux valgus who underwent either the ML (21 feet) or OL (24 feet) procedure between 2014 and 2022 at a single centre. All fixations were performed with 3.5 cortical screws, except for 9 cases that were fixed with a plantar locking plate. Differences in the immediate postoperative (6 weeks) and postoperative (6 months) intermetatarsal angle (IMA) and hallux valgus angle (HVA) were analyzed using Mann-Whitney tests, and complications were reported.

Results: The mean preoperative IMA and HVA for the OL procedure were 15.8° ± 3.5° and 36.4° ± 9.5°, respectively, while for the ML procedure, means were 14.5° ± 2.3° and 33.0° ± 7.0°. The immediate postoperative IMA and HVA were similar for both procedures (7.2° ± 2.0° and 7.7° ± 4.3° for OL, and 7.3° ± 2.1° and 8.5° ± 5.5° for ML). Although from 6 weeks to 6 months postoperatively, the loss of correction of the HVA did not differ between the two procedures, the loss of correction of the IMA was significantly higher in the ML (1.1° ± 1.4°) than in the OL (0.5° ± 1.1°) ($p < 0.05$). One case of delayed union was reported in the OL group, but it did not require revision.

Conclusion: The study results suggest that the modified Lapidus procedure does not provide the same stability as the original Lapidus procedure in the early postoperative period, as there was a significant greater early loss of correction of the IMA at 6 months postoperatively in the modified Lapidus group compared to the original Lapidus group. Although there were no differences in the loss of correction of the HVA angle, an observed loss of 5 degrees remains a concern. Further studies are necessary to better understand the differential indications of the modified and original procedures.

POSTERS: A71 PAEDIATRIC ORTHOPAEDICS

P090

A rare combination of three fractures in a adolescent

Hanna Wellauer; Franziska Kocher; Ines Raabe
HFR - Hôpital Cantonal Fribourg

Introduction: Fractures of the distal tibial epiphysis, known as tillaux and triplane fractures, are rare fractures of the adolescent. These specific fracture patterns occur because the distal tibial epiphysis fuses in a specific sequence towards the end of growth. The central portion of the physis closes first followed by the anteromedial then posteromedial portions and the lateral portion closes last.

The deforming force acting on the ankle in these fractures is external rotation, which exerts a tensile load on the anterior inferior tibiofibular ligament, resulting in osseous avulsion of the anterolateral epiphysis. It is often an isolated fracture, but there are individual case reports in the literature with concomitant injuries.

Methods: The patient was a 14 year old female who was brought to the emergency department after a fall during figure skating. During the execution of a double flip, , the skate blocked on landing and she felt a cracking sensation in her lower leg.

Conventional imaging revealed a spiral fracture of the distal tibia and a suspected fracture of the distal physisfracture. In the CT scan, a dislocated Tillaux fracture, a non-displaced Volkmann fracture and the tibial shaft fracture were diagnosed. In addition, a Salter Harris 2 injury of the distal fibula was found.

Results: Due to the dislocation of the articular fragment, we indicated surgical treatment. The Tillaux fragment was repositioned and fixed anatomicly with a 2.7 screw through a minimal anterolateral approach. Osteosynthesis of the shaft fracture was then performed using lag screw osteosynthesis and a neutralization plate. The fibula as well as the Volkmann fracture were stable in intraoperative testing.

Postoperatively, the patient was immobilized in a lower leg cast and partial weight bearing of 15 kg for 4 weeks.

Figure skating training could be resumed after 4 months without any complaints. The removal of the material is planned for 6-8 months postoperatively.

Conclusion: This case is a rare combination that has not been described in the literature. In 1995, Cox et al. published a similar case, but without Volkmann's involvement.

The dominant deforming force in this case was external rotation. In younger children this would have led to a typical triplane fracture. Since in this patient the physis was already nearly closed, this unique combination of an adolescent fracture in combination with a complex tibial shaft fracture occurred.

P091

Destructive streptococcal knee arthritis with extensive deep vein thrombosis in a 4-year-old boy. Case presentation and literature review

Benjamin Kraler; Manuel Kraus; Claudia Höfele-Behrendt; Julia Anna Bielicki; Heide Elke Viehweger; Marcus Mumme
Universitäts-Kinderspital beider Basel (UKBB)

Introduction: An increase of invasive streptococcal group A infections has been reported in the paediatric population in the post-covid era including musculoskeletal manifestations (1). Paediatric streptococcal joint infections are an orthopaedic emergency not only due to cartilage destruction, but also due to streptococcal M1 protein related platelet activation and coagulopathy (2-4). Therefore, streptococcal group A infections can lead to deep vein thrombosis, septic embolism, respiratory distress, toxic shock syndrome, and even death (1-4).

Case presentation: We report the case of a 4-year-old male patient who presented to another institution with fever for 6 days and pain in his right knee and popliteal cavity without preceding trauma. He had experienced cough one week previously. At presentation knee motion was severely painful and he was unable to bear weight. Ultrasound showed extensive thrombus formation from the popliteal vein to the femoral veins and knee MRI revealed intraarticular effusion. Joint aspiration isolated Streptococcus pyogenes (group A). Subcutaneous enoxaparin and intravenous cefuroxime were started, but surgical management postponed. On day 6, follow-up knee MRI highlighted bony necrosis in the distal femoral epiphysis and to a lesser extend in the proximal tibial epiphysis. Clindamycin was added. On day 7 the patient was transferred to our institution for arthroscopic irrigation. Biopsies during arthroscopy identified Streptococcus pyogenes after 7 days of antibiotic therapy. Due to persisting fever, effusion, and rising inflammatory markers a second knee arthroscopy was performed on day 11, which showed softened but intact cartilage. Biopsies remained negative. Cefuroxime was switched to high-dose penicillin and clindamycin continued. Intensive physical therapy slowly improved knee range of motion. Thrombus size reduced under therapeutic enoxaparin. Inflammatory parameters finally declined, and the patient was discharged with oral clindamycin after 32 days in hospital.

Conclusion: Streptococcal group A musculoskeletal infections can lead to platelet activation with coagulopathy and predisposes to thrombus formation. Prompt surgical drainage is mandatory not only to clear infection but also to minimize the risk of complications such as thrombosis and embolism. Co-existence of bone and joint infections and thrombosis may be underestimated due to similar clinical presentations.

P092

Extruded large bone fragment in a 6 year old boy with a type III open tibial fracture resulting in leg length discrepancy and axis deformity

Harald Lengnick; Johannes Cip; Christoph Matissek
Ostschweizer Kinderspital St. Gallen

Introduction: Extruded large bone fragments with open tibial fracture are rare injury patterns in children and young people. On the one hand there is no standardized treatment concept in acute injury state. On the other hand medium-term posttraumatic deformities have to be considered in this cases.

Methods and Results: We present the case of a six year old boy with a Gustillo type III open tibial fracture with extruded large tibia bone fracture and proximal femur fracture on the left leg. In the polytraumatized situation the tibia and femur fracture were both stabilized with fixateur externe following the damage control strategy. The tibia bone fragment of the diaphysis messured eight centimeter and was conserved by freezing it at -20°C. Before secondary reimplantation the fragment was defrosted and bathed in jod-dilution. After this it was reinserted using fixateur externe technique and soleus flap soft tissue operation ten days post trauma. After nine months the diaphysary tibia fragment was completely healed without osteomyelitis and fixateur externe could be removed. Fifteen months after the trauma the left tibia was 1.4cm longer than the right side leading to a leg length discrepancy and especially a genu valgum of 12°,

which made growth guided temporary hemiepihyseodesis of the proximal medial tibia necessary.

Conclusion: Our case report describes the reimplantation of extruded and contaminated large bone fragments after freezing and decontamination with jod dilution as possible treatment technique in children. After healing process a close observation in the outpatient setting should be performed concerning posttraumatic deformities like leg length discrepancy and axis deformity.

P093

Fractured screw osteosynthesis due to re-trauma of a pediatric femoral neck fracture: Solution approach with 3D planning and printing

Manuel Johannes Kraus; Benjamin Kraler; Benjamin Frei; Andreas Krieg

University Children's Hospital of Basel (UKBB)

Introduction: Surgical procedures and fractures of the femoral neck are associated with a high risk of femoral head necrosis, especially in skeletally immature patients. We present the case of an 11-year-old patient with a breakage of both screws and the femoral neck fracture healed in malposition after initial direct posttraumatic screw osteosynthesis. Correspondingly a limitation of motion was noted. MRI at this time showed a focal necrosis of the femoral head epiphysis. Thus, the question arose as to how best to correct the deformity without further increasing the risk of advancing necrosis by metal removal or re-manipulation of the femoral neck.

Methods: A CT data set of the left hip was reconstructed in 3D and further planning was performed using Mimics Innovation Suite software. A cannulated 130° blade plate was chosen for stabilization. Since it was assumed that removal of the broken threads would mean a relevant loss of substance or too much manipulation, it was decided to remove the broken screw shafts only. In order to correctly place the central guide wire of the blade, the trochanteric massif and the two screw holes after removal were chosen as reference for the corresponding drilling jig. A cutting jig was developed to achieve a subtrochanteric osteotomy with removal of a 50° wedge that is neutral in flexion and extension but is shortened by approximately 1 cm, with the instrument omitting the placed blade. Finally, the sterilizable jigs were 3D printed.

Results: Analogous to the preoperative planning, the implant could be positioned satisfactorily. An adjustment of the preoperatively increased antetorsion by 16° and a valgization of the left femoral neck by 40° to 120° could be achieved. Restrictive follow-up treatment with wheelchair mobilization for 6 weeks and subsequent weight-bearing resulted in regular consolidation with good function, freedom from symptoms, and so far, no evidence of progression of the femoral head necrosis.

Conclusion: In complex traumatic issues, preoperative planning with anticipation of possible intraoperative problems can influence the choice of implants, shorten the operative time, and help to ultimately achieve the intended surgical result.

P094

Management of pediatric displaced supracondylar humerus fractures: Open reduction is a safe option and leads to similar functional and radiographic outcomes at long-term follow-up

Franziska Kocher; Alexander Frank Heimann; Moritz Tannast; Ines Raabe

Department of Orthopaedic Surgery, HFR Fribourg, University of Fribourg

Introduction: Supracondylar humerus fractures are the second most common fracture in children between ages 5-8 years. Operative treatment of displaced fractures (Gartland type III and IV) is favored because of the limited remodeling potential of the growing distal humerus, in particular malrotation. Operative treatment consists of either closed or open reduction, with fixation predominantly using K-wires. The literature regarding closed versus open reduction of abovementioned fractures is controversial, especially regarding perioperative complication rates , long-term follow-up in terms of clinical-functional and radiographic outcome. Most centers favor closed reduction to avoid perioperative complications (e.g. nerve lesions, periartiuclar heterotopic ossifications) and limited range of motion at follow-up.

Methods: We retrospectively reviewed all surgically treated patients with displaced supracondylar humerus, with either closed (n = 31), secondary open (n = 22) or primary open (n = 11) reduction and K-wire fixation over the last 10 years. Patients subsequently underwent clinical-functional follow-up assessment using Flynn's criteria and QuickDASH score. Radiographic outcome (Baumann's angle, anterior humeral line) were determined at a minimum follow-up examination of 1 year (mean 6 ± 3 years). Further, we assessed reasons for conversion to an open surgical reduction and perioperative complication rates.

Results: The main reason for intraoperative conversion was insufficient fracture reduction, often due to incarcerated structures. We found no significant differences between our study groups regarding the prevalence of perioperative complication rates (p = .237) as described by Sink, long-term functional (p = .305) and cosmetic (p = .196) outcomes by Flynn's criteria between study groups, or radiographic outcome assessed by Baumann's angle (p = .753) and the anterior humeral line (p = .579). QuickDASH score assessment showed a comparable mean level of disability between 0 and 2% for all patients at long-term follow-up.

Conclusion: Conversion from unsuccessful closed to open reduction to restore sagittal and frontal alignment in surgical treatment of displaced supracondylar humerus fractures is a safe option, although percutaneous pinning is usually advocated where possible. In our retrospective observational study, we found similar functional and radiological results in the long-term follow-up in patients beneficing either close or open reduction.

POSTERS: A72 INFECTIONS

P095

Bone tuberculosis in Switzerland – only an Immigrant problem?

Sonja Cronenberg; Michael Schmelz; Matthias Hoffmann; Christoph Schwaller

Kantonsspital Olten

Purpose: in the general public and among doctors of all specialities tuberculosis both pulmonary and extra pulmonary are mostly associated with immigrants from Eastern Europe or subsaharan Africa. In central Europe and many other countries, the incidents have declined ever since the introduction of medical anti- tuberculosis therapy. Does this mean we loose it out of sight in our daily practice?

Methods: an 82-year-old lady was referred to our ER with an unclear lesion to the forearm. The patient had a swelling and redness over several weeks without any history of trauma. The GPs ibuprofen cream did improve the situation and 3 days prior to presentation the lesion opened up spontaneously and discarded what was perceived as pus. On presentation we at first were thinking of a bone tumor, especially as we saw osteodestructive leasions on xray (Codman triangles), sonography showed liqiud in all tendon sheaths but the CRP was not elavated.

Results: thinking of being confronted with a bone tumor primarily we did an MRI which showed extensively destructed areas, still most likely neoplastic or infectious. The first biopsy taken showed both neither in microbiology nor in histopathology acid-fast rods but only Staph aureus after enrichment. Only after longer incubation acid fast rods were detected.

Due to the instability 5 weeks after the first debridement the radius fractured but under tuberculostatic therapy and casting the fracture eventually healed.

