Congrès annuel de la Société Suisse d’Orthopédie et de Traumatologie

Lausanne (Switzerland), 22–24 June 2011
Hip arthroscopy for treatment of femoroacetabular impingement: is outcome comparable to open surgery? Dr. med. Mirjam Victoria Neumann1, Dr. med. Lorenz Büchler2, Dr. med. Lukas Iselin3, Dr. med. univ. Stefan Neuhüttler4, Dr. med. Miscia Vincenti1

Materials and Methods: Cadaver hips were prepared down to joint capsule and bone. Parts of the lamina quadrangularis were removed by means either of hammer and chisel or high speed cutters to open the fossa from the psoas side. 30° and 70° angled optics were used to examine the performance of the LCF during different movements of the joint.

Results: Every different form of appearance of the LCF described in the literature (ovaloid, flat, round, ....) could be found during different movements of the hip joint. We couldn't separate three different bundles, we could proof a "continuous recruitment of fibres" when taking different positions; in nearly every movement of the joint parts of the LCF get tightened. As already known the LCF gets the highest tension in flexion-adduction-external rotation and in extension-adduction-external rotation of the hip. The most unstressening position for the LCF is in 0° rotation (extension or flexion), whereas every kind of rotation (internal or external) tightens different sections of the LCF. The more the rotation gets, the more fibres get recruited.

Summary: The described technique of examining the LCF offers the opportunity to see and evaluate the actions of the LCF during the full range of motion of the hip joint respectively the tensioning of fibres in different positions. Reviewing the literature it's one of the first examinations of the LCF performed in situ. The LCF gets tensed in every form of rotation, independent of the flexion-extension-position. In flexion-adduction-internal rotation (impingement-position) the posterior fibres are strongly tensioned. The posterior tensioning of different fibres depending on the motion. This supports the theory of the mechanistic stabilising effect of the LCF in hip joints.

Hip arthroscopy for treatment of femoroacetabular impingement: is outcome comparable to open surgery? Dr. med. Mirjam Victoria Neumann1, Dr. med. Lorenz Büchler2, Dr. med. Lukas Iselin3, Dr. med. univ. Stefan Neuhüttler4

Introduction: Femoroacetabular impingement (FAI) is a risk factor for the development of osteoarthritis of the hip. Surgical hip dislocation remains the gold standard in treatment of FAI, but because of surgical progress in hip arthroscopy this treatment becomes more popular. Difficulty of this technique is restricted intraarticular view with possible over- or undercorrection of the femoral head neck junction. To compare the two techniques we retrospectively reviewed the results of a consecutive cohort of patients treated with surgical hip dislocation or hip arthroscopy for symptomatic FAI.

Methods: Between 2006 - 2009 all patients treated for symptomatic FAI were reviewed and divided into group 1 (hip arthroscopy, n = 66) and group 2 (surgical hip dislocation, n = 132). These two groups were used as outcome measure after a minimum follow-up of 1 year (mean: 22, range: 12–54 months).

Results: Overall, 25 patients (9%) claimed relevant residual pain resulting in re-arthroscopy (8), periacetabular osteotomy (1), surgical hip dislocation (1) and total hip replacement (17) after a mean postoperative time of 9 months. When compared to the palliative group, hip arthroscopy in curative intention was performed in significantly younger patients (22 years vs 56 years, p < 0.001) and resulted in a significantly better WOMAC score (128 versus 227, p < 0.001), a significantly higher subjective hip values (77% versus 71%) and estimated benefit (77% versus 72%). Eighty-six per cent (versus 80%) would undergo hip arthroscopy again in the same situation. Sidecut cartilage damage, age was identified as an additional factor that significantly correlated with a lower WOMac score (Spearman’s rho 0.352, p < 0.01). In 3% of the cases transient hypoaesthesia of the lateral cutaneous femoral (3), genitofemoral (3) and saphenous (2) nerve was seen. Two deep vein thrombosis (0.1%) and five insufficiency neck fractures (2%) were encountered. The later healed uneventfully without surgery.

HIP ARTHROSCOPY VERSUS SURGICAL HIP DISLOCATION FOR FEMOROACETABULAR IMPINGEMENT (FAI): RESULTS OF A PROSPECTIVE COMPARATIVE STUDY Dr. Tobias Bühler1, Dr. Patrick Zingg2, Dr. Fabian Kalberer3, PD Dr. Claudio Dora4

Background: Surgical treatment of femoroacetabular impingement (FAI) is either performed by surgical hip dislocation (SHD) or by arthroscopy (HAS). There are no comparative studies assessing the quality of morphological correction, rehabilitation time, morbidity or short-term outcome. The aim of the present study was to compare radiological and clinical outcome after SHD and HAS.

Methods: Between 2007 and 2009, 38 patients (23 HAS, 15 SHD) were included in a prospective, partially randomized study. Standardized follow-up examination at 6 weeks, 3 and 12 months. The amount of acetabular and femoral bony resection was measured on X-rays and on radial reformations of MRT (7 sectors within the antero-superior quadrant) by assessment of the arc of impingement and the acetabular coverage angle. To compare the clinical outcome, the Harris Hip (HHS) and WOMAC score as well as pain (VAS), the subjective hip value (SHV), and the period of incapacity to work were assessed.

Results: The mean age was 28 years (range 18–46). Neither the preoperative bony deformity nor the demographic data (age, gender, BMI, profession) differed between the groups. The amount of morphological correction, rehabilitation time, morbidity or short-term outcome. The aim of the present study was to compare radiological and clinical outcome after SHD and HAS.
Hip joint capsule – Normal values and implications for hip arthroscopy

Dr. Jan Weidener, PD Dr. Martin Beck
Orthopädie Inselspital Bern; Luzerner Kantonsspital Luzern

Purpose: Goal of this study was to determine the normal values for thickness of the hip joint capsule, the location of distal capsular insertion and the presence and extent of the recess between labrum and capsule. This is important to assess the possible clinical impact of postoperative changes like thickening of the capsule or the formation of adhesions between labrum and capsule and as guidance for optimal portal placement in hip arthroscopy.

Methods: 30 patients with clinical symptoms of femoro-acetabular impingement (FAI) who underwent MR arthrography prior to open or arthroscopic hip surgery were included in this study. Measurements of the hip joint capsule were taken on radial MRI slices along the femoral neck.

Results: According to our measurements, the thickest part of the joint capsule is antero-superior between 12 and 3 o’clock (4.2–6.2 mm). The longest distance from the femoral head/neck junction to the femoral insertion of the capsule is on the superior part between 9 and 3 o’clock (17.9–25.4 mm). If a capsular recess is present, its biggest depth is found on the anterior part between 3 and 9 o’clock where it ranges from 63 to 93% relative to the labrum.