Finally it turned out that the patient was sick for many weeks when she was 17 with a "lung disease" and under oral therapy. A Mantoux test from 1972 was positive.

Conclusion: even though tuberculosis and bone manifestaions are rare and uncommon lesions in local patients especially in the older generations this still can be the first symptome of extrapulmonary tuberculosis.

P096

Cement loaded with high-dose gentamicin and clindamycin does not reduce the risk of infection after aseptic total hip or knee revision surgery: a preliminary study

Ceyran Hamoudi; Pierre-Antoine Debordes; Jean-Yves Jenny

Centre Hospitalier Universitaire de Strasbourg

Introduction: The use of antibiotic-loaded acrylic cement for preventing periprosthetic joint infections remains controversial. A previous study showed that the combination of high-dose gentamicin with clindamycin was effective for preventing infection after one-stage exchange of a total hip or knee arthroplasty for peri-prosthetic infection. However, the possible impact of such a cement for preventing infection after aseptic exchange of a total hip or knee arthroplasty is not evaluated.

We hypothesized that the raw rate of surgical site infection (SSI) is lower after using cement loaded with high-dose gentamicin and clindamycin than after using cement loaded with standard-dose gentamicin for implant fixation during total hip (rTHA) or knee revision arthroplasty (rTKA) for aseptic reason.

Material and methods: This retrospective study included 290 consecutive patients undergoing aseptic rTHA or rTKA. Two consecutive cohorts were defined based on the type of ALBC used. The first cohort (control group) involved 145 patients where ALBC with gentamicin only was used. The second cohort (study group) involved 145 patients where ALBC with high-dose gentamicin and clindamycin was used. The primary endpoint was the raw SSI rate after 24 months.

Results: The raw SSI rate was 8/145 (6%) in the control group and 13/145 (9%) in the study group (odds ratio 0.62, p = .26). There was a significant impact of the presence of any risk factor on the SSI rate (15/100 vs 6/169, odds ratio = 4.25, p = .002). There was no significant impact of any individual risk factor on the SSI rate. No complication or side effect related to ALBC was observed in either group.

Conclusion: The use of G+C cement did not allow a significant decrease in the SSI rate in aseptic cases of total hip and knee revision arthroplasty. The routine use of this cement for prophylaxis of postoperative infection cannot be recommended.

P097

Long term outcome after internal hemipelvectomy and partial sacrum resection in a patient with pelvic bone hydatosis. A case report

Philippe Siegenthaler[1]; Carol Strahm[1]; Nathalie Alexander[2]; Thomas Forster[1]; Karl Grob[1]

[1] Kantonsspital St. Gallen KSSG; [2] Ostschweizer Kinderspital St. Gallen

Introduction: Cystic Echinococcosis (CE) is a parasitosis caused by Echinococcus granulosus which is endemic in Eastern Europe. CE mainly involves the liver or lung, the bone is only rarely affected and accounts for 0.5 - 4% of all manifestations. The only curative treatment is surgical resection. We report a case of hydatid disease involving the entire left pelvis, hip joint and left sacrum with a 5 year follow up.

Case: A 29 year old male who grew up in Kosovo, presented with a tumor-like mass of the left supraacetabular region. Open biopsy 4 years before in Serbia confirmed a localized manifestation of CE and was treated with albendazole for 9 months. The MRI and CT scan showed extensive bone destruction of the whole left hemipelvis extending to the sacroiliac joint, the neuroforamina S1 and S2 and the surrounding intra- and extrapelvic soft tissue. After resuming antihelmintic therapy an internal left hemipelvectomy, resection of the femoral head together with a partial transforaminal sacrum resection was performed. Due to extensive bone loss and the remaining unprotected nerves of the lower limb after surgery, second stage prosthetic procedure was deemed impossible. The remaining pelvitrochanteric muscles were connected around the greater trochanter and fixed to the abdominal muscles.

Results: Hemipelvectomy has been managed without harm to the main neurovascular structures. 9 months after hemipelvectomy the patient showed pain free and fluent ambulation with crutches and could walk for 20 meters without assistive devices. 5 years post-surgery a left leg shortening of 7 cm remained and the patient presented with a Duchenne and shortening gait, only. Wearing an individually fitted shoe the patient is mobile without any walking aids and free of analgesics. Moreover, he works full time as a mechanic in a standing position.

The postoperative histopathology showed an R1 resection with cyst wall remnants on the bony structures. 16 months post-surgery the antihelmintic therapy was suspended, however was

resumed when a follow up MRI showed a new small Cyst suspicious for a CE manifestation. Since then the patient remains on therapy.

Conclusion: Hydatide Osteopathy is an infiltrating, progressive disease. Surgery in combination with pre- and postoperative antihelmintic therapy is the standard of care. Early diagnosis helps in the eradication and salvage of the bone. The treatment remains challenging with the potential of functional loss and high recurrence rates.

P098

Management of acute periprosthetic knee infection: a comparison of arthroscopic and open debridement

Anna Bartsch[1]; Philip Krenn[1]; Bart Lubberts[1]; Mario Morgenstern[1]; Geert Pagenstert[2]; Martin Clauss[1]

[1] University Hospital Basel, Switzerland; [2] CLARAHOF Clinic of Orthopaedic Surgery, Basel

Introduction: In acute periprosthetic knee infections, debridement and implant retention (DAIR) in early postoperative (within 4 weeks after arthroplasty) and acute hematogenous periprosthetic infection (duration of symptoms less than 4 weeks) is the preferred treatment prior to one- and two-stage revisions. Open or arthroscopic debridement are both established procedures for removal of the infected tissue. The aim of this study is to compare the outcomes of arthroscopic and open debridement of infected primary total knee arthroplasties (TKA).

Methods: We analyzed clinical, laboratory, and antibiotic treatment data, collected in patients with periprosthetic knee infection treated with DAIR at a Swiss Level 1 orthopedic and trauma center over a 10-year period between January 2005 and May 2015. Inclusion criteria were primary TKA and early postoperative or acute hematogenous periprosthetic joint infection. The primary endpoint was the need for further revision surgery due to persistent infection. The secondary endpoint was the prosthesis salvage in further infection surgeries.

Results: Forty-two patients with 44 acute or hematogenous periprosthetic knee infections were included. The follow-up time after revision surgery of each patient was at least 6 years (average follow-up time after index surgery 8.4 years). In total, 20 out of 44 cases (45%) had persistent infections after initial DAIR. Arthroscopic DAIR showed unfavorable results with 10 failures out of 13 debridements (77% failures) compared to the open DAIR group with 10 failures out of 31 debridements, (32% failures). This finding was statistically significant ($p = 0.007$). Of the failed cases, which received further arthroscopic debridement, none could be effectively treated with this procedure and finally received open debridement. Success rate for open debridement at the second attempt was approximately 45%, regardless of whether the first debridement was open or arthroscopic. Two-stage revisions had to be performed in nine patients in total, of which three patients were treated arthroscopic initially (23%) and six patients were initially treated with an open procedure (21%). There was no significant difference detected in final TKA salvage between initial open and initial arthroscopic debridement group ($p = 0.586$).

Conclusion: Open debridement for acute periprosthetic knee infection shows clear benefits in terms of infection eradication and prosthesis salvage compared to arthroscopic DAIR.

P099

The chimeric medial and lateral sural artery perforator gastrocnemius flap for combined soft tissue / extensor apparatus reconstruction in periprosthetic joint infection of the knee

Seraina L.C. Müller; Steven J. Lo; Schaefer Dirk J.; Martin Clauss; Rik Osinga

Universitätsspital Basel (USB)

Introduction: Periprosthetic joint infection is a severe complication after total knee arthroplasty (TKA). Here, we present a single-centre series of elderly patients with PJI of the knee and combined soft-tissue / extensor apparatus defects treated with a pedicled chimeric medial or lateral sural artery perforator (MSAP/LSAP) myocutaneous gastrocnemius flap. Perioperative complications were assessed and the clinical orthoplastic outcome minimally one year after surgery is reported.

Methods: At the Center for Musculoskeletal Infections at the University Hospital of Basel, a retrospective study included all patients undergoing a pedicled chimeric MSAP/LSAP myocutaneous gastrocnemius flap reconstruction for a composite soft tissue defect both of the skin and the underlying extensor apparatus in PJI after TKA between 2019 and 2021. Perioperative complications were assessed and the postoperative orthoplastic outcome minimally one year after surgery is reported. The functional assessment included range of motion and stability of the knee as well as clinical assessment of new or recurrent PJI of the reconstructed knee. The American Knee Society Score (AKSS) was measured before and one year after surgery.

Results: In total 8 patients with a MSAP/LSAP myocutaneous gastrocnemius in PJI after TKA were included (mean age 73 years). Six reconstructions were performed with a MSAP and 2 with a LSAP myocutaneous gastrocnemius flap. All donor sites could be closed primarily. The median time for the wound to heal was 13 days. Short-term follow-up showed successful reconstruction in 7 patients. One patient developed minor wound dehiscence which was treated conservatively. One patient developed a perigenicular hemato-seroma which needed flap elevation and evacuation. In 2 patients reinfection of the TKA occurred with a new pathogen. Patients with MSAP/LSAP reconstruction showed postoperatively a significantly better AKSS functional and clinical score after surgery than preoperatively ($p < 0.05$).

Conclusion: The pedicled MSAP/LSAP myocutaneous gastrocnemius flap is a safe, reliable and versatile option to reconstruct composite soft-tissue including extensor apparatus defects in patients with PJI after TKA. It allows orthoplastic soft-tissue reconstruction without the need for microsurgical free tissue transfer, which in the elderly and comorbid patient subgroup is relevant. The functional outcome is excellent with comparatively low peri- and postoperative complications.

P100

Solving the anchorage problem distal to the isthmus as an essential feature of a customized spacer

Michael Klauser; Alexander Vacariu-Seelig; Andrej M. Nowakowski

Purpose: After surgery, immediate full weight bearing is especially important in the elderly population. Besides reducing postoperative morbidity, it also increases patient well-being and satisfaction. Especially in two-staged surgeries, it is a surgeon's goal to achieve a situation in which the patient is fully mobile inbetween the two surgeries. However, in some unique cases this may be a challenge for surgeons.

Material/Methods: An 88-year-old patient suffered a chronic implant-associated infection with a difficult to treat germ,

which implemented a two-stage revision approach. The patient had undergone several previous surgeries, including implantation of a cemented long-stem prosthesis, which lead to cement leakage due to a femoral defect in the lateral shaft area at the isthmus. Hence, it was necessary to achieve stabile anchoring distal of the isthmus to allow weight bearing in the interval between the two interventions. To allow distal anchorage, a gamma nail was sawed off proximally to build up the custom-made spacer. The following custom-made spacer was implanted. Additionally modified with transversal drill-holes, this distal part of the nail got cemented into a cement sleeve using two 10ml syringes as a guide form. After curing of the cement, the modified nail could be locked distally to be further built up with a conventional long spacer.

Results: The patient could be mobilized very well with the custom-made implant until the reimplantation of the new prosthesis could be performed. Even though the patient was of age, there was no thrombosis, no embolism, and no excessive muscle atrophy. She was quickly mobile again after reimplantation. One year postoperatively, the 89-year-old patient, still free of infection, presented with a safe and limp-free gait. She still lives at home and is independently mobile. There are no contractures, a negative Trendelenburg and unrestricted and pain-free mobility.

Conclusion: For individual cases, the industry does not always have a suitable (interim) implant. So with our custom made spacer distal anchoring was possible as well as postoperative mobilization. We think that the mobility and the preserved preload of the abductors during the spacer phase reduced immobility-associated complications such as pneumonia, deconditioning, thromboembolic events, sarcopenia, etc.

POSTERS: A73 TUMORS

P101

Ganglioneuroma of the psoas presenting with diarrhea

Tim Schmid[1]; Georg Schelling[1]; Arash Najafi[2]; Bruno Fuchs[3]

[1] Luzerner Kantonsspital (LUKS); [2] Kantonsspital Winterthur; [3] Swiss Sarcoma Network

Introduction: Ganglioneuromas are tumors of sympathetic origin, with a heterogeneous clinical course ranging from localized or spontaneously regressing to widely metastatic disease. The challenge in treating these tumors focus on the definition of the oncological aggressivity of the disease, and to tailor the treatment accordingly.

We herein present a rare cause of a low-grade ganglioneuroma presenting with diarrhea which was treated minimally invasive through local ablation.

Methods: A 44yo male noticed a sudden onset of severe diarrhea with associated weight loss. Because he recently was in the Dominican Republique, an inflammatory cause was investigated but remained negative. A colonoscopy as well as gastroscopy were negative. The imaging work-up however revealed a soft tissue mass in the psoas muscle at the lumbar-pelvic junction.

Results: A minimal-invasive local radio-frequency ablation was performed in general anesthesia to eliminate the lesion. At the first follow-up, the patient remained completely free of diarrhea.

Conclusion: Ganglioneuroma represent a rare cause of a soft tissue tumor. Despite its low-grade biology, it necessitated therapy because of the clinical symptoms. Using a minimally invasive ablation strategy, the symptoms were solved.

P102

Soft tissue coverage of a large pretibial defect of the integument after tumor resection

Kim Linette Müller[1]; Georg Schelling[1]; Mario Scaglioni[1]; Gabriela Studer[1]; Beata Bode-Lesniewska[2]; Bruno Fuchs[3]

[1] Luzerner Kantonsspital (LUKS); [2] Pathologie Institut Enge; [3] Swiss Sarcoma Network

Introduction: Large pretibial soft tissue sarcomas pose a particular challenge for a sarcoma surgeon because any resection exposes the bare bone without the possibility of direct wound closure. Traditionally, local pedicled muscular flaps were used such as a gastrocnemius or a soleus flap, together with mesh-grafting. However, these provide only limited area of coverage and therefore no flexibility. We herein present the use of kissing pedicled perforator flaps to cover a large pretibial defect.

Methods: A 68yo female noticed a rapidly growing pretibial lump on her right leg. A US-guided core biopsy revealed a G3 undifferentiated pleomorphic sarcoma of maximally 9cm diameter and a volume of 288cc. She underwent hypofractionated radiation therapy (5x5Gy = 25Gy) to then undergo surgical wide R0-resection.

Results: The defect anterior to the tibia after local resection measured 11x9cm. Preoperative angio-CT as well ICG revealed local perforators, so that pedicled perforator flaps were harvested on the medial and the lateral side to advance and meet each other over the tibia, to fully cover the defect. There were no postoperative complications. At 1 year follow-up, the flaps healed nicely and there was no local recurrence of the tumor.

Conclusion: Two perforator flaps harvested and advanced from both sides of the lower leg (so called "kissing flaps") provide an alternative option to cover large pretibial soft tissue defects.

P103

Giant chronic hematoma of the medial proximal thigh mimicking a soft tissue sarcoma

Constance Raith[1]; Georg Schelling[1]; Lars Kern[2]; Beata Bode-Lesniewska[3]; Bruno Fuchs[2]

[1] Luzerner Kantonsspital (LUKS); [2] Swiss Sarcoma Network; [3] Pathologie Institut Enge

Introduction: The differential diagnosis of soft tissue sarcomas includes a large variety of lesions and specifically a large variety of sarcoma simulators. The pathological work-up is critically important and a lot of experience is required to make a call whether the lesion is benign or malignant. Despite the advances of molecular diagnostics, it is not always clear and a cautious treatment approach is mandatory.

We herein present a chronically growing hematoma as a mimicker of a sarcoma.

Methods: A 77yo male underwent a hip arthrodesis in his youth due to tuberculosis and was hospitalized for more than a year at that time. This experience primed him for the rest of his life, being terrified of hospitals. He noticed a soft tissue lump of 10 cm length dorsal to his arthrodesis, affecting his daily activities. There was no history of trauma and no anticoagulation. A first ultrasound-guided core biopsy was inconclusive and a low-grade lesion could not be ruled out. The patient opted for follow-up imaging. Each time we saw the patient, the tumor slightly increased in size, but it took the patient two years until he agreed to have a surgery.

Results: In a modified prone position because of the hip arthrodesis, the tumor was completely R0- removed while sparing the sciatic nerve. The clinical course was uneventful. Pathological work-up revealed an old chronic hematoma without any signs of malignancy.

Conclusion: Careful work-up in diagnosing sarcomas is always mandatory. If the diagnosis cannot be exactly specified and the patient is hesitant, the clinical course has to be carefully monitored always taking the malignant potential into account.

P104

Do we always need a muscle flap for reconstruction of the extensor mechanism of the knee?

Constance Raith[1]; Georg Schelling[1]; Urs Müller[1]; Beata Bode-Lesniewska[2]; Bruno Fuchs[3]

[1] Luzerner Kantonsspital (LUKS); [2] Pathologie Institut Enge; [3] Swiss Sarcoma Network

Introduction: The reconstruction of the extensor mechanism at the knee after resection of the proximal tibia poses great challenges to the sarcoma surgeon, mainly because of the sparse soft tissue mantle. These patients often undergo adjuvant therapy with consecutive immunocompromise. If there is the slightest problem in wound healing, the risk of infection with the frequent associated involvement of its underlying prosthesis is considered important. Others argue that a flap coverage is important for restoration of the extensor function.

We herein present a reconstruction method of knee extension without the use of a muscle flap.

Methods: A 32yo male presented with an increasing hard lump below the left knee. Six years prior he had a first radiograph taken, but he was told that the lesion was uneventful. Work-up of the lesion revealed a periosteal chondrosarcoma. The decision was made to surgically resect the lesion which also involved the removal of the entire patellar tendon. For this purpose, patient-specific instruments for resection (PSI) were designed.

Results: During surgery, the tumor was exposed to accept the PSI. Multiplanar R0-resection was carried out keeping the articular surface of the knee joint. Afterward we used an allograft which was shaped by using PSIs to perfectly match the resected defect. A plate was used to fix the allograft to the tibia. The remnants of the patellar tendon were adapted using strong FiberWires, followed by the primary closure. There were no complications. At 6 months of follow-up, the patient actively extended his knees with a 10° lag, and the MRI showed the restauration of the patellar tendon.

Conclusion: In selected cases, specifically when no adjuvant therapy is used and when no prosthesis is implanted, direct soft tissue coverage without the need of muscular flap reconstruction may be considered.

P105

Soft tissue coverage in the poplitea after treatment for unplanned resection

Laura Buchmann[1]; Georg Schelling[1]; Mario Scaglioni[1]; Beata Bode-Lesniewska[2]; Gabriela Studer[1]; Bruno Fuchs[3]

[1] Luzerner Kantonsspital (LUKS); [2] Pathologie Institut Enge; [3] Swiss Sarcoma Network

Introduction: Unplanned resection with contamination of the local environment may pose great challenges in case of a soft tissue sarcoma, specifically if it's located in the poplitea, which is considered a high demand anatomic region. The aim is to present the use of a free SCIP (superficial circumflex iliac perforator) flap for coverage of a large soft tissue defect in the poplitea to enable normal mechanical and functional use.

Methods: A 65yo female noticed an increasing lump at her poplitea over months. Although it was suggested by a sarcoma surgeon to first undergo an ultrasound-guided core biopsy of this undetermined epifascial and 6cm large mass, a direct excision was carried out. The work-up revealed an incompletely resected low-grade myxofibrosarcoma. At the multidisciplinary sarcomaboard, a combination therapy was recommended. First, a hypofractionated 5x5Gy = 25Gy preoperative radiation therapy was conducted followed by re-resection.

Results: A local resection was performed exposing and preserving the peroneal nerve, leaving a soft tissue defect of 8x7cm. After changing to supine position, a SCIP flap was harvested to adapt the thickness of the soft tissue environment, to then bring it in at the poplitea. At 6 months of follow-up, the patient was free of recurrence and the free SCIP flap healed uneventfully.

Conclusion: Soft tissue coverage after tumor resection is particularly challenging in anatomic regions which are subjected to high mechanical demand such as the popliteal region. A SCIP flap can be custom-made according to the soft tissue thickness of the local environment and has nearly no comorbidity at the local harvest site.

P106

How do we cover a large frontal soft tissue defect after tumor resection?

Philipp Lindeburg[1]; Georg Schelling[1]; Mario Scaglioni[1]; Beata Bode-Lesniewska[2]; Bruno Fuchs[3]

[1] Luzerner Kantonsspital (LUKS); [2] Pathologie Institut Enge; [3] Swiss Sarcoma Network

Introduction: Oncological surgical principles require complete resection of intermediate and malignant soft tissue tumors. Very often, the defects after tumor resection can be closed primarily. If this is not the case, a reconstructive soft tissue coverage has to be taken into consideration. The type of flap coverage is mainly determined by the anatomical location and can be performed either pedicled or free.

The aim of this case report is to present the first use of a free SCIP (superficial circumflex iliac perforator) flap for coverage of a large soft tissue defect at the front.

Methods: A 46yo male had a growing lump at his left anterior front for several months. A local physician removed it without prior imaging and work-up, leaving a 3cm long scar, which nicely healed up. Pathological analyses revealed a dermatofibrosarcoma protuberans, an intermediate biology known to have satellite tumor cells around the main mass in up to several centimeters distance. At the multidisciplinary sarcomaboard, complete resection with adequate margins after post-festum MRI-imaging was suggested.

Results: At the left anterior front, the tumor bed was widely excised including the galea aponeurotica leaving a soft tissue defect of 8x7cm. First, the temporal ipsilateral vessels were exposed anterior to the ear. Then, at the ipsilateral inguina, a SCIP flap was harvested with the appropriate thickness and brought into the frontal defect. A tunnel for the vessels was created to the incision in front of the ear, and end-to-side anastomoses were performed. An ICG confirmed excellent perfusion of the flap, which was sewed in.

Conclusion: Because the harvest of a SCIP flap can be varied for thickness, it is ideally suited to cover a large soft tissue defect at the front to achieve a nice cosmetic result.

P107

Leiomyosarcoma of the hand with two metachronous metastatic lesions other than the primary

Yiwen Luo[1]; Georg Schelling[1]; Urs Hug[1]; Mario Scaglioni[1]; Beata Bode-Lesniewska[2]; Bruno Fuchs[3]

[1] Luzerner Kantonsspital (LUKS); [2] Pathologie Institut Enge; [3] Swiss Sarcoma Network

Introductions: Most soft tissue sarcomas metastasize hematologically, only rarely via the lymphatics, most prevalently into the lungs, rarely into the bones. The process of metastasis is still being investigated, latest research indicates that metastatic cells may be even present before the primary tumor. In sarcoma, metastasis may be present at initial presentation (synchronous) or subsequently (after 6 months, metachronous). Oligometastatic disease is an emerging concept defining a potential better prognosis for patients with less than 5 lesions. Here we present an unusual case of metachronous multilocular metastatic disease of a soft tissue sarcoma of the hand.

Methods: A 43yo female was presenting with a 5cm soft tissue lump in her right dominant hand involving metacarpals III/IV. Work-up revealed a G2 leiomyosarcoma, which prompted a preoperative radiation followed by resection of the tumor and reconstruction of the metacarpals using a vascularized fibula with skin flap. The initial postoperative was uneventful except for a revision of the anastomosis.

Results: At one year postoperatively, the CT chest showed an indeterminate lesion over the scapula. A whole-body MRI then evidenced also a soft tissue lesion in the left ischiocrural musculature. Both lesions were compatible with the initial tumor at the hand and were removed. After all, because the two latter lesions were indolent, it can not be reconstructed for how long they had been there.

Conclusion: A great level of suspicion has to be maintained in a patient being diagnosed with a soft tissue sarcoma while considering further lumps as reported by the patient. Performing a US-guided biopsy in case of doubt is never wrong.

P108

Management of a pleomorphic liposarcoma at the anterior lumbar pelvic junction

Philipp Lindeburg[1]; Georg Schelling[1]; Felix Grieder[2]; Thomas Lattmann[2]; Ralph Zachariah[2]; Stefan Brodmann[2]; Stefan Breitenstein[2]; Bruno Fuchs[3]

[1] Luzerner Kantonsspital (LUKS); [2] Kantonsspital Winterthur (KSW); [3] Swiss Sarcoma Network

Introduction: Retroperitoneal sarcomas are very challenging, specifically when these are located at the anterior lumbar pelvic junction with an extremely complex anatomy with major vessels, nerves, ureter, bowels, and spine. Another level of complexity is added when the tumor is biologically extremely aggressive and requires preoperative combination therapy including systemic chemotherapy and local radiation, which may all scar the tumor with its local microenvironment.

The aim of this case report is to present the surgical approach with local anatomy for an aggressive pretreated large tumor at the anterior lumbar pelvic junction.

Methods: A 30yo female presented with increasing pain and right sciatica, and work-up revealed a localized pleomorphic liposarcoma at the lumbar pelvic junction with 8cm in size. Because of the documented rapid growth, and given the anatomic location, it was decided at the multidisciplinary sarcoma board to proceed with neoadjuvant systemic doxorubicin/ifosfamide (3 cycles) followed by hypofractionated radiation therapy 28x1.8 = 50.4Gy.

Results: Imaging revealed that the tumor growth could at least be halted. Through a median laparotomy, the tumor was exposed. The iliac external vein and L5 nerve root had to be resected, the first being reconstructed with a pericard-supple prosthesis. Macroscopically, the tumor was removed completely, however, was R1 at the L5 foramen. At one year follow-up, the patient is still disease free, however, there is still unspecific local pain.

Conclusion: Removing a tumor with a complex anatomy requires a multidisciplinary approach of surgical disciplines to obtain an optimal result both regarding oncological tumor control as well as function.

P109

Free SCIP Flap Coverage after Tumor Resection at the Lateral Ankle

Luisa Lotter[1]; Georg Schelling[1]; Mario Scaglioni[1]; Beata Bode-Lesniewska[2]; Bruno Fuchs[3]

[1] Luzerner Kantonsspital (LUKS); [2] Pathologie Institut Enge; [3] Swiss Sarcoma Network

Introduction: Large soft tissue tumors around the ankle pose a difficult problem because of the scarce soft tissues which do frequently not allow direct wound closure. This is particularly the case when an intermediate or malignant soft tissue tumor is diagnosed and following a generous margin of soft tissues for margin purposes.

First, we want to present the case of a rare soft tissue tumor called hemosiderotic fibrolipomatous tumor (HFLT), which is of intermediate aggressivity. Second, we describe the use of a SCIP flap coverage for this anatomic region for the first time.

Methods: A 47yo chiropractor noticed a painless but increasing swelling at the lateral right ankle for 6 months. An US-guided core biopsy revealed a HFLT, which is a rare soft tissue tumor and has the capacity to recur if not completely excised.

Results: The patient underwent complete tumor resection at the lateral right ankle joint, exposing the peroneal as well as the extensor tendons together with the anterior tibial vessels. It was opted to harvest a free SCIP flap from the ipsilateral iliac crest with end-to-end as well as end-to side vascular anastomosis. AN ICG confirmed the patency of the vessels as well as nice flap perfusion. There were no postoperative complications and at six months follow-up, the flap was nicely healed without any restrictions functionally.