Conclusions: The results presented in this study can be helpful for planning the portal placement in hip arthroscopy.

Level of evidence: Level II, diagnostic study.

Topographical Cartilage Thickness Variation in Patients with Femoroacetabular Impingement

Dr. med. Simon Damian Stepacher, Dr. med. Christoph Emanuel Albers, Dr. med. Monitz Tannast, Prof. Klaus Arno Siebenrock
Orthopädie und Traumatologie, Inselspital, Universität Bern

Femoroacetabular impingement (FAI) is a pathologic condition of the hip that leads to osteoarthritis (OA). The surgical hip dislocation for the treatment of FAI allows full access to the hip joint and the opportunity to measure cartilage thickness in vivo. We investigated the topographical cartilage thickness variation in patients with FAI and early stage OA using an ultrasonic probe during surgical hip dislocation.

We performed a prospective case-series of 42 patients (45 hips) that underwent surgical hip dislocation. The mean age at operation was 30.6 (18–48) years. Indication for surgery was symptomatic FAI with 4 hips (9%) with pincer type, 8 hips (18%) with cam type, and 33 hips (73%) with mixed-type of FAI. Cartilage thickness was measured intraoperatively with an electrode 22 MHz ultrasonic probe at 8 locations on the acetabular cartilage. The maximum in cartilage thickness was found in the weight bearing zone (range 2.8–3.5 mm), whereas the minimum was found in the posterior acetabular horn (1.0–2.2 mm). In all hips, cartilage thickness was increased on the outer rim of the lunate surface compared to the inner rim. In the anterior and posterior acetabular horn, the anterior area, and the superior area (inner rim of the lunate surface) a significantly decreased cartilage thickness in pincer type compared to cam type of FAI was found (p < 0.05).

Hips with FAI show specific damage patterns with pincer type of FAI having a relevant (>70%) improvement of clinical symptoms can be expected for the majority of patients and mainly affects pain reduction. Nevertheless, especially in terms of gait performance relevant deficits remain.

Vastus lateralis advancement for irreparable hip abductor tears – Clinical and radiological outcome

Dr. Michael Betz, Dr. Patrick Zingg, Prof. Dr. Christian Pfirrmann, PD Dr. Claudia Dora
Uniklinik Balgrist

Introduction: Degenerative and postoperative hip abductor tears can be associated with intractable pain and dysfunction and may therefore be reconstructed. The presence of large defects may compromise direct repair in this region and demand tissue transfers such as tendon allograft reconstructions or vastus lateralis advancement. Having occasionally used vastus lateralis advancement in the past we wanted to document patient’s benefit and possible donor site morbidity after this procedure.

Methods: Eleven consecutive patients underwent proximal advancement of the vastus lateralis muscle during the past 5 years. All presented with abductor muscle weakness, intractable trochanteric pain and MRI confirmed abductor discontinuity, which intra-operatively revealed unsuitable for direct repair. After a mean follow-up of 33 months, patient’s benefit was evaluated using standardized questions, the WOMAC score, the Harris Hip Score and hip abductor strength measurements. Integrity of the reconstruction was evaluated by MRI. Possible donor site morbidity was evaluated in terms of quadriceps muscle strength and extension lag as well as MRI of the quadriceps muscle compared to the opposite side.

Results: Two patients died for reasons not related to the surgical procedure, leaving 9 patients for evaluation. Overall, six patients relevantly improved, one was indifferent and two were unsatisfied. The use of pain killers diminished from regular use in 7 of 9 patients to 2 or 0.

Conclusions: Proximal advancement of the vastus lateralis muscle has no detectable donor site morbidity. Overall, relevant improvement can be expected for the majority of patients and mainly affects pain reduction. Nevertheless, especially in terms of gait performance relevant deficits remain.

Acetabular Retroversion as a Contributing Factor for Posterior Traumatic Hip Dislocation

Dr. med. Simon Damian Stepacher, Dr. med. Moritz Tannast, Dr. med. Christoph Albers, Prof. Klaus Arno Siebenrock, Prof. Reinhold Ganz
Orthopädie und Traumatologie, Inselspital, Universität Bern

Traumatic hip dislocation is a rare injury in orthopaedic practice and typically occurs in high energy trauma. The goal of this study was to analyze the hip morphology in patients with low energy traumatic hip dislocations and to compare it with a group hips with a normal morphology. We performed a retrospective comparative study. The study group included 45 patients with traumatic posterior hip dislocation. The mean age at trauma was 34 ± 15 years (range, 11–68 years) and included 42% of male patients. A low energy trauma was defined as a traumatic hip dislocation without a fracture or with a simple acetabular rim or head fracture (Pipkin I and II). Traumatic dislocations combined with other acetabular or femoral fractures were excluded. This resulted in 20 dislocations (44%) without a fracture, 14 (31%) with a acetabular rim fracture, 8 (18%) with Pipkin I or II fracture, and 5 (11%) with a combined acetabular rim and femoral head fracture. The control group consisted of 90 patients (180 hips) that underwent radiographic examination for urogenital indication and had no history of hip pain. Hip morphology was assessed on antero-posterior pelvic and axial hip radiographs and parameters describing acetabular coverage and orientation were computed using commercially available software called Hip° Norm. The study group showed significantly increased incidence of positive cross-over sign (82% vs. 27%; p < 0.001) with a increased retroversion index (26 ± 17° vs. 10 ± 10°; p < 0.001), positive ischial spine sign (70% vs. 34%; p = 0< 0.001), posterior positive wall sign (79% vs. 21%; p < 0.001), decreased posterior acetabular coverage (41 ± 10 [17–67] vs. 47 ± 9 [22–71]; p < 0.001), and decreased caudocranial coverage (77 ± 12 [42–96] vs. 83 ± 15 [64–100]; p = 0.01). Hips that underwent a low energy posterior traumatic hip dislocation show significantly more radiographic sign for acetabular retroversion compared to a control group. Therefore, acetabular retroversion seems to be a contributing factor for posterior traumatic hip dislocation.

Minimum 5-Year Results of Joint-Preserving Surgery after Perthes Disease

Dr. Christoph E. Albers, Dr. med. Simon D. Steppacher, Prof. Dr. med. Reinhold Ganz, Prof. Dr. med. Klaus A. Siebenrock
Klinik für Orthopädische Chirurgie; Inselspital, Universitätsspital Bern

The goal of joint preserving surgery in patients after Legg-Calvé-Perthes disease (LCPD) is to improve hip pain and motion and to delay secondary osteoarthritis. The operative treatment at our institution includes Perciabeticular acetabular osteotomy (PAO) to reconstruct acetabular coverage as well as surgical hip dislocation (SHD). SHD allows to correct a potential asphericity of the femoral head and to achieve relative lengthening of the femoral neck (RLFN), distalization of the greater or lesser trochanter and/or head reduction plastic surgery. We present the minimum 5-year results of a series of adolescents and adults after Perthes disease that underwent surgery. We asked (1) what is the minimum 5-year survivorship, (2) what is the clinical and radiographic outcome and (3) are there any factors predicting poor outcome.