Conclusion: HFLT is a very rare soft tissue tumor with intermediate biology to recur if not completely resected. Because the thickness of the flap can be adapted, SCIP flap is ideally suited for soft tissue coverage around the ankle joint.

POSTERS: A08 BASIC RESEARCH

P110

Gait retraining in people with medial knee osteoarthritis: the effects of modifying multiple parameters on a specific targeted kinetic change

Luis Carlos Pereira[1]; Baptiste Ulrich[2]; Jos Runhaar[3]; Sita Bierma-Zeinstra[3]; Julien Favre[2]; Brigitte M. Jolles[2]

[1] CHUV; [2] Lausanne University Hospital (CHUV); [3] Erasmus MC-University Medical Center Rotterdam

Gait retraining has been demonstrated to be effective in reducing the peak knee adduction moment (pKAM) in people with knee osteoarthritis (KOA). Since medial-compartment loading has been related to both the pKAM and the peak knee flexion moment (pKFM), reducing the pKAM without considering the changes in the pKFM does not ensure a decreased load. It is unknown whether combining multiple gait parameters is more effective than single-parameter changes in achieving specific kinetic targets for both the pKAM and the pKFM.

We hypothesised that the number of people achieving the dual kinetic change (2KC) of decreasing the pKAM (≥10%) without increasing the pKFM through a combined parameter gait changes is higher than the number of people achieving it through a single gait parameter change.

A motion capture system and floor-embedded force-plates were used to measure the kinetics (pKAM and pKFM) of the affected knee and the spatio-temporal parameters (foot progression angle (FPA), step width (SW), stride length (SL) and walking speed) during gait. The gait retraining method was an augmented-reality system. Gait speed was controlled. Each patient performed 81 trials combining three different amplitudes of PFA, SW and SL, in random order. The gait modifications were toeing-in by 15°, by 10° and normal, walking width narrower (0.10m), normal or wider (0.15m) SW, and/or walking with normal, or shorter (0.10 or 0.15m) steps. Descriptive statistics was used. The data of 17 patients, mean 52.7 years old (SD 15.9), mean height 172.9cm (12.8) and mean BMI 24.9 Kg/m2 (3.2) was compiled for statistical analysis.

76.5% of the patients achieved the 2KC with at least one of the combinations. Changing one and multiple gait parameter led to a 2KC in 7 and 13 patients, respectively. Adding a third to a combination of two gait parameters change “only” added one patient to the total. All patients achieving the 2KC with a single modification were also able to achieve it using two combined modifications. All patients achieving the 2KC with a combination of two gait parameters, achieved it too combining three parameters. One patient achieved the 2KC with a combination of three gait parameters only.

Gait retraining through the combination of multiple gait parameter changes leads more KOA people achieving the targeted kinetic changes than single-parameter changes. Future research should assess the percentage of KOA people retaining the 2KC on both the shorter- and the longer-term.

P111

Influence of Knot Number on Holding Capacity of two High Strength Sutures Tapes – A Biomechanical Analysis

Torsten Pastor[1]; Ivan Zderic [2]; Boyko Gueorguiev[2]; Peter Varga [2]; Tatjana Pastor[2]

[1] Luzerner Kantonsspital; [2] AO Research Institute

Purpose: The number of seven needed knots to provide secure hold of high strength sutures was pre-viously reported, which is now common practice in orthopedic surgery. However, this number was evaluated in dry conditions, which might not reflect in-vivo conditions. Furthermore, new technologies like tape sutures (smaller knot stack) and sutures with a salt infused silicon core (dynamic tightening) have been developed, potentially reducing the number of needed knots and therefore, the amount of foreign material in patients. Aims: To investigate the influence of (1) throw number and (2) different ambient conditions on knot security in two different high-strength sutures, and (3) to compare their biomechanical competence.

Methods: Two sutures (SutureTape (FT); n = 56 and DynaTape (DT); n = 56) were assigned for alternating knot tying on two roller bearings at 50N tightening force. Specimens were exposed to different media during tying and biomechanical testing, namely air, saline solution, and fat. A monotonic tensile ramp to failure was applied in each test run. For each suture and ambient condition, seven specimens with 3 to 7 throws each were tested (n = 7), evaluating their slippage and ultimate force to failure. The minimum number of throws preventing suture unraveling and thus resulting in suture rupture was determined in each suture and condition.

Results: For each suture type and condition failure occurred via rupturing in all specimens for the following minimum number of throws: FT: dry–6, wet–6, fatty-wet–6; DT: dry–6; wet–4; fatty-wet–5. No significant differences were found comparing ultimate load to rupture of the two groups with minimum number of needed throws in each media. (FT dry-6 vs. DT dry-6; $p < 0.07$); (FT wet-6 vs. DT wet-4; $p < 0.20$); (FT fat-6 vs. DT fat-5; $p < 0.58$). Knot slippage of DT was significantly higher in wet and fatty conditions compared to ST $p < 0.001$ and $p < 0.004$, however it remained insignificant between the groups in dry conditions; $p < 0.077$.

Conclusion: In fatty-wet conditions as found during open surgery DT requires 5 throws to achieve a secure knot. In wet conditions as found during arthroscopy this number can be reduced to 4 throws. FT needs 6 throws to provide a stable knot in all conditions. The biomechanical competence of both sutures are comparable.

P112

Clinical and functional outcomes of different limb and components alignment strategies in medial unicompartmental knee arthroplasty: a systematic review

Manuel-Paul Sava[1]; Isabel Scala[2]; Alexandra Leica[1]; Johannes Beckmann[3]; Michael T. Hirschmann [1]

[1] Kantonsspital Baseland Bruderholz, Liestal, Laufen; [2] University of Italian Switzerland (USI); [3] Krankenhaus Barmherzige Brüder München

Purpose: The aims of this systematic review were to report significant correlations between different limb/component alignments and clinical/functional outcomes after medial unicondylar knee arthroplasty (mUKA), as well as to investigate if a particular coronal limb alignment, or a coronal/axial component alignment, which yields superior clinical and/or functional outcomes, when compared between different limb and component alignments, does exist.

Material and Methods: A systematic literature search following PRISMA guidelines was conducted on PubMed, Embase and World of Science from their inception until July 2022, to identify potentially relevant articles for this review. Selection was based on the following inclusion criteria: English- or German-language publications in peer-reviewed journals that assessed the clinical outcome of mUKA based on postoperative limb or implant alignment. Not original research or studies treating only lateral unicondylar knee arthroplasty (lUKA), sagittal alignment, or revision and failure rates, were excluded. Quality of every article was assessed using the Methodological Index for Non-Randomized Studies (MINORS) for non-randomized comparative and non-comparative clinical intervention studies.

Results: The literature search identified 215 articles in the initial screening process. 15 of them met all the inclusion criteria following the selection process. Regarding coronal alignment of the femoral component (FCCA), multiple authors present different FCCA values as yielding the best outcomes. On the other hand, findings are more homogenous when discussing Tibia Component Coronal Angle (TCCA). Additionally, worse outcomes have been identified for patients with a tibia component placed lower than the intercondylar eminence and the lateral joint and/or in an excessive valgus relative to the lower limb axis. Furthermore, cut-off values for tibia and femoral components' external rotation have also been identified.

Conclusion: In the context of mUKA, a coronal limb alignment between 5º-10º varus has been identified as yielding the best clinical and functional outcomes. When discussing tibia implant component, the -2.5º (valgus) – 5º (varus) alignment interval generates preeminent clinical and functional outcomes. In the case of implant components' axial alignment, a clear recommended interval of external rotation for the tibia component has been identified (4º-5º).

P113

Early edema formation after release of the infraspinatus muscle as an experimental model of rotator cuff lesions in sheep – a histological analysis

Alexandre Lädermann; Rieke Gehrke; Karina Klein; Salim Darwiche; Agnieszka Karol; Peter Schwarzenberg; Karl Wieser; Brigitte von Rechenberg

Division of Orthopaedics and Trauma Surgery, La Tour Hospital, Meyrin, Switzerland; Department of Orthopaedics and Trauma Surgery, University of Geneva, Geneva, Switzerland.

INTRODUCTION: The aim of these experiments was to prove muscle edema formation histologically during the first 4 weeks after the release of the infraspinatus tendon without or with additional trauma while the muscle was stretched. The study was based on the hypothesis that edema formation contributes to an inflammatory reaction and already early muscle fiber degeneration before fatty infiltration takes place.

METHODS: An animal model in sheep with acute release of the infraspinatus tendon as a model for rotator cuff lesions in humans was used for these experiments.

RESULTS SECTION: Early edema formation after tendon release of the infraspinatus muscle was documented histologically without or with additional trauma to the muscle. Both groups showed a peak and significant increase of edema formation between 3-4 weeks in MRI being confirmed with histological sections ($p = 0.0001$) and lyophilization samples. Histology showed normal muscle tissue with fibers closely attached to each other at t0, whereas at the later time points (t21 & t28), widening of the interstitial spaces between fibers, fiber degeneration with an increase of fibrosis ($p = 0.008$) but no fat tissue between the epimysium was recorded in both groups. Muscle fiber diameter was significantly increased over time ($p = 0.0001$). Inflammatory mediators, NFKb, inflammatory cytokines and macrophages were also increased over time mainly between t0 and t21 resp. t28.

DISCUSSION: The results of this study proved our hypothesis that after release of the infraspinatus muscle edema formation occurs with a peak at 3-4 weeks causing an inflammatory reaction that induced already muscle fiber degeneration before fatty infiltration takes place. Additional trauma to the stretched muscle as would be expected in a trauma case of rotator cuff lesions aggravated symptoms slightly and showed slight protraction of healing mechanism, but without statistical significance.

SIGNIFICANCE/CLINICAL RELEVANCE: Results of this study should prove significant for clinical therapy. Surgery of acute rotator cuff lesions are often delayed for several weeks or even months. Knowing that edema and inflammatory reactions of the tissue causes atrophy of muscle fibers already within 2-4 weeks will possibly change clinical decisions for early surgery. Therefore, furthermore, future research should be directed at reducing edema and inflammatory reactions at a very early stage to study its influence on later degeneration.

P114

Load distribution on intervertebral cages with and without posterior instrumentation

Anna-Katharina Calek[1]; Frédéric Cornaz; Mauro Suter; Marie-Rosa Fasser; Sina Baumgartner; Philipp Sager; Mazda Farshad ; Jonas Widmer

[1] Universitätsklinik Balgrist

Study Design: Biomechanical cadaveric study

Objective: The aim of this study was to quantify the forces acting on cages under axial compression force with and without posterior instrumentation.

Summary of Background: Data Posterior and transforaminal lumbar interbody fusion (PLIF, TLIF) are well-established procedures for spinal fusion. However, little is known about load sharing between cage, dorsal construct, and biological tissue within the instrumented lumbar spine.

Materials and Methods: Ten lumbar spinal segments were tested under uniaxial compression using load cell instrumented intervertebral cages. The force was increased in 100N increments to 1000N or a force greater than 500N on a load cell in the cage. Each specimen was tested after unilateral PLIF (uPLIF) with/without posterior instrumentation, bilateral PLIF (bPLIF) with/without posterior instrumentation and TLIF with/without posterior instrumentation. Dorsal instrumentation was performed with 55 N of compression per side.

Results: Cage insertion resulted in a median cage preload of 16N, 29N and 35N for uPLIF, bPLIF and TLIF. The addition of compressed dorsal instrumentation increased the preload to 224N, 328N and 317N, respectively. With posterior instrumentation, the load on the cage was less than 25% at 100N load (uPLIF: 20.3%; bPLIF: 16.5%; TLIF: 11%), less than 45% at 500N (uPLIF: 34%; bPLIF: 41.7%; TLIF: 39.7%) and less than 50% at 1000N (uPLIF: 40.3%; bPLIF: 49.7%; TLIF: 43.6%). Without posterior instrumentation, the load on the intervertebral cages was significantly higher with values above 50% at 100N (uPLIF: 55.6%; bPLIF: 75.5%; TLIF: 66.8%), 500 N (uPLIF: 71.7%; bPLIF: 79.2%; TLIF: 65.4%), and 1000 N external load (uPLIF: 73.7%; bPLIF: 80.5%; TLIF: 66.1%). At maximum axial compression (1000N), the bPLIF cages showed significantly higher force absorption compared to the TLIF cage ($p = 0.03$) or the uPLIF cage ($p = 0.03$).

Conclusion: Without posterior instrumentation, the intervertebral cages absorb more than 50% of the axial load and the load distribution is largely independent of load amplitude. With posterior instrumentation, the load sharing of the cages is significantly lower and the load sharing becomes dependent on the load amplitude, with a higher proportion of the load being transferred by the cages in high load situations. bPLIF cages absorb more load than uPLIF and TLIF, which can be explained by the larger surface area of this configuration.

P115

Optimal Stability of Patient-Specific Instrumentation (PSI) in Osteotomy – a Basic Guideline

Michel Meisterhans[1]; Christoph Zindel[1]; Bastian Sigrist[2]; Sandro F. Fucentese[1]; Lazaros Vlachopoulos [1]

[1] Department of Orthopaedics, Balgrist University Hospital, Zurich, Switzerland; [2] Research in Orthopedic Computer Science, Balgrist University Hospital, UniversityofZurich, Zurich, Switzerland

Introduction: The use of computer-assisted 3D planning and patient-specific instruments (PSI) for osteotomies is becoming more popular in orthopedic surgery for correcting mechanical axis and post-traumatic deformities in the upper and lower extremities. However, the 3D printed PSI osteotomy guides currently in use have a high potential for intraoperative deformation, which can adversely affect the accuracy of the procedure. To address this issue, this study used finite element analysis (FEA) to analyze different design parameters to improve the stability of the guides.

Material and Methods: A commonly utilized PSI guide with a rectangular cross-section and four 4 mm k-wires slots used for reduction was simplified and the following parameters were modified: width, height, profile design, k-wire thickness, distance between k-wire positions, k-wire orientation and bone to guide distance. Bending and torsional moment was applied to the guide construct and deformation and equivalent stress of the guide and k-wires was determined using finite element analysis.

Results: Increasing the profile height by 25% resulted in a 44% reduction in guide deformation and a 39% reduction in stress for bending (37% and 26% respectively for torsion). A 25% increase in profile width led to an 18% deformation reduction and 19% stress reduction for bending (22% and 27% respectively for torsion). The use of an I-shaped profile reduced bending deformation by 20%, but increased torsion deformation by 36%. Transverse k-wire slots resulted in 37% less deformation in torsion than longitudinally oriented slots. Placing the central k-wire slots 25% closer to the osteotomy reduced guide deformation by 20% for bending and 11% for torsion. Using a 5 mm k-wire instead of a 4 mm k-wire reduced guide deformation by 5% for bending and 19% for torsion (5% and 12% respectively for the k-wires).

Conclusion: The most effective ways to increase guide stability for all load cases are by increasing the guide height and reducing the central k-wire distance to the osteotomy. When performing opening or closing wedge osteotomies, which mainly involve bending of the PSI guide, a high profile guide and longitudinally oriented k-wire slots should be used. On the other hand, for rotational osteotomies, where torque is predominant, the k-wire holes in PSI guides should be oriented transversely to reduce intraoperative deformation.

P116

Biomechanical and radiographic assessment of an ALIF device with integrated screws at the lumbosacral junction and its association to lumbar BMD

Alina Jacob[1]; Maximilian Heumann[1]; Ivan Zderic [1]; Peter Varga [1]; Sascha Lauterborn[1]; Daniel Haschtmann [2]; Tamas Fekete [2]; Boyko Gueorguiev[1]; Markus Loibl [2]

[1] AO Research Institute Davos, Switzerland; [2] Schulthess Clinic, Zurich, Switzerland

Introduction: The use of a stand-alone anterior lumbar interbody fusion (ALIF) device provides the opportunity to avoid supplemental posterior fixation. This may reduce morbidity and complication rate, which is of special interest in elderly patients who tend to show reduced bone mineral density (BMD). This study aims to assess immediate biomechanical stability and radiographic outcome of an ALIF cage with an integrated angular-stable locking plate with respect to lumbar BMD.

Methods: Eight human cadaveric spines (L4-sacrum) were instrumented with SynFix-LR™ (DePuy Synthes) at L5/S1. Quantitative computed tomography was used to measure BMD of L5 in AMIRA. Threshold values proposed by the American Society of Radiology 80mg CaHa/mL and 120 mg CaHa/mL were used to differentiate between Osteoporosis, Osteopenia, and normal BMD. Segmental lordosis, anterior disc height, and posterior disc height (pDH) at L5/S1 were analysed on pre- and postoperative radiographs. Specimens were tested intact and following instrumentation using a flexibility protocol consisting of three loading cycles to ±7.5 Nm in flexion-extension, lateral bending, and axial rotation. The ranges of motion (ROM) of the index level were assessed using an optoelectronic system.

Results: BMD ranged from 58–181mg CaHA/mL. Comparison of pre- and postoperative radiographs revealed significant increase of L5/S1 segmental lordosis (mean 14.6°, SD 5.1, $p < 0.001$) and anterior disc height (mean 5.8mm, SD 1.8, $p < 0.001$), but not posterior disc height. ROM of 6 specimens was reduced compared to the intact state. Two specimens showed destructive failure in extension. Mean decrease was most distinct in axial rotation up to 83% followed by flexion-extension.

Conclusion: The ALIF device with integrated screws at L5/S1 significantly increases segmental lordosis and anterior disc height without correlation to BMD. Primary stability in the immediate postoperative situation is mostly warranted in axial rotation. The risk of failure might be increased in extension for some patients with reduced lumbar BMD, therefore additional posterior stabilization should be considered.

P117

The Effect of Gluteal Muscle Weakness on Joint Kinematics, Reaction Forces and Dynamic Balance During Deep Bilateral Squats: An experimental In-vivo Analysis with Sequential Superior and Inferior Gluteal Nerve Blocks

Dimitris Dimitriou; Michel Meisterhans; Marina Geissmann; Paul Borbas; Armando Hoch; Jan Rosner; Martin Schubert; José Aquirre; Urs Eichenberger; Patrick Zingg

Balgrist Universitätsklinik

Background: Squatting is a common daily activity and a fundamental exercise in resistance training and closed kinetic chain programs. The aim of the present study was to investigate the effects of an experimentally induced weakness of the hip abductors and gluteus maximus muscles, through sequential nerve blocks of the superior and inferior gluteal nerve, on joint kinematics, reactions forces (JRFs) and dynamic balance performance during deep bilateral squats in healthy young adults.

Methods: Ten healthy adults (5 females) with an average age of 24.7±2.7 (range: 22 to 29) years with no history of musculoskeletal pain participated. Sequential blocks of 1) branch of the superior gluteal nerve to the M. tensor fasciae latae (SGNtfl), 2) superior gluteal nerve (SGN), and 3) inferior gluteal nerve (IGN) were performed on the dominant right leg. At the control condition and following each block, the participants were instructed to perform deep bilateral squats standing on two force plates. Dynamic balance measurements included the center of pressure (CoP) path range, standard deviation (SD), and velocity in the mediolateral (ML) and anteroposterior (AP) directions.

Results: Hip, knee, ankle, and pelvis kinematics (other than a slight anterior pelvic tilt following IGN block) did not change significantly following the nerve blocks. More interestingly, a pelvic drop was not observed. The most important finding was the significant differences in JRFs following SGN and IGN block, with the affected hip, patellofemoral joint, and ankle demonstrating lower JRFs, whereas the contralateral joints significantly higher JRFs, especially the patellofemoral joint which demonstrated an average maximum difference of 940N compared to the control condition. When performing a deep bilateral leg squat under SGN and IGN block, the subjects demonstrated an increased CoP range (60.1±24.1 and 58.7±15.4, respectively) and SD in ML directions (15.1±6.6 mm and 14.0±3.9 mm, respectively) suggesting that they swayed further and had less controlled behavior compared to the control condition (CoP range: 41.4±12.5 mm, SD: 9.6±2.9 mm).

Conclusion: These results imply that squat performance changes significantly following an acute weakness of hip adductors and gluteus maximus and should be considered when assessing and training patients with chronic hip muscle insufficiencies.

P118

Iopamiro®-injected CT-scan and polyurethane casting for description of the distal medial femoral vascular tree anatomy following a medial femoral distal opening wedge osteotomy: a cadaveric study

Alina Malov[1]; Fatos Ramadani[1]; Moritz Tannast[1]; Luis Filgueira[2]; Daniel Petek[1]

[1] Department of orthopedic surgery, HFR Fribourg, chemin des Pensionnats 2, 1752 Villars sur Glâne, Switzerland; [2] Unit of Anatomy, Department of Medicine, University of Fribourg, Route Albert-Gockel 1, Fribourg, Switzerland

Introduction: Varus or valgus deformities of the lower limb are frequently corrected by osteotomies around the knee joint (distal femur or proximal tibia). The osteotomies have been described as opening or closing wedge. Cadaveric studies have already described the distal vascularization of distal medial and lateral femur condyles based on soft tissue dissection, direct examination or casting of the distal femoral vascular tree. To the best of our knowledge, no data has been published for medial distal opening wedge femoral osteotomies (mDFO) in terms of vascular disruption when performing a mDFO. The first aim of the study is to confirm that radiologic injected CT scan give the same vascular tree as corrosion casting in cadaveric knees. Then, a mDFO (opeing wedge) has been performed and the vascular supply has again been studied by angio-CT scan followed by corrosion casting to evaluate the amount of the medial femoral vascular disruption.

Methods and Materials: 4 fresh frozen knees have been analyzed. All knees underwent Iopamiro®-injected-CT-scan imagery before and after open wedge mDFO and placement of a Tomofix® plate. Each osteotomy has been opened by 10mm. Then the knees underwent the corrosion casting described by Ramadani F et al. From both the angio-CT scan and the corroded cast, the distribution of the vascular tree to the medial distal femoral condyle has been studied. Also, a comparison between the 3D reconstruction on imagery and the anatomical casts has been made.

Results: The CT-scan radiological imagery and the corrosion casting showed equivalent anatomical entry points of vessels to the medial femoral condyle. A disruption of the vascular tree to the medial condyle of femur after the placement and fixation of the Tomofix® plate has been described in each examined knee.

Conclusion: In this study, the vascular tree of the medial femur condyle has been equally described by Iopamiro-injected CT scan and corrosion casting. Also, the study confirms the diminution of vascular supply to the medial femoral condyle after mDFO (opening wedge) and plate fixation. Thus, the study points the risk of vascular impairment in opening wedge osteotomies of the medial femur. The authors could not differentiate the lack of vascularization due to direct vessel surgical injury or distraction at the osteotomy level.

P119

Modified Gritti-Stokes amputation: tips and tricks

Laura Walthert[1]; Kevin Moerenhout[1]; Olivier Borens[2]; Michael Ris[1]; Pietro Di Summa[1]; Sylvain Steinmetz[1]

[1] CHUV - Centre hospitalier universitaire vaudois; [2] Hirslanden Lausanne, clinique Bois-Cerf

Introduction: The goal of any major limb amputation is an optimal functional result with a maximal limb length combined with optimal wound healing. Trans-knee-amputations (TKA) are associated with a high complication rate like skin break down and persistent pain. Recently, Gritti-Stokes amputation (GSA) regained attention as an excellent alternative to the TKA with furthermore possibility to circumvent their disadvantages. GSA has simplified the rehabilitation and prosthesis fitting, with similar outcomes as below-knee-amputations (BKA).

The aim of this poster is to describe our experience with GSA and to discuss and point out the important steps of this procedure.

Methods: The important steps of the procedure of GSA are described in detail and illustrated for a better understanding by photos, figures and x-rays. We compare our procedure with other possible methods described in the literature. The steps include the preoperative planning, patient positioning, flap design, skin and soft-tissue incision, femoral and patellar cuts, posterior dissection, patellofemoral arthrodesis, soft-tissue closure and postoperative care.

Results: GSA allows preserving as much as possible the lower-limb function and femur length, a stable end-bearing stump and good primary wound healing, which is of particular interest in older frail adults. Particular attention must be paid to careful preoperative evaluation, the vascularization of the limb and optimization of comorbidities. A meticulous surgical technique is warranted, including atraumatic tissue handling and an optimal patellofemoral arthrodesis technique. The postoperative care should be optimised.

Conclusion: With a proper procedure and respecting the different steps, we believe that GSA is an excellent surgical option for patients requiring major lower limb amputations where BKA can't be considered. It allows diminished postoperative complications and quicker rehabilitation. In our hospital GSA are regularly performed with satisfying results. We like, with this poster, to draw attention to this procedure with all tips and tricks necessary to obtain the best result.

P120

Significant changes in lower limb alignment due to flexion and rotation – a systematic 3D simulation of radiographic measurements

Maximilian Jörgens; Josef Brunner; Maximilian Weigert; Hannah Kümpel; Nikolaus Degen; Julian Fürmetz

Ludwig Maximilians Universität München

Introduction: Many radiographic lower limb alignment measures are dependent on patients' position, which makes a standardised image acquisition of long-leg radiographs (LLRs) essential for valid measurements. The purpose of this study was to investigate the influence of rotation and flexion of the lower limb on common radiological alignment parameters using three-dimensional (3D) simulation.

Methods: Joint angles and alignment parameters of 3D lower limb bone models (n = 60), generated from computed tomography (CT) scans, were assessed and projected into the coronal plane to mimic radiographic imaging. Bone models were subsequently rotated around the longitudinal mechanical axis up to 15° inward / outward and additionally flexed along the femoral intercondylar axis up to 30°. This resulted in 28 combinations of rotation and flexion for each leg. The results were statistically analysed on a descriptive level and using a linear mixed effects model.

Results: A total of 1680 simulations were performed. Mechanical axis deviation (MAD) revealed a medial deviation with increasing internal rotation and a lateral deviation with increasing external rotation. This effect increased significantly ($p < 0.05$) with combined flexion up to 30° flexion (- 25.4mm to 25.2mm). With the knee extended, the mean deviation of hip-knee-ankle angle (HKA) was small over all rotational steps but increased towards more varus/valgus when combined with flexion (8.4° to - 8.5°). Rotation alone changed the medial proximal tibial angle (MPTA) and the mechanical lateral distal femoral angle (mLDFA) in opposite directions, and the effects increased significantly ($p < 0.05$) when flexion was present.

Conclusion: Axial rotation and flexion of the 3D lower limb has a huge impact on the projected two-dimensional alignment measurements in the coronal plane. The observed effects were small for isolated rotation or flexion, but became pronounced and clinically relevant when there was a combination of both. This must be considered when evaluating X-ray images. Extension deficits of the knee make LLR prone to error and this calls into question direct postoperative alignment controls.