We performed a retrospective case control study of 53 consecutive patients (53 hips) between 1997 and 2005 with painful hip motion after...
previous LCPD. The mean age at surgery was 21 ± 10.1 (7–47) years and the mean follow up was 8 ± 2.1 (5–13) years. In 82% hip deformity was ≥3 according to Stulberg. Six patients underwent PAO, five patients combined PAO and SHD and 42 patients SHD. All patients were evaluated for a recently developed frame for functional analyses assessing surgical treatment options. Survivorship analysis according to Kaplan-Meier was performed with the endpoint set as total hip arthroplasty (THA), a Merle d'Aubigné score (MdB) ≤14 or progression of osteoarthrosis. Demographic, preoperative and surgery related factors were analyzed using the Cox regression analysis to detect predictive factors for poor outcome. At 5-year follow up, the cumulative survivorship was ≥90% (CI, 85-94). Hip cores were converted to THA. There had been a progression of osteoarthrosis and two presented with a MdB ≤14. The mean MdB improved from (p < 0.001). The prevalence of a positive impingement test and a positive Trendelenburg sign reduced (p < 0.001). Abductor strength improved significantly. Age at operation, preoperatively progressed osteoarthrosis, and the degree of preoperative hip deformity were significant predictors for poor outcome. Joint preserving surgery in patients with hip deformity after PAO provides an effective treatment option to prevent or delay the progression of osteoarthrosis and to improve pain and hip dysfunction. A good long term result depends on the preoperative cartilage condition and the degree of hip deformity.

**SCFE: Clinical Assessment and Intra-operative Evaluation of Dislocation and Retraction**

Dr. Lazaros Vlachopoulos, Dr. Lazaros Vlachopoulos, Dr. Hanspeter Huber, Dr. Stefan Dierauer, PD Leonard Ramseier 1 Uniklinik Balgrist; 2 Kinderchirurgie-Traumatologie; 3 Children’s Hospital Boston; 4 Inselspital Bern

**Background:** Clinical Classifications of SCFE attempt to identify hips with disconnected epiphysis, associated with a high risk of avascular necrosis (AVN) of the femoral head; however closed surgery makes confirmation difficult. The assignment of AVN to loss of physeal integrity or to surgical aspects of stabilisation.

**Questions:** Are actual classification systems sufficiently accurate in detecting mechanical instability? Is epiphyseal disconnection the main risk factor for AVN? Retrospectively clinical classification of physeal stability and in 82 consecutive SCFE was compared with respective findings at open surgery; epiphysial perfusion at surgery was recorded as well.

**Results:** Complete epiphysial disconnection at open surgery was seen in 28 hips (34.1%). With the Fahey and O’Brien classification the sensitivity for disconnected epiphysis is 82.1% and the specificity 44.4%. With the Loder classification, the values were 39.3% for sensitivity and 75.9% for specificity. Epiphysial perfusion could be demonstrated in 76 of 78 tested epiphyses. Both hips with lack of intraphyseal perfusion were in the subgroup with disconnected epiphysis.

**Conclusion:** Actual clinical classifications are weak for the diagnosis of a disrupted epiphysis. Disruption per se can but does not necessarily lead to a stop of epiphyseal perfusion. High incidence of AVN may be more related to treatment modalities.

**Level of evidence:** Level III retrospective comparative study.

**Persistenting growth after prophylactic single screw epiphysiodesis in upper femoral epiphysis**

Dr. Lazaros Vlachopoulos, Dr. Lazaros Vlachopoulos, Dr. Hanspeter Huber, Dr. Stefan Dierauer, PD Leonard Ramseier

**Background:** Prophyllactic fixation of the contralateral hip in cases of slipped upper femoral epiphysis is controversial in North America, although in Europe it is more common. Using a single cannulated screw has been therefore widely accepted. However differing reports exist about the occurrence of persisting growth after prophylactic epiphysiodesis. The aim of this retrospective study was to evaluate the presents of persisting growth of the upper femoral epiphysis after prophylactic fixation.

**Methods:** From 2006 until 2009 eleven children underwent prophylactic pinning using a single cannulated 6.5mm cancellous screw. Time to fusion, persisting growth as well as overgrowing of the screw was measured on plain radiographs taken postoperatively and at least after the growth plate was fused.

**Results:** All patients except one (91%) showed a persisting growth of the epiphysis and in 2 cases therefore actually a hardware replacement was necessary. The mean length of the femoral neck length was 8.2% (sem 1.46%). Mean follow up was 32 months (range 12–49 months). All patient had a risser score grade 0 at the time of surgery, and equal or less than grade 2, when the growth plate was fused.

**Conclusion:** Descriptive reports that a prophylactic fixation using a single cannulated cancellous screw is unproblematic and safe we showed that growth persistence is the rule and in some cases the physeal overgrowth necessitates a hardware replacement. Careful follow-up until fusion of the growth plate should be obligatory. Adjustment of the technique may be helpful to minimize further surgeries.

**Five-year results of surgical hip dislocation for the treatment of femoroacetabular impingement**

Dr. Florian D. Naal, Dr. Hermes H. Miozzari, Dr. Michael Schäli, Prof. Dr. Hubert P. Nötzel

**Background/Aim:** This study aimed to determine the results of surgical hip dislocation for the treatment of femoroacetabular impingement (FAI) in a large patient series at a mid-term follow-up.

**Methods:** We conducted a retrospective study including 185 consecutive patients who underwent surgical hip dislocation for the treatment of FAI. The mean follow-up was 61 months. We determined clinical outcomes in terms of several criteria including alpha angles. All revisions and conversions to total hip arthroplasty (THA) were recorded.

**Results:** Hip flexion and internal rotation significantly improved. 82% of the patients were satisfied or very satisfied with the results of surgery and 81% would undergo the same surgery again. Alpha angles decreased from 60 to 43°. Conversion to THA was performed in seven hips (3%). Seven hips (3%) underwent major revisions and eleven (4.7%) minor revisions. Female patients had a significantly increased risk for conversion to THA (odds 10.7).