P121

Relevance of patellar positioning in radiographic imaging of the lower limb – a 3D simulation study

Maximilian Jörgens; Josef Brunner; Maximilian Weigert; Alexander C. Paulus; Denis Ehrl; Julian Fürmetz

Ludwig Maximilians Universität München

Introduction: The impact of patellar positioning on radiographic alignment and surgical planning procedures is still unknown and object of present investigations. The aim of this study was to quantify changes in rotation of the lower limb between image pairs based on patellar position. Additionally, we investigated the differences in alignment between centralized patellar and orthograde positioned condyles.

Methods: Three-dimensional models of 30 paired legs were aligned in neutral position with condyles orthogonal to the sagittal axis and then rotated internally and externally in 1° degree increments up to 15°. For each rotation, the deviation of the patella and the subsequent changes in alignment parameters were calculated and plotted using a linear regression model. Differences between neutral position and patellar centralization were analyzed descriptively.

Results: A linear relationship between lower limb rotation and patellar position can be postulated. The physiological lateralization of the patella at neutral position was on average 8.3 mm (SD: ± 5.4mm). The regression model ($R^2 = 0.99$) calculated a change of -0.9mm per degree rotation and alignment parameters showed small changes due to rotation. From neutral position, internal rotation that led to a centralized patella was on average - 9.8° (SD: ± 5.2°).

Conclusion: The approximately linear dependence of the patellar position on rotation allows an inverse estimation of the rotation during image acquisition and its influence on the alignment parameters. As there is still no absolute consensus about lower limb positioning during image acquisition, our study provides data about the impact, that a centralized patella respectively an orthograde condyle positioning has on alignment parameters.

P122

STABILITY OF MALPOSITIONED MEDIAL AND LATERAL SCREWS: A CADAVERIC BIOMECHANICAL STUDY

Christos Tsagkaris[1]; Marie-Rosa Fasser[2]; Mazda Farshad [3]; Jonas Widmer[2]; José Miguel Spirig[4]

[1] Spine Biomechanics, Department of Orthopedics, Balgrist University Hospital Zurich, University of Zurich, Switzerland; Institute for Biomechanics, ETH Zurich, Zurich, Switzerland; [2] Spine Biomechanics, Balgrist University Hospital, University of Zurich

Introduction: Pedicle screw instrumentation is widely used in spine surgery. Axial screw misplacement is a common complication. Misplacement not exceeding 2-4mm poses low risk for neurovascular injury. However, the biomechanical stability of misplaced screws is still under debate. The present study investigates whether screw misplacement in the lumbar spine reduces mechanical screw hold.

Methods: Pedicle screws were inserted in 12 fresh frozen cadaveric spines between the T12 and the L5 levels. The insertion was planned intentionally either completely within the pedicle (control screw, n = 29), or with 2-4mm (medial, n = 26 or lateral, n = 26) and with >4mm (medial, n = 28 or lateral, n = 29) breach of the pedicle. Pre- and post-instrumentation computed tomography (CT) scans were acquired for instrumentation planning and quantification of the misplacement. The instrumented vertebrae were potted into CT transparent boxes using Polymethyl methacrylate and mounted on a standardized biomechanical setup for pullout (PO) testing with uniaxial tensile load. Data analysis was performed in MATLAB.

Results: The bone density of all the specimens as per HU was comparable. The pullout force (POF) for screws misplaced medially was 4-19% higher than the POF for the well placed screw (813,1, SD: 401,7). The most resistant screws were the ones misplaced less than 2 mm in this plane (970, 4, SD: 419,7). Conversely, the POF for laterally displaced screws was 6% lower for screws misplaced up to 2 mm and 52 and 60% lower for screws misplaced up to or more than 4 mm respectively.

Discussion: Medial displacement is associated with increased axial screw hold against static loads. It is reasonable to assume that this compensates for the low risk of complications within the clinically safe (0-2mm) and tolerable (2-4mm) breach zone. Lateral displacement is associated with decreased screw hold combined with a reportedly increased risk for neurovascular injury.

P123

Building Surgeon-specific Predictive Models of Tibial Insert Thickness using Knee Joint Laxity Signature

Laurent Angibaud[1]; Wen Fan; Amaury Jung[2]; Oliver Kessler[3]; James Huddleston[4]

[1] Exactech; [2] Blue-Ortho; [3] Zentrum für Orthopädie und Sport AG; [4] Stanford University

INTRODUCTION: Soft tissue balancing plays an important role in TKA. One of the factors contributing to a successful soft tissue assessment relates to the thickness of the tibial insert, a surgical decision that varies based on surgeon experience and preference. Only few studies have evaluated factors that were potentially predictive of tibial insert thickness. The aim of this study was to test the correlation between laxity curves and tibial insert thickness and build surgeon-specific models to predict tibial insert thickness.

METHODS: The study cohorts included 176 cases using a CAOS system performed by 4 different surgeons. During trial reduction, a novel intra-articular tensor applied a quasi-constant distraction force between the trial femoral component and the tibial cut. Then, the limb was manually taken through a full arc of motion and the corresponding joint laxities were recorded. Correlation coefficient between tibial insert thickness and recorded gaps was calculated. Two statistical models used in this study were random forest and ordinal logistic regression model.

RESULTS: When considering all four surgeons together, the correlation coefficients between ML gaps and tibial insert thickness across degrees of flexion were all less than 0.35. Two of four surgeons had their highest correlation coefficients less than 0.4 at 5° and 45° of flexion respectively and were not selected for the model training process. The rest of the two surgeons that were selected for model training showed relatively high correlation between ML gaps and tibial insert thickness with correlation coefficients of 0.45/0.48 and 0.71/0.56 at 15° of flexion.

DISCUSSION: This preliminary study demonstrated that the relationship between the knee joint laxity and tibial insert thickness tended to be surgeon specific. Predictive models built with both random forest and ordinal logistic regression methods were shown to be accurate based on surgeons with high correlation between joint gaps and tibial insert thickness. These models can guide surgeons select the proper thickness of the tibial insert during the surgery, which not only provides a more efficient way in terms of making surgical decisions, but also ensures joint stability postoperatively. Sample size is one of the limitations of this study which can impact the model training process and testing results.

P124

Prospektive Einschätzung des Sturzrisikos anhand Machine-Learning-basierter Ganganalyse während des TUG-Tests mit 2 Jahres Follow-Up

Moritz Kraus[1]; Maximilian Saller[2]; Alexander Keppler[2]; Carl Neuerburg[2]; Wolfgang Böcker[2]; Ulla Stumpf[2]

[1] Schulthess Clinic, Zurich, Switzerland; Muskuloskelettales Universitätszentrum München, LMU Klinikum München; [2] Muskuloskelettales Universitätszentrum München, LMU Klinikum München

Zur Abschätzung des Sturzrisikos bei gefährdeten Patienten gewinnen Ganganalysen (GA) zunehmend an Bedeutung, da vom Gangbild Rückschlüsse auf das vorhandene Niveau an Koordination, Kraft und Gleichgewicht möglich sind. Diese Faktoren werden auch in etablierten Tests erhoben. Das Ziel der Studie war es das Sturzassessment durch eine simple mobile Ganganalyse während des TUG-Tests zeitlich auf ein Minimum zu reduzieren und mittels Machine Learning Algorithmen (MLA) die Einschätzung des Sturzrisikos zu verbessern.

In einem prospektiven Studiendesign wurde 2020 bei 58 Patienten zusätzlich zum standartmäßigen Sturzassessment eine mobile 3D-GA (Science Insole3®, Moticon, München) während des TUG Test durchgeführt. Das 2-Jahres-Follow-Up wurde mittels postalisch zugesandter Fragebögen erhoben. Die Anzahl an aufgetretenen Sturzereignisse und die Outcome-Scores EQ-5D-5L, FRAX® und SARC-F wurden abgefragt. Die zum Einschlusszeitpunkt gesammelten Daten wurden mit der Gruppeneinteilung, hinsichtlich aufgetretener Sturzereignisse statistisch verglichen. Anschließend wurden mittels eines recursive feature elimination Algorithmus (rfeA) die Parameter mit der höchsten Aussagekraft für das Sturzrisiko ermittelt, wobei der SPPB-Score als Referenz diente. Auf Basis der initialen Daten wurde ein Random-Forest (RF) MLA trainiert, und die Vorhersagegenauigkeit für im 2-Jahres-Verlauf aufgetretene Stürze mit der von den etablierten Scores SARC-F und TUG-Test verglichen.

Das Durchschnittsalter lag bei 80±7 Jahren, mit einem leicht höheren Alter von 82±6 bei Patienten, die bereits gestürzt sind

(p = 0.11). Die Recall Rate betrug 71%. 11 Stürze waren zu verzeichnen. Der mit den Gangparametern (Schrittanzahl, -länge, -kadenz, Gangzykluszeit, und -beschleunigung, -geschwindigkeit, Alter, COP-Variabilität und Doppelstandzeit) trainierte RF konnte Vorhersagen über Stürze mit Genauigkeit (ACC) von 0.93 (95%CI: 0.80-0.99, Spez: 100%, Sens: 73%) machen. Die Werte des TUG (ACC: 67% 95% CI: 0.49-0.81, Spez: ACC: 46% und Sens: 78%) und SARC-F (66%, 95%CI: (0.49-0.81), Spez: 43%, Sens: 72%) waren etwas weniger verlässlich. PPW und NPW waren bei SARC-F und TUG schlechter als beim RF.

Eine während des TUG-Tests durchgeführte GA im mobilen Setting bietet eine zeiteffiziente Möglichkeit, um für das Sturzrisiko relevante Parameter erheben zu können. Die beschriebene Ganganalyse ermöglicht in Kombination mit MLA eine spezifischere Einschätzung des Sturzrisikos als die etablierten Scores.

P125

Condyle du fémur médian recombiné artificiellement pour des reconstructions squelettiques complexes

Thomas Giesen [1]; Francesco Costa[1]; Ivan Tami[1]; Elmar Fritsche[2]

[1] Clinica Ars Medica, Gravesano-Lugano; [2] Luzerner Kantonsspital (LUKS)

L'un des défis auxquels sont confrontés les chirurgiens orthopédistes est lorsqu'ils traitent des défauts osseux complexes qui nécessitent une reconstruction vascularisée. Ces défauts peuvent survenir en raison de traumatismes graves, d'infections osseuses, de pseudarthrose volumineuse et / ou récalcitrante ou de tumeurs osseuses. Dans de tels cas, une greffe osseuse vascularisée est souvent nécessaire, et un moniteur cutané pour vérifier la vascularisation de l'os reconstruit est préférable. Dans les cas graves, une reconstruction osseuse et des tissus mous vascularisée synchrone peut être nécessaire. Le condyle du fémur médial est une option populaire pour reconstruire les défauts osseux petits à moyens. Cette étude présente pour la première fois sept reconstructions squelettiques complexes à l'aide d'une greffe osseuse de condyle médial vascularisé, recombinée artificiellement au microscope avec un lambeau fascio-cutané libre utilisée à la fois comme moniteur pour la greffe osseuse vascularisée et comme outil de reconstruction pour les tissus mous environnants.

Matériel et méthodes: De décembre 2021 à novembre 2022, nous avons réalisé sept reconstructions complexes à l'aide d'un condyle fémur médian recombiné artificiellement avec un lambeau libre de l'aine chez sept patients. Nous avons reconstitué deux tibias distaux, un olécrane, une clavicule et trois scaphoïdes. Tous les scaphoïdes présentaient un défaut ostéochondral sévère et le condyle vascularisé du fémur médian a été récolté à la marge de la trochlée afin d'inclure la quantité appropriée de cartilage. Les condyles du fémur al ont ensuite été assemblés sur la table au microscope avec un lambeau d'aine libre fascio-cutané qui a été joint à l'artère du condyle libre médial. Il y avait quatre femmes et trois hommes âgés en moyenne de 41 ans entre 19 et 65 ans. Deux patients étaient fumeurs, un patient souffrait de polyarthrite rhumatoïde, aucun patient n'était diabétique.

Résultats: Tous les condyles fémuraux médiaux recombinés ont finalement survécu. Chez un patient mâle le scaphoïde reconstruit ne s'est pas consolidé malgré la survie de l'os et de la peau reconstruits. Il a ensuite subi une arthroplastie de résection. Tous les autres patients ont retrouvé une fonction satisfaisante sans autres procédures.

Discussion: Les résultats de ces séries semblent suggérer que l'ingénierie tissulaire microchirurgicale pourrait être bénéfique pour la reconstruction de défauts osseux complexes.

POSTERS: A09 QUALITY ASSURANCE

P126

'B-Corporation®' Certification in the Swiss Health Care System – Preliminary assessment of a pioneer's journey in quest of true Corporate Social and Environmental Responsibility

Lisca Drittenbass; Mathieu Assal

Centre Assal de Médecine et de Chirurgie du Pied

Background: As many medical institutions are transforming into maximum-profit organizations and the quest for operational efficiency is driving cost-cuttings on behalf of personnel and environment, work conditions deteriorate rapidly. Measures taken are often more inspired by 'green-' and 'social-washing' than meant to be effective.

The only true remedy is sincere commitment to Corporate social and environmental responsibility (CSER). We present our journey of CSER, meant to inspire as well as to introduce a tool for assessment and setting tangible standards in CSER for the health care sector.

Method: The 'B Corporation®' Certification, considered the gold standard in CSER, is delivered by the non-profit organization 'B-Lab®' to companies that meet the highest standards of verified CSE performance, legal accountability and public transparency.