**Conclusions:** The results offer evidence that surgical hip dislocation is a successful procedure for the treatment of FAI. More than 90% of the patients were satisfied with the results of surgery at a mid-term follow-up. The present data also suggest that older and taller female patients are at an increased risk for a worse outcome.

**Pathological gait patterns in coxa retrotorta in pediatric population—supplementary examination for preoperative planning?**

Dr. med. Harald Lengnick, Dr. med. Katja Zdenek, Regina Uhlmann, Dr. med. Enka Payne, Dr. med. Harry Klimalé, Verena Fanner

1 Orthopädie Kantonsspital St. Gallen, Kinderorthopädie Ostschweizer Kinderspital St. Gallen; 2 Kantonsspital St. Gallen, Ganglabor; 3 Kinderorthopädie Ostschweizer Kinderspital St. Gallen; 4 Leiterin Ganglabor

**Introduction:** Coxa retrotorta is known as prearthrosis of the hip joint and therefore should be corrected operatively (1, 2). Clinical examination and conventional X-ray are diagnostic standard tools, whereas CT allows quantification of femoral retrotorsion leading to the precise diagnosis. Nevertheless children are rarely symptomatic and decision making for children and parents is difficult. Gait laboratory analysis gains relevance in diagnosis of unphysiological movement patterns in patients with coxa retrotorta. Reproducible analytic findings concerning disadvantages of an increased femoral neck length of the lower extremity may offer important information for surgical indication and preoperative planning.

**Methods:** We studied five patients (15.5 ± 2.8) with clinical and CT-diagnosed coxa retrotorta using gait analysis (VICOM, 8 MX cameras, Plug-in Gait). Focused were changes and abnormalities of the patients gait pattern compared to the physiological gait pattern. **Results:** All patients presented with reduced or nullified internal rotation of the hip joint (−10°) and CT-diagnosed pathologic reduced anteverision (<5°) or absolute femoral retrotorsion (<5°). Kinematics in gait analysis showed in all patients an increased adduction of the hip in the coronal plane. Three of five patients had an increased external rotation of the knee joint of the affected leg in the transverse plane according to the clinical picture of kneeing out. The analysis of kinetics indicated a pathologic external valgus moment in all patients and in three of five a pathologic external flexion moment within the first 20% of the stance phase.

**Conclusion:** We summarize the diagnostic pathway of coxa retrotorta including clinical examination, image-guided tools and gait analysis. Kinematical and kinetic analysis of the hip highlight pathologic movement patterns in patients with coxa retrotorta. Breit et al. showed in a cadaver study an increased valgus joint alignment in diminished anteversion of the hip joint. Our preliminary results support these findings showing increased valgus moment in the knee joint in all our patients. It might be discussed, if coxa retrotorta does also affect the knee joint. Taking these changes in account, gait analysis can serve as an important diagnostic and preoperative planning tool in coxa retrotorta. Further studies will be necessary to analyze the reproducibility of these observations in a larger patient population.
Not fully centered femoral head after closed reduction in children with developmental dysplasia of the hip: Immediate re-reduction is not necessary

Dr. Sasha Tharakan, PD Dr. Leonhard Rameisier, Dr. Stefan Dierauer
Kinder-Universitätsklinik Zürich

Introduction: Subluxed and fully luxated hips can be treated by closed reduction followed by immobilization in a spica cast. For these patients, avascular necrosis (AVN) of the femoral head is a serious complication. The incidence for avascular necrosis after this treatment varies between 47% and 76%. We present a series treated by spica cast that were not fully reduced at the initial MRI, but centred spontaneously over a period of two weeks.

Methods: Between 2008–2010, 16 patients (17 hips) underwent closed hip reduction with immobilization in a spica cast. At time of reduction was between 5d and 5 m (mean 2 m). MRI control was made on the same day to confirm the reposition. If a correct and centered position was seen, spica cast was left for 4 wks. After removal, a goniographic control was done. Further treatment was a Düsseldorfer-splint for several weeks. If after primary closed reduction, a not optimal centering of the femoral head, without interposed labrum, was found, the position was tolerated. In those cases, a follow up MRI was done 2 wks later.

Results: In 6 patients MRI showed a fully centered femoral head after first closed reduction. In 3 patients it was not possible to perform a closed reduction. There was an inadequate centering because of interposed labrum. In 7 patients, a not fully centered femoral head with interposed labrum was seen in the control MRI after closed reduction. The femoral head was in a slightly doro-cranial subluxated position. A follow up MRI was performed 2 wks later that showed now in 7 hips a full centering of the femoral head.

Discussion: A remarkable observation was seen in those 7 patients (43%) who did not have a completely centered femoral head after the first closed reduction. The doro-cranial subluxed position was 2 wks later seen in a spontaneously re-reduced perfect position while wea ring the same spica cast. The follow-up examinations over a period of 6–27 m showed up to now no evidence of complications, such as AVN of the femoral head.

Conclusion: We showed that after closed reduction in DDH and initially not optimal centering of the femoral head, an immediate re-reduction is not mandatory given to the fact that obviously a sponta neous re-reduction can occur if no soft tissue is interposed.

The ?true? anteverision (AV-) angle of the acetabulum – 3D model versus 2D axial CT-cuts

Dr. Andreas Krieg, Dr. Zdzislaw Krol, Pawel Skalitubowicz, Prof. Dr. Fritz Hafner
Kinderorthopädische Universitätsklinik, UKBB; Institute of Computer Science, Department of Biomedical Computer Systems, University of Silesia, Sosnowiec

Background: Acetabular retroversion could be a cause in the development of femoro-acetabular impingement. A successful pelvic osteotomy includes the correction based on CT scanning. However, we lack normative CT values in planning realignment of the osteotomized acetabulum. Also using 2D axial CT-cuts, different factors can lead to inconsistencies in measurement for acetabular version in this method.

Patients and methods: We retrospectively studied 260 hemipelvises that had been CT scanned for abdominal evaluation. We created 3D- surface models and the femora were removed for facilitate the detailed analysis of the acetabular area. Sex and age differences were also studied. We compared the results of our 3 D analysis vs. the cross sectional cuts of the same acetabula.

Results: The overall (n = 260) mean 3D- Acetabular AV-angle was 16.1° (SD = 5.6°) with a range of [0.2°, 31.2°]. In the case of the 3D- Acetabular AV-angle for male hemipelvises (n = 138) the mean acetabular AV-angle was 14.1° (SD = 5.3°) within a range of [0.2°, 28.8°] for male and for female (n = 122) the mean acetabular AV-angle was 18.4° (SD = 5.6°) within a range of [3°, 31.2°] accordingly. However, comparison of mean angles in women with those in men showed a difference for the Acetabular AV-angle, but we found no significant differences between the mean figures for right and left hips. The mean 2D axial analysed AV-angle was 21.0° (SD = 35°) within a range of [9.8°, 35.0°]. The mean difference to the 3D analysis in the same acetabula (n = 50) was 4.8° (SD = 3.5°), within a range of [0.1°, 13.4°].

Discussion: Knowledge of the normal anatomy of the acetabulum is essential in the type and severity of acetabular deformities, as well as in preoperative planning. Accurate estimation of the normal contact surface orientation permits correct realignment of the osteotomized acetabulum. These data are relevant for surgeons in providing targets for normal positioning of the acetabulum during pelvic osteotomies and acetabular recontouring procedures.

Total Hip Arthroplasty with a large diameter metal-on metal cup (Durom) and a standard stem. Short term results

Panayiotis Christofilopoulos, Dr. Anne Lübbeke, Dr. Charles Berton, Dr. Alexandre Lädermann, Dr. Pierre Hoffmeyer
HUG

Introduction: Large diameter metal on metal cups have been used in total hip arthroplasty advocating superior results with respect to dislocation rates, range of motion and long term survival. The Durom cup used as part of the Durom hip resurfacing system has been incorporated with positive results based on CT scanning. However, we lack normative CT values in planning realignment of the osteotomized acetabulum. Also using 2D axial CT-cuts, different factors can lead to inconsistencies in measurement for acetabular version in this method.

Patients and methods: We retrospectively studied 260 hemipelvises that had been CT scanned for abdominal evaluation. We created 3D- surface models and the femora were removed for facilitate the detailed analysis of the acetabular area. Sex and age differences were also studied. We compared the results of our 3 D analysis vs. the cross sectional cuts of the same acetabula.

Results: The overall (n = 260) mean 3D- Acetabular AV-angle was 16.1° (SD = 5.6°) with a range of [0.2°, 31.2°]. In the case of the 3D- Acetabular AV-angle for male hemipelvises (n = 138) the mean acetabular AV-angle was 14.1° (SD = 5.3°) within a range of [0.2°, 28.8°] for male and for female (n = 122) the mean acetabular AV-angle was 18.4° (SD = 5.6°) within a range of [3°, 31.2°] accordingly. However, comparison of mean angles in women with those in men showed a difference for the Acetabular AV-angle, but we found no significant differences between the mean figures for right and left hips. The mean 2D axial analysed AV-angle was 21.0° (SD = 35°) within a range of [9.8°, 35.0°]. The mean difference to the 3D analysis in the same acetabula (n = 50) was 4.8° (SD = 3.5°), within a range of [0.1°, 13.4°].

Discussion: Knowledge of the normal anatomy of the acetabulum is essential in the type and severity of acetabular deformities, as well as in preoperative planning. Accurate estimation of the normal contact surface orientation permits correct realignment of the osteotomized acetabulum. These data are relevant for surgeons in providing targets for normal positioning of the acetabulum during pelvic osteotomies and acetabular recontouring procedures.

Development of Bilateral Total Hip Arthroplasty during the last 10 years

Dr. Georg Neubauer, MD Vaughan Poutawera, Dr. Patrick Zingg, PD Dr. Claudio Dora
Uniklinik Baarig; New Zealand; Uniklinik Baarig

Background: Hip osteoarthrosis occurs bilaterally in 42% to 54% of patients and current literature on bilateral total arthroplasty (THA) favours one stage procedures. Nevertheless, according to a review of 33’500 primary THA in Europe, only 3% were performed in a single stage procedure. During the last 10 years advances in terms of ease of recovery should have made bilateral one stage procedures increasingly favourable. The aim of the present investigation was to evaluate the frequency of single stage bilateral THA during the past 10 years in our institution and to document their outcome.

Materials and methods: We retrospectively reviewed our prospective database for patients undergoing bilateral THA within a 12 month period from 2000 to 2009. 99 patients were identified and their charts retrospectively reviewed in terms of Age, gender, BMI, ASA-score, surgical technique used, surgical time, blood loss, need of homologous blood transfusions, hospital stay, complications and outcome (WOMAC) after a minimum follow up of 1 year. Comparison between single stage versus two stage procedures were performed and the impact of surgical techniques analyzed.

Results: 14.3% of our patients in need of THA had a bilateral replacement. Frequency of single stage procedures increased from 1.9% in the 2000–2004 period to 3.7% in the 2005–2009 period. In our study group age and ASA-score were significantly lower in patients undergoing single stage procedures (55.4 ± 12.8 versus 66.7 ± 11.9 years, p = 0.001, ASA 1.8 ± 0.6 versus 2.2 ± 0.6, p = 0.009). 59 of 99 patients underwent a single stage procedure (50.5%). Significant lower surgical time (1973 ± 510 versus 232 ± 1 ± 55.7, p = 0.001) and hospitalisation time (9.5 ± 3.3 versus 14.1 ± 4.4, p = 0.001) was shown for bilateral single stage THA.

Conclusion: Several technico-medical improvements during the last 10 years increased safety and ease of postoperative rehabilitation after THA favouring single stage procedures. Our data showed an increase of single stage procedures in younger patients with a lower ASA score combined with a tremendously shorter hospitalisation time and surgical time for patients who underwent bilateral single stage procedures, that are equal to two stage procedures in terms of complications and outcome.

Total Hip Arthroplasty with a large diameter metal-on metal cup (Durom) and a standard stem. Short term results

FM14

FM15

FM16

FM17
short-term revision rate of the large diameter metal-on-metal couple reported by others. In all revision cases the retrieved cups showed no osteo-integration.

Trochanteric Osteotomies for Primary and Revision
Total Hip Arthroplasty: Risk Factors for Nonunion
Dr. Karl Wieser, Dr. Patrick Zingg, PD. Dr. Claudio Dora
Uniklinik Balgrist

Introduction: Even if nowadays the indication of trochanteric osteotomy (TO) for primary hip arthroplasties (THA) has declined it remains useful for some reconstructions. Nevertheless, non-union of the greater trochanter represents a relevant complication. The purpose of this investigation was to identify risk factors for trochanteric non-union.

Materials and Methods: According to our prospectively collected THA data base, 338 TO (310 patients) were performed between January 2000 and October 2009. From these 40 cases were excluded because of missing follow-up or loss of index patient. At least 6 months after surgery (mean follow-up 298 cases we recorded 1) patient related factors such as gender, age, BMI, and nicotine abuse; 2) indication for TO, complex primary- or revision THA; 3) surgical technique related factors such as use of cement, distal trochanteric advancement, type of TO (extended versus anterior slide), and fixation of TO; 4) presence of previous TO (healed or not healed) and femoral component cementation; 5) complications such as intraoperative periprosthetic fracture or postoperative hip dislocation. Non-union of the TO was our primary endpoint and was assessed on a.p. and crossable lateral views acquired at least 6 months after surgery.