The Centre ASSAL for Foot and Ankle Surgery (CA), a private healthcare provider with 30 employees, applied in Dec. 2020 for 'B Corporation®' Certification to validate its commitment to CSER. The CA's CSE performance and its impact on workers, community, environment and stakeholders were diligently assessed using the 'B Impact Assessment (BIA)' Tool by 'B Lab®'. After completing the BIA successfully, the process of verification was launched.

Results: In Sept. 2022, the CA became the first 'B Corporation®' health care provider in Switzerland, achieving a score of 94.7. The median score of ordinary businesses who complete the BIA is 50.9.

The main positive impact of the Certification perceived by CA were the validation and increased visibility, both internally and externally, of existing CSER values, attracting/retaining expert work forces and enhancing partnership with stakeholders like doctors and patients. The costs of the certification incl. fees and working hours of own staff were estimated 80'000 CHF. The financial impact of the commitment to CSER itself is estimated to decrease the profit of CA by 25%.

Conclusions: CSER is becoming increasingly important also for the health care sector. The BIA can be a valuable tool to assess CSE Performance and the 'B Corporation®' Certification an inspiration and possible benchmark for tangible standards in CSER for the health care sector. In conclusion, CSER commitment has a cost, but the journey is worth it and sustainable.

P127

Overcrowded hospital emergency departments directly affect patient acquisition for the orthopedic department and patient treatment

Christian Frank[1]; Murat Bilici[2]

[1] Kantonspital Baselland Bruderholz; [2] Universitätsspital Basel (USB)

Introduction: Over the past years, an increase in the number of patients seeing the emergency room has led to an overloaded central emergency department. This may affect both the acquisition of patients with minor orthopedic trauma for the orthopedic department as well as lead to less satisfied patients due to longer waiting times. Eventually, causing avoidance of the emergency department, loss of patients to the competitors in the private sector and ultimately to a further decrease in the number of patients acquired by the emergency department and transferred to the orthopedic department.

Methods: From 2010 to 2021 data on quality indicators such as waiting time, duration of treatment, case numbers and severity according to ESI classification were collected from patients visiting our hospitals emergency department. Patients were grouped according to their emergency severity: group 1 were mostly inpatients, ESI 1-3 and group 2 were outpatients with mainly minor orthopedic trauma, ESI 4 and 5. The number of cases per group were compared to each other as well as compared to the number of surgeries performed in the orthopedic department over the years.

Results: From 2010 to 2021 the ratio between group 1 (46.2% of patients) and group 2 (53.8%) changed significantly (group 1 = 75.5%, group 2 = 24.5%). Quality indicators (waiting time and duration of treatment) in group 1 showed consistency despite the increasing number of cases over time. In group 2 the decrease in number of cases did not lead to shorter waiting times or decreased duration of treatment. Simultaneously, the number of orthopedic surgeries in our orthopedic department decreased.

Conclusion: An overcrowded emergency department due to increased number of patients visiting the emergency room with higher levels of emergency severity naturally leads to an increased focus on the more severe cases. This had a direct negative effect on the number of patients with minor orthopedic trauma acquired by the emergency department. If these patients should be retrieved, it will be very important in the future that the emergency and orthopedic department collaborate with each other and a transfer takes place of the minor orthopedic trauma patients from the emergency room to the orthopedic department.

POSTERS: A10 TRAUMA

P128

Surgical repair of a complete full-substance biceps brachii rupture in young wakesurfing adult: A case report

Manuel Kramer; Melanie Manser; Olaf Chan-hi Kim; Bernhard Jost; Christian Spross

Kantonsspital Sankt Gallen

Introduction: The complete intrasubstance rupture of biceps brachii muscle is a very rare injury and little literature is available on this topic. Most of these injuries occurred in parachutists in the 2000s or later described as part of wakeboarding. The trauma mechanism describes in most of all cases a high energy trauma with either direct impact of a static line or a sudden extension movement in the elbow. A small comparative study from the year 2002 showed better results after primary suture of the muscle than conservative treatment. However, due to the low number of cases, the evidence for or against surgical treatment remains weak.

Methods: One patient was treated with surgical repair for a complete rupture in the mid portion of biceps brachii, following the instruction of Kragh et al. 2002 using mason allon sutures. Postoperative care involved an elbow splint with 90, 60 and 30 degree extension limits for two weeks each. Photo documentation was performed pre- and intraoperative and at 3, 6, and 24 months follow up control. After two years we added MRI examinations and MAYO and DASH Score as well as strength measurements for flexion and supination.

Results: At the two year follow up control, a dent was visible and palpable at the site of suture, but the patient satisfaction was very good. We examined unrestricted mobility and the strength was limited by a maximum of 10% compared to the opposite side. Functional scores showed no relevant differences. The MRI showed no muscle fatty degeneration and only small areas of scarring.

Conclusion: In this case, the muscle rupture was primary sutured and the patient showed excellent functional results and high satisfaction after two years. The evidence remains weak, but nevertheless a primary muscle suture should be aimed for young and active patients. In this case the patient injured himself while wakesurfing due to a rope that was chosen too long and therefore wrapped his arm during the fall. In addition to surgical treatment, preventive measures should also be considered. The rope should be chosen as short as possible and good instruction should be provided by trained personal.

P129

Training with a novel Digitally Enhanced Hands-on Surgical Training (DEHST) enhances the performance during intramedullary nail distal interlocking

Torsten Pastor[1]; Emanuele Cattaneo[1]; Tatjana Pastor[2]; Boyko Gueorguiev[2]; Markus Windolf [2]; Jan Buschbaum

[1] Luzerner Kantonsspital; [2] AO Research Institute

Background: Freehand distal interlocking of intramedullary nails remains a challenging task. If not performed correctly it can be a time consuming and radiation expensive procedure. Recently, the AO Research Institute developed a new training device for Digitally Enhanced Hands-on Surgical Training (DEHST) that features practical skills training augmented with digital technologies, potentially improv-ing surgical skills needed for distal interlocking.

Objectives: To evaluate weather training with DEHST enhances the performance of novices without surgical experience in free-hand distal nail interlocking compared to a non-trained group of novices.

Methods: 20 novices were assigned in two groups and performed distal interlocking of a tibia nail in a simulated surgery under OR like settings. Participants in group 1 trained with DEHST (five distal locking attempts, 1 hour of training) prior to simulated surgery, while group 2 was not provided with DEHST training. Time, number of x-rays, nail hole roundness, critical events and success rates were compared between the groups.

Results: Time to complete the task (sec) and x-ray exposure (µGcm2) were significantly lower in Group1 414.7 (290–615) and 17.8 (9.8–26.4) compared to Group2 623.4 (339–1215) and 32.6 (16.1–55.3); p = 0.041 and 0.003. Perfect circle roundness (%) was 95.0 (91.1–98.0) in Group 1 and 80.8 (70.1–88.9) in Group 2; p <0.001. In Group 1 90% of the participants achieved successful completion of the task (hit the nail with the drill), whereas only 60% of the participants in group 2 achieved this; p = 0.121.

Conclusions: Training with DEHST significantly enhances the performance of novices without surgical experience in distal interlocking of intramedullary nails. Besides radiation exposure and operation time the complication rate during the operation can be significantly reduced.

P130

The Impact of Direct Oral Anticoagulants on Time to Surgery in Patients Receiving Intramedullary Nailing for an Acute Proximal Femur Fracture

Yves Brand[1]; Benjamin Rufer[2]; Hubert Nötzli[2]

[1] Bürgerspital Solothurn (Solothurner Spitäler AG); [2] Orthopädie Sonnenhof Bern

Introduction: Fractures of the proximal femur are an indication for urgent surgical treatment. However, treatment may be delayed for several reasons. One important reason is blood thinning. It is known that time to surgery (TTS) of more than 48 hours is associated with a significant increase in mortality. The aim of this study was to evaluate the effect of direct oral anticoagulants (DOAC) on TTS and the 1-year mortality and survival in patients sustaining a proximal femur fracture.

Methods: Retrospective cohort study of 204 patients admitted with proximal femur fracture between January 1, 2014 and January 31, 2020. Primary outcome measures were difference in TTS, 1-year mortality and survival between patients with DOAC treatment versus without DOAC treatment. Median TTS was assessed performing a Mann-Whitney U test. Mortality and survival were evaluated using a logistic regression and Cox proportional hazard model. Patients with other oral anticoagulant therapy, e.g. Clopidogrel, Aspirin or vitamin K Antagonists (VKA) were included in the no-DOAC group.

Results: 22 of 204 patients had DOAC treatment at time of admission. Median TTS in these patients was 3.17-fold higher than TTS in patients without DOAC treatment (60.8 h vs. 19.1 h, p <0.001). No evidence for an effect of DOAC on 1-year mortality or survival was found.

Conclusions: 1. TTS was significantly increased in patients with DOAC treatment who sustained a proximal femur fracture compared to all no-DOAC patients including those receiving other blood-thinning therapy, such as VKA treatment.

2. Due to the small number of DOAC cases in this study, no conclusions concerning the effect of prolonged TTS in DOAC-treated patients on 1-year mortality and survival after surgery could be drawn.

3. Reduction of TTS in daily routine remains a challenge in patients with DOAC due to the lack and/or price of antidote. It may be facilitated using laboratory evaluations such as the anti-FXa assay.

P131

Clinical outcome after osteosynthesis of lateral clavicle fractures with a distal radius locking plate and arthroscopic-assisted CC-cerclage

Philipp Braken; Richard Glaab

Kantonsspital Aarau AG

Introduction: Very lateral and comminuted clavicle fractures still present a challenge in stable fixation, even with designated implants. We evaluated our strategy of using a distal radius VA-locking plate, combined with an arthroscopic-assisted CC-cerclage regarding clinical outcomes.

Methods: We retrospectively reviewed patients who underwent an osteosynthesis of a lateral clavicle fracture with a distal radius VA-locking plate and CC-Cerclage. Post-op rehabilitation allowed for non-weight bearing exercises up to 90°abduction in the first 6 weeks. The outcomes were complications (incl. need for plate removal), bony union, clinical outcome.

Results: Between 2017 and 2022 14 patients were identified (10 male, 4 female; mean age 48 years). Most patients sustained a mono-trauma (n = 7). 6 patients suffered additional injuries (mean ISS 10), one patient was severely injured (ISS 20). The most frequent encountered fracture type was Neer IIB (n = 12). On average 6 days passed between accident and surgery. For the surgery 81 minutes were needed on average. One patient was lost to follow-up after surgery. Mean and median follow-up time was 8.5 and 12 months, resp. 6 Patients completed treatment without any complications and a free range of motion. 3 patients were not able to reach the pre-injury ROM or were partially irritated by the plate. No further interventions were necessary, though. It was necessary to remove the hardware in 2 patients because of local irritation. A low-grade infection was diagnosed in 1 patient after 6 weeks (C. acnes). It was possible to maintain the hardware after debridement and antibiotic treatment. One patient suffered a symptomatic non-union. After 4 months the plate was removed because of screw penetration into the AC-joint. A new tape cerclage was applied. After 9 months symptoms persisted and a revision was advised. However, the patient was lost to follow-up.

Conclusion: According to the literature the use of a hook plate or an isolated CC-cerclage results in inferior results compared to locking plates. In our experience, especially very lateral and comminuted fractures are difficult to address with existing plate systems The use of a volar/dorsal distal radius VA-locking plate ensures good fixation of the lateral fragments. To compensate the small dimension of the plate an additional arthroscopic-assisted CC-cerclage was applied. This led to good clinical outcomes in most of our patients. Hardware removal is seldom required.

P132

Long-term follow up after Lisfranc fracture: patient outcome after surgical treatment

Laura Fontanella; Moritz Tannast; Angela Seidel

Hôpital cantonal Fribourg

Introduction: Long term follow-up data are difficult to collect and therefore in literature it is rare to find patient reported outcome after 10 years from surgery. We would like to present data from long term follow up after surgical treatment of Lisfranc fractures, in order to provide answers to physicians and patients about outcome expectations.

Methods: All patient operated for a Lisfranc fracture in our hospital, between 2010 and 2016, were included in the study. Patient were contacted by phone and invited to fill out a questionnaire, including the EFAS and SF-12 score, and undergo an x-ray of the operated foot. The possibility of not undergoing the x-ray was also given.

Results: 14 of 29 patient (48%) completed the questionnaire. Among the excluded: 2 were deceased, 9 did not answer, and 4 didn't want to participate in the study. There were 4 male and 10 female patients among the analyzed group. The initial Hardcastle & Myerson Classification was the following: 2 A, 1 B1, 10 B2, 1 C2. 3 patients underwent multiple surgeries: 1 external fixation followed by definitive stabilisation, and 2 received fasciotomies prior to definitive stabilisation. Two presented open fractures, and only one patient had a complication (skin necrosis). The mean follow up was of 8.3 years. The mean EFAS score was 26.2, while the mean SF physical component was 44.69 and the mean SF mental component was 52.6. The Kellgren-Lawrence score was 2.7.

Conclusion: Lisfranc fractures present a challenge to both the surgeon and the patient. Patients need to be informed of the complexity of the lesion and of the possibility of chronic pain after surgery. The achievement of an anatomical reduction significantly increases the chances of a positive outcome in the long term.

P133

Clinical outcomes of conservative treatment for low-energy pelvic ring fractures

Diana Rudin; Belgin Bal; Vilijam Zdravkovic; Pia Sachser-Zurmühle; Bernhard Jost

Kantonsspital St. Gallen

Introduction: The increasing number of elderly people leads to a rising number of fractures in this cohort. A frequent type of low-energy fractures in elderlies are pelvic ring fractures, especially the combination of pubic branch and sacrum fractures as seen in lateral compression type 1 and 2 (LC1 and LC2) fractures. The combined affection of the anterior and posterior ring bears the risk of prolonged pain, resulting in a decreased mobility and increased complications. But in this often multimorbid population, operative treatment poses a higher risk of intra- and post-operative complications. Hence the management and treatment of this particular fracture type remains controversial.