Results: The overall trochanteric union rate was 80.5%. 5.4% showed a fibrous union only (i.e. visible osteotomy line without migration of the trochanter) and 14.1% a non-union (i.e. visible osteotomy line and migration). Non-union occurred in 40 of 247 anterior trochanteric slide osteotomies (16.2%) and in 2 of 51 extended trochanteric osteotomies (3.9%), respectively (p: 0.02). Non-union occurred in 35 of 195 cemented stems (18.3%) and in 7 of 103 non-cemented stems (6.8%), respectively (p: 0.01). Non-union occurred in 16 of 130 primary THA (12.3%) and 26 of 168 revision THA (15.5%), respectively (p: 0.45). Multiple logistic regression analysis revealed patient's age (Odds: 1.03 per year and case, CI: 1.01–1.06, p: 0.016) and use of cement (Odds: 3.03, CI: 1.22–7.56, p: 0.02) as the only independent risk factors for non-union.

Conclusion: With respect of these results our current praxis has been changed as follows: The older the patient, the more the indication of a trochanteric osteotomy is restricted. If a trochanteric osteotomy appears indispensable non-cemented femoral reconstruction is prioritised.

Distal Femoral Cortical Hypertrophy Using the Fitmore Stem
S. Incidence, Risk Factor Analysis, And Clinical Implications
Caroline Thalmann1, Marc Attinger1, Tina Stoelzle2, Heinz Bereiter1, Karl Stoffel1
1Kantonsspital Graubünden; 2Kantonsspital St. Gallen; 2Fa. Zimmer

Background: Stem design is an important factor influencing bone remodelling. The Fitmore Stem has a triple taper design with proximal Ti-Plasma coating. The design creates a press fit and proximal transfer of forces which is supported by biomechanical studies. However in some cases cortical hypertrophy in the distal femur has been observed with use of triple taper stems. The frequency, cause, and clinical relevance of cortical hypertrophy in the distal femur after hip arthroplasty with the Fitmore stem has not been previously documented.

Methods: A series of 99 total hip arthroplasties with a Fitmore tapered femoral component were performed in 96 patients between April 2008 and January 2010 at our institution. 10 hips (in 8 patients) were lost to follow-up. 89 hips in 88 patients were followed for at least 12 months. Clinical evaluation included Oxford, SF 12, and EQ-5D score, the incidence of thigh pain, and BMI. Radiographic examination at 6 (11), 12 (12) and 52 weeks (5) postoperatively was used to evaluate cortical hypertrophy.

Results: Cortical hypertrophy was observed in 44 patients (49.4%). In 30 cases, the main site of hypertrophy was found in region 3 according to the British classification. 8 cases of hypertrophy were noted in region 5, 6 in regions 3 and 5. Hypertrophy appeared on x-ray after 12 weeks in only 6 patients, whereas in the remaining 38 patients the hypertrophy was seen only after 1 year. Positive radiographic appearance of the hypertrophy did not correlate with subsidence, position of the stem, family, gender, age or BMI. No correlation of the radiographic findings with thigh pain at 6 weeks or one year postoperative was found.

Conclusion: Distal cortical hypertrophy was observed in nearly 50% of patients treated using the uncemented triple tapered Fitmore Stem. Neither subsidence nor stem positioning correlated significantly with the presence of cortical hypertrophy. Furthermore the presence of this radiological finding did not correlate at any time with thigh pain. The fact that in most cases the hypertrophy becomes present only after 1 year makes the role of a primary distal load transfer very unlikely. It is more likely that due to the large proximal bone area the short stem creates a secondary load transfer from the whole proximal fragment (which includes the stem) to the distal part of the proximal femur. Future studies should investigate how this hypertrophy might evolve over time.
Results: Perfect match for implant size was obtained in more than 60% of patients. In the remaining 40%, the variation was limited to 1 implant size. Planned lengthening and lateral offset displayed substantial to good correlation with post-operative recordings.

Conclusion: Filmless preoperative planning using the Osiris hip templating plugin represents a reliable, user friendly solution, available at no cost for any surgeon equipped with a standard Mac computer.

Internal rotation test for the clinical evaluation of stem stability
Dr. Otmar Hersche
Schulthess Klinik

Introduction: In many cases stem stability is difficult to assess and needs additional examinations such as a plain radiograph and/or a bone scan. Furthermore there are patients, where stem stability is doubtful in the absence of evident signs of loosening. It would although be helpful to be able to test stem stability postoperatively. We present a clinical test, which has produced very reliable results with a very high sensitivity.

Method: In the internal rotation test the patient’s hip and knee are flexed at 90 degrees. The patient is told to push his lower leg against the outside of the leg (thus doing an internal rotation of the hip). The examiner resists this motion and pushes abruptly against the leg. In a loose or unstable stem, the patient experiences pain in the proximal thigh, the degree of pain corresponding to the degree of loosening. We evaluated the internal rotation test in 40 patients which were scheduled for hip revision. In all 16 patients there were clear signs of stem loosening, in 4 patients stem stability was doubtful and in another 20 patients revision surgery was done for cup loosening with a stable stem. During surgery stem stability was tested by trying to extract the stem with a stem extraction system.

Results: In all 16 patients, where the internal rotation test was positive (painful), the stem was evidently loose. In the 4 patients with doubtful stability on plain X-ray and a positive test the stem was fixed macroscopically but could easily be extracted. In all patients, where the preoperative internal rotation test was negative the stem was well fixed and could not be extracted. Thus the sensitivity of the internal rotation test regarding stem instability or stem loosening was 100%.

Conclusion: The internal rotation test is a very valuable tool for the diagnosis of stem instability or loosening. We found it superior to plain X-ray or even to bone scans and it has become an important diagnostic tool in daily practice.

Survivorship of Second-Generation Metal-On-Metal Primary Total Hip Replacement
PD Dr. med. Fabian von Knoch, Dr. med. Carl Neuerburg, Dr. phil. Franco Impellizzeri, PD Dr. med. Marius von Knoch, PD Dr. med. Michael Leunig, Schulthess Klinik; *Munich University Hospital LMU; †Klinikum Bremerhaven

Introduction: The revision rate of metal on metal (MoM) hip resurfacing is increasing. Survivability analysis of MoM hips is therefore of great interest. The aim of this study was to evaluate the survivorship data of patients with MoM primary THA.

Methods: We analyzed 224 hip resurfacing arthroplasties in 172 patients (37 women, 135 men), mean age 54 years (range, 20 to 87 y) in a cross-sectional study. Patients with a standardized follow-up 1, 2, and 5 years postoperatively in 2010 were included (mean implantation time 3 years, 11 month). All assessments included a clinical examination, radiographs and sonography of both hips and plasma levels of cobalt and chrome were measured at the last-follow-up. Harris Hip Score and pain score are available preoperatively and at follow-up.

Results: The mean cobalt plasma level was 2.55 ug/l (range 0.2 to 74 ug/l, normal range 0-1 ug/l), chrome 2.40ug/l (1 to 32 ug/l, normal <1 ug/l). Peak values were found 2 years postoperatively in the measured patients. Cobalt and chrome levels were significantly higher (CI 95%, r = 0.921) in bilateral resurfacing. Renal function was normal in all patients.

Discussion: We found slightly elevated Co/Cr levels without clinical relevance for the outcome of hip resurfacing. Not negligible remains the fact that patients with bilateral hip resurfacing show significantly higher values in measured Co and Cr levels compared to unilateral resurfacing. Further analysis of clinical outcome as well as toxicological considerations will need to be specifically addressed.

Metal on Metal Hip Resurfacing: A cross-sectional analysis of Cobalt/Crom levels
MSc Dr. Anna Carolina Rienmüller, Dr. Thomas Guggi, Jessica Leuenberger, Dr. Otmar Hersche, PD Dr. Michael Leunig Schulthess-Klinik Zürich

Introduction: Currently metal on metal (MoM) hip resurfacing is being scrutinized due to high failure rates, poor revision results, hip pain in relation to pseudo-tumors and concerns that those implants are at risk for coxitis. On the one hand the failures are seen due to implant positioning and osseous changes as thinning of the femoral neck. On the other hand there is a highly discussed immune and cytotoxic effect of periprosthetic metallosis. Cobalt inhibits cellular respiration and has the potential to adversely affect multiple organ systems. For reasons of quality management and safety for our patients we performed a cross sectional analysis of patients undergoing MoM hip resurfacing, analyzing the cobalt/chrome plasma levels in relation to outcome.

Methods: We analyzed 224 hip resurfacing arthroplasties in 172 patients (37 women, 135 men), mean age 54 years (range, 20 to 87 y) in a cross-sectional study. Patients with a standardized follow-up 1, 2, and 5 years postoperatively in 2010 were included (mean implantation time 3 years, 11 month). All assessments included a clinical examination, radiographs and sonography of both hips and plasma levels of cobalt and chrome were measured at the last-follow-up. Harris Hip Score and pain score are available preoperatively and at follow-up.

Results: The mean cobalt plasma level was 2.55 ug/l (range 0.2 to 74 ug/l, normal range 0-1 ug/l), chrome 2.40ug/l (1 to 32 ug/l, normal <1 ug/l). Peak values were found 2 years postoperatively in the measured patients. Cobalt and chrome levels were significantly higher (CI 95%, r = 0.921) in bilateral resurfacing. Renal function was normal in all patients.

Discussion: We found slightly elevated Co/Cr levels without clinical relevance for the outcome of hip resurfacing. Not negligible remains the fact that patients with bilateral hip resurfacing show significantly higher values in measured Co and Cr levels compared to unilateral resurfacing. Further analysis of clinical outcome as well as toxicological considerations will need to be specifically addressed.

Complications and five year clinical outcomes in metal-on-metal vs. PE-ceramic total hip arthroplasties
Anne Lübbeke, Dr. Guido Garavaglia, Dr. Constantinos Roussos, Prof. Robin Peter, Prof. Pierre Hoffmeyer
Hôpital Bellinzona; Hôpitaux Universitaires de Genève

Introduction: Recent review of literature concerning metal-on-metal total hip arthroplasty (THA) revealed the lack of large comparative clinical studies and inclusion of patient-reported outcomes.

Predictors for the need of a rehabilitation after primary hip replacement
Dr. med. Anne Mertens, Silke Pannhorst, Larissa Ichmann, PD Dr. med. Dr. phil. Thomas Ichmann Kantonsspital Liestal

Introduction: In the last years the need of in-patient rehabilitation and fast-track surgery after joint-replacement operation has come in the focus of research activity. Not all patients might be suitable for such a program. Retrospectively we looked up our database for criteria which might predict a discharge home or the need of rehabilitation after THA.

Methods: A total of 283 consecutive primary THA were operated via an anterior MIS approach from 3/09 until 12/10. Patients with femoral neck fracture, postoperative complications (infection, luxation, medical), simultaneous bilateral THA or bilateral THA within the same hospitalisation and all patients who lived preoperatively in retirement homes were excluded. 191 THA remained. Demographical, medical and functional factors were analysed. 60 consecutive patients were selected for a questionnaire based analysis of 30 social parameters.

Results: Patients with discharge home did not differ in the preoperative evaluation, radiographs and sonography of both hips. Blood plasma levels of cobalt and chrome were measured at the last-follow-up. Harris Hip Score and pain score are available preoperatively and at follow-up.

Conclusion: Patients with a low preoperative HHS, higher age, a history of backpain and have to climb stairs at home seemed to be predictors for the need of rehabilitation after THA.

Predictors for the need of a rehabilitation after primary hip replacement
Dr. med. Anne Mertens, Silke Pannhorst, Larissa Ichmann, PD Dr. med. Dr. phil. Thomas Ichmann Kantonsspital Liestal

Introduction: In the last years the need of in-patient rehabilitation and fast-track surgery after joint-replacement operation has come in the focus of research activity. Not all patients might be suitable for such a program. Retrospectively we looked up our database for criteria which might predict a discharge home or the need of rehabilitation after THA.

Methods: A total of 283 consecutive primary THA were operated via an anterior MIS approach from 3/09 until 12/10. Patients with femoral neck fracture, postoperative complications (infection, luxation, medical), simultaneous bilateral THA or bilateral THA within the same hospitalisation and all patients who lived preoperatively in retirement homes were excluded. 191 THA remained. Demographical, medical and functional factors were analysed. 60 consecutive patients were selected for a questionnaire based analysis of 30 social parameters.

Results: Patients with discharge home did not differ in the preoperative evaluation, radiographs and sonography of both hips. Blood plasma levels of cobalt and chrome were measured at the last-follow-up. Harris Hip Score and pain score are available preoperatively and at follow-up.