The aim of this study is to analyse the outcomes and define parameters of conservative treatments of this fracture type.

Methods: A retrospective data analysis of 49 patients (F/M; 34/15) treated conservatively for a low-energy LC1 or LC2 fracture between the years 2016 and 2020 was performed. The primary measure was mobility after 2 weeks and 6 weeks. The data was assembled via chart analysis and phone interviews.

In addition to descriptive statistics, a binary logistic regression model was conducted to determine the factors having an impact on patient's outcomes. As a secondary measure, the consolidation of fractures was assessed via x-ray analysis.

Results: The mean age at the time of fracture was 78.6 years. 40 patients regained mobility (F/M; 32/8) after 2 weeks. Another 7 patients were mobile after 6 weeks (F/M; 2/5). Two male patients did not regain mobility. The most determinant variable of non-mobility at 2 weeks was male gender (OR 0.077, 95%CI 0.0066-0.501).

Age, BMI, pubic branch fracture dislocation >5mm, analgetic use of opiates, corticosteroid therapy, rheumatoid arthritis, alcohol, and smoking had no effect on mobility.

In 75.5% of the patients (F/M ; 27/10) follow-up imaging revealed fracture consolidation. 12 patients (F/M; 7/5) were lost to follow-up.

Conclusion: These results show a successful remobilisation of all but 2 patients within 6 weeks. The only factor with a negative influence on early mobilisation seems to be male gender. Radiographic fracture displacement >5mm of the pubic branches shows no adverse outcomes. Therefore, conservative treatments are a promising option for low-energy LC1 or LC2 fractures.

P134

Variable angle locking anterior patella plates for all types of patella fractures: A new multi-purpose fixation technique

Valentina Scholz; Christian Michelitsch; Philipp F. Stillhard; Christoph Sommer

Kantonsspital Graubünden

Introduction: Patella Fractures account for about 1% of all skeletal injuries and can be challenging to treat. Operative treatment is indicated for displaced patella fractures with a disrupted extensor mechanism. Various fixation techniques are described and each has its own advantage and disadvantage. We assessed the surgical, patient-based radiological and functional outcomes after open reduction and internal fixation (ORIF) of displaced patella fractures using a recently developed 2.7 variable angle locking anterior patella plate (VA-LCP).

Methods: We retrospectively analysed data of a consecutive series of ten patients with displaced patella fractures following operative fixation by 2.7 VA-LCP at our institution between 04/2021 and 09/2022. In all patients, a computed tomography (CT) scan was performed prior to surgery in order to fully evaluate the fracture pattern. The primary endpoint was bony union after a minimum follow up of three months. Secondary outcomes were range of motion, hardware irritation and complications.

Results: The mean age was 65.3 years (SD 16.82) with 60% female patients. All fractures were C3 types (according to AO/OTA classification). Mean follow-up was 7.7 months. Bony union occurred in all cases at an average of 10.5 weeks after surgery (SD 4.55). No postoperative infection occurred; one reoperation was performed due to an early secondary displacement of the lateral part of the upper pole, not affecting the integrity of the extensor mechanism. Implants were removed in three individuals. At final follow up all patients were fully mobilised without limping. The affected knee showed the same range of motion as shown on the contralateral side.

Conclusion: The 2.7 VA-LC anterior patella plate is an effective fixation method for treating displaced and especially comminuted patella fractures even in osteoporotic bone. This study demonstrated secure fixation, favourable clinical outcomes and a low rate of complications.

P135

Technical considerations by exchange of a cemented helical blade after fixation of proximal femoral fracture with proximal femoral nail (TFNA)

László Tóth; Michael Klauser; Alexander Vacariu-Seelig; Andrej M. Nowakowski

Kantonsspital Baselland

Introduction: The proximal femoral nailing system (TFNA) has an implant design with the ability to augment with cement through the perforated helical blade. Recent studies showed cement augmentation of the femoral neck implant to be advantageous. However, the lateral migration of the femoral neck implant could cause further debilitating complications with pain in the proximal thigh and therefore needs to be treated.

Methods: Given the fact that there is no documented case and technical description of a cement augmented helical blade exchange, a comprehensive literature review was carried out to identify the contributing factor that could affect the process. According to the evidence available, a new technical process was established and described.

Results: At the helical blade exchange, the patient is positioned supine on the trauma table with gentle traction. After connecting the insertion handle to the nail, a temporary wire through the aiming guide can be used to increase fracture stability. The locking mechanism of the helical blade is disengaged and the blade is easily removed using the reverse hammer. Following proper length measurement, the shorter helical blade can be precisely inserted in the preexisting cement shell of the head-neck fragment if the distance of the guide remains variable and is not fixed. The guide sleeve gives exactly the same rotational movement at the implantation site, as performed by the originally implanted helical blade. The helical blade is locked statically. In case of intermediate length, the shorter blade should be chosen to avoid a secondary dislocation of the cement strengthened head-neck fragment.

A 76 years-old active man suffered a proximal femur fracture treated with a TFNA cement augmented helical blade. 6-months postoperatively a symptomatic lateral migration (12mm) of the helical blade was seen. The helical blade was successfully exchanged with a shorter blade showing excellent clinical outcome and complete pain resolution.

Conclusion: The minimal invasive correction of a lateral migrated cemented femoral neck implant is possible without damaging the bone-cement interface. The first exchange of a cemented femoral neck implant due to a proximal femoral fracture treated with TFNA, has been documented. Further biomechanical studies are needed to obtain the need for cement-in-cement augmentation in case of reimplantation of a shorter helical blade.

P136

Incidence and injury pattern of athletes requiring acute medical treatment at the “Eidgenössische Schwing und Älplerfest” (ESAF) 2022

Markus Saner; Sebastian A. Müller; Julian Röhm; Caspar Steiner; Thomas Suter; Andrej M. Nowakowski

KSBL Bruderholz

Introduction: Swiss style wrestling is a high demanding sport in terms of strength, endurance, strategic techniques and resilience. Top athletes often have a body weight of 100-150kg and try to put their opponent on their backs using technique, strength and dynamics. In experiments, forces on the neck of 300kg and peak forces of over a ton were measured. There is

no reliable data on incidence of injury or injury pattern. Nevertheless, serious and sometimes life-threatening injuries can occur. Accordingly, an adequate system for primary medical care is necessary. All acute injuries at the ESAF 2022 that led to interruption or termination were systematically recorded.

Methods: Sports doctors from Kantonsspital Baselland ensured medical first aid for the athletes at the ESAF 2022. The team was supplemented by an emergency doctor (SGNOR) and a paramedic. 274 wrestlers faced each other in 1790 pairings on two days of competition. All medical treatments in the arena were systematically recorded.

Results: 14 wrestlers (5.1%) had to quit due to an injury. 7 athletes (2.6%) needed acute medical treatment. One athlete suffered a multi-fragmentary lower leg fracture and required surgery the same day. Another athlete suffered an ACL and MCL rupture. In 2 other athletes there was clinical suspicion of an ACL rupture/re-rupture. One ankle sprain with a posterior syndesmotic injury and one posterior elbow dislocation with spontaneous reduction were noted. 1 epistaxis could be settled in the arena with the athlete continuing. Delayed, 1 athlete had to be taken to the emergency department due to a chest trauma. Minor injuries could not be recorded systematically due to decentral treatment.

Conclusion: Fortunately, only 7 athletes had to be treated immediately in the arena with one requiring emergent surgery. Nevertheless, the rate of 5% of all athletes who had to quit is relatively high and the injury patterns show that serious injuries can occur. Therefore, well-established sports medical and emergency medical care on site is important.

A systematic recording of injuries in swiss style wrestling would be an important step for the development of a protection concept and protective equipment as well as for injury prevention.

P137

Correction of posttraumatic lower limb discrepancy and deformity with an intramedullary motorized distraction nail

Simone Schreiner[1]; Andreas Krieg[2]

[1] UKBB / Kinderorthopaedie; [2] Universitäts-Kinderspital beider Basel (UKBB)

Introduction: Fractures in childhood due to injury the epiphysis may result in a significant leg length discerapancy (LLD) and deformity. Correction of post-traumatic shortening and malalignement was traditionally performed with callostasis using external fixation (Ilizarov-method). Complex cases were usually performed with hexapod fixator (TSF®); for limb length equalization monolateral fixators or fixator based lengthening procedures over an intramedullary nail were also described. These methods were often associated with pain, pin tract infections, muscle tethering and secondary deformities due to early removal. Therefore intramedullary solutions with fully implanted motorized devices were invented.

Methods: Between 2006 and 2021 a total of 29 cases of posttraumatic LLD mean 3,5 cm (range 2 cm to 6,9 cm) were treated with a fully implanted motorized lenghening device (Fitbone®, Orthofix, Verona, Italy) at femur or tibia. A minimal follow up of 2 years was required. Hospitalization time, complications, leg equalization, and rehabilitation time were recorded and compared to conventional methods.

Results: Leg length eqalization was successfully performed in 27 cases (less than 10 mm difference). Angular and/or rotatory correction was additionally performed in 18 cases. Hospital stay was mean 11 days (range 7 to 15). The mean distraction index was 0,86 mm/day (range 1,3 to 0,51), mean consolidation Index 53 d/cm (range 16 to 211). No Bone or soft tissue infections were observed during the whole treatment. Pseudarthrosis or delayed union with surgically intervention occured in 2 cases. 1 motor failure occured ; the device was exchanged. 1 breakage of a nail occured. Functional results were good. The device was completely removed in 28 cases.

Conclusion: Gradual correction of posttraumatic LLD with/without malalignement using a motorized nail like the Fitbone® nail can be seen as a valiable alternative to conventional methods. The risk of infection is lower. Nevertheless, lower limb deformity correction and LLD equalization is still challenging and should be performed in an experienced center.

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Prospektiver Vergleich zur Einschätzung des Sturzrisikos anhand etablierter Scores in der Alterstraumatologie mit 2 Jahres „real-world" Evaluation

Moritz Kraus[1];Maximilian Saller[2]; Alexander Keppler[2]; Carl Neuerburg[2]; Wolfgang Böcker[2]; Ulla Stumpf[2]

[1] Schulthess Clinic, Zurich, Switzerland; Muskuloskelettales Universitätszentrum München, LMU Klinikum München; [2] Muskuloskelettales Universitätszentrum München, LMU Klinikum München

Fragestellung: Die Abschätzung des Sturzrisikos (SR) ist besonders bei von Osteoporose betroffenen orthogeriatrischen Patienten essenziell, um die richtige Therapieoption auszuwählen. Darüber hinaus kann die Lebensqualität der Patienten positiv beeinflusst werden. Es existieren multiple Scores und Tests zur Abschätzung des Sturz- und Frakturrisikos, dabei herrscht kein Konsens über einen Goldstandard. Zusätzlich existiert bei allen etablierten Methoden eine starke Populationsabhängigkeit hinsichtlich des Referenzkollektivs. Die vorliegende Studie soll dazu dienen, Patienten mit erhöhtem Sturzrisiko frühzeitig zu erkennen und entsprechende Faktoren zu identifizieren, die mit erhöhtem Sturzrisiko verbunden sind.

Methodik: Zum Einschlusszeitpunkt wurde ein Sturzassessment durchgeführt, welches aus SARC-F, FRAX, Timed-Up-and-Go-Test (TUG Test) und der Short Physical Performance Battery (SPPB) bestand. Zusätzlich wurden eine Handkraftmessung, Risikofaktoren (RF) sowie die gesundheitsbezogene Lebensqualität (EQ5D) erhoben. Für das 2-Jahres-Follow-Up wurden postalisch versandte Fragebögen verwendet. Neben der Anzahl der Sturzereignisse wurden die Scores EQ5D, SARC-F sowie RF untersucht. Die Patientengruppen mit und ohne Sturzereignis wurden statistisch verglichen und die prädiktive Güte der verschiedenen Scores hinsichtlich der Sturzvorhersage analysiert.

Ergebnisse: Bei 72 der 103 eingeschlossenen Patienten konnte der ein vollständiges Follow Up erhoben werden. Die komparative Statistik der Patienten die gestürzt sind gab gegenüber den nicht gestürzten beim initialen Assessment ein signifikant erhöhtes Alter (79±7 vs. 74±8; p = 0.019), und eine signifikant reduzierte Knochendichte am LWK 1(0.75±0.14 vs. 0.89±0.18), p = 0.028) und eine reduzierte selbsteingeschätzte Lebensqualität (66±21 vs. 77±13; p = 0.025). Der SARC-F wies bei dem etablierten Grenzwert von 2 Punkten den höchsten positiv prädiktiven Wert mit 89% auf, der TUG-Test mit dem Grenzwert von t≥12 s den höchsten negativ Prädiktiven Wert mit 53%. Bei der Sensitivität ist der TUG mit 75% dem SPPB mit 70% und dem SARC-F mit 68% überlegen. Bei der Spezifität erreichte der TUG-Test mit 61% die besten Werte gegenüber dem SARC F mit 58% und dem SPPB mit 48%.

Schlussfolgerung: Neben der Berücksichtigung des Alters scheint der SARC-F ein adäquates Screeningtool mit hohem PPW für das SR zu sein. Der TUG-Test lässt sowohl sensitivere als auch spezifischere Einschätzung des SR zu als die übrigen Methoden zu.

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