Conclusion: Patients with a low preoperative HHS, higher age, a history of backpain and have to climb stairs at home seemed to be predictors for the need of rehabilitation after THA.
Methods: We conducted a prospective cohort study including all metal-on-metal (group I) and conventional polyethylene (PE)-ceramic (group II) THAs with an uncemented press-fit cup, 28 mm head. Only THAs for primary osteoarthritis were included. The following outcomes were compared between the two groups: (1) Complication rates (infection, dislocation and revision) for patients operated upon between 1/1999 and 12/2008; (2) Radiographic outcomes (femoral osteolysis, loosening), and (3) Clinical outcomes (Harris Hip score, SF-12, activity, satisfaction) for patients operated between 1/1999 and 12/2004. Evaluation was performed five years postoperatively by an independent assessor. Cox regression analysis was used to compare incidence rates while adjusting for baseline differences.

Results: 1988 THAs were included, 544 with metal-on-metal and 1444 with PE-ceramic bearing. The two groups differed significantly with respect to sex distribution (men 55% vs. 41%, respectively), mean age (66 vs. 74 years), co-morbidities and type of stem (uncemented 16% vs. 2%). Crude incidence rates for complications were: 0.19 vs. 0.10 cases /100 person-years for infection; 0.35 vs. 0.38 cases /100 person-years for dislocation; and 0.31 vs. 0.14 cases /100 person-years for all-cause revision. Adjustment for baseline differences attenuated the higher rates for infection and revision in group I. Osteolytic lesions were found in 3.5% vs. 3.8%. After adjustment for age, sex and activity the OR was 0.4 (95% CI 0.1:1.5). Five years postoperative, 181 THAs of group 1 and 697 THAs of group 2 were seen at follow-up. Clinical outcomes were similar with a mean Harris Hip score increase of 48.1 points and 47.7 points in patients in group 1 and 2, respectively. Both columns were highly satisfied (9.3 vs. 8.9 points) and reported higher activity levels (UCLA 6.5 vs. 5.3).

Conclusion: Mid-term results were similar among patients with metal-on-metal and PE-ceramic THAs for dislocation and clinical outcome. There was more infection in the metal-on-metal group, but there were higher satisfaction and activity levels and a slightly lower risk of femoral osteolysis. A larger study is necessary to precisely determine infection, revision and osteolysis occurrence.

Radiological comparative analysis of osseointegration in MIS-THR and postoperative full weight loading based on the comparison of 200 THA-coated and uncoated SL-PLUS-MIA-stems after one year

Prof. Dr. Gerald Pflüger, Dr. Sabine Junk-Jantsch, Dr. Johannes Bonomo
Evangelisches Krankenhaus Wien, Orthopädische Abteilung

Introduction: MIS-THR combined with immediate postoperative full weight mobilization has been shown to reduce complications and hospitalization. To get to the operating room on the same day of admission, the technique has to be modified. The well established Zweymüller SL-PLUS stem exclusively in the lateral proximal part to spare bone loss and to reduce soft tissue trauma. In certain cases we observed the appearance of Rll’s in the proximal part of the stem, possibly due to share forces at the implant-bone-interface before completion of osseointegration. Thus we up-graded the stem with a bioactive HA-coating the proximal part. Aim of our study was how far the TiHA-coating influenced the occurrence of Rll’s despite postoperatively full weight bearing.

Methods: From December 2005 to October 2008 we implanted the uncoated SL-PLUS-MIA stem in more than 1,000 cases. Since then the TiHA coated SL-PLUS-MIA stem was used in our department. Each operating surgeon was very familiar to all the tricks and tips of the intramedullary technique in terms of locking success rate.

Results: The radiological results after one year show in both groups a good osseous integration. The uncoated SL-PLUS-MIA-stem shows in 24% radiolucent lines in the proximal part versus 15% in the coated SL-PLUS-MIA-stem group. Regarding HHS and radiological follow-ups were performed after 6 weeks, 3, 6 and 12 months. Main focus of the radiological evaluation were Rll’s in the proximal Gruen zones and stem migration. The radiological evaluation was performed by digital image analysis.

Conclusion: To allow postoperative full mobilization not only a soft tissue-sparing technique, but also an adapted implant for MIS-technique are demanded. Our results show that Osseointegration improved significantly in the coated group. This is probably due to the osteoconductive effect of the TiHA coating. As a consequence only coated stems should be used in MIS-THR combined with post-operative full weight mobilization, as uncoated stems reach their limit concerning osseointegration.

Primary hemiarthroplasty for unstable intertrochanteric fractures in the elderly: A retrospective series of 101 cases

Dr. Daniel Petek, Prof Dominique Saragaglia, Prof Pierre Hoffmeyer
Hôpitaux Universitaires de Genève; CHU – Grenoble

Introduction: The objective of this retrospective case series study was to evaluate, short-term results of 101 unstable intertrochanteric fractures in the elderly treated by primary hemiarthroplasty. We focused on morbidity, mortality and postoperative autonomy.

Materials and methods: The series consists of 101 patients, 87 women and 14 men, mean age 85.6 ± 72 years (68–102), operated between January 2003 and December 2008. According to AO/OTA classification we operated 86 fractures type 31A2.2, 6 fractures type 31A3.2 and 1 31A3.3 fracture. We used in 95% of cases a cemented reconstruction stem (TSF®, SERF, Décines) and in 93% of cases a bipolar head, all by a posterior approach. The greater trochanter was fixed if necessary by metallic wires. The average delay between the accident and surgery was 2 ± 1.65 days (0–9). The preoperative Parker score averaged 7 ± 2 (1–9). All patients were allowed full weight bearing immediately after surgery.
Factors associated with rifampin resistance in staphylococcal periprosthetic joint infections (PJI): a matched case-control study

Dr. med Martin Clausi1, Dr. med Yvonne Achermann2, Prof. Dr. Markus Vogt3, Prof. Dr. med Werner Zimmern4, PD Dr. Andrej Trampuz5
1Kantonsspital Liestal; 2University Hospital Zurich, Zurich; 3Basel University Medical Clinic, Liestal; 4University and University Hospital Lausanne, Lausanne

Biofilms of rifampin-resistant staphylococci are considered difficult to treat and eradicate. Causing periprosthetic joint infections (PJI), rifampin-resistant staphylococci, controls as those caused by rifampin-susceptible staphylococci. We matched at least one case with at least one control for each of the following groups: (i) infecting agent (Staphylococcus aureus or coagulase-negative staphylococci) and (ii) location of PJI (hip, knee, elbow, ankle, shoulder). Conditional logistic regression analyses were performed to estimate odds ratios (OR) with 95% confidence intervals (95%-CI). We included 48 cases and 48 controls (median age 67 y; range 64–73 y) with hip (n = 58), knee (n = 26), elbow (n = 8), shoulder (n = 2) or ankle (n = 2). P. aureus was isolated in 20, coagulase-negative staphylococci in 76 patients. Rifampin resistance was associated with male sex (OR 3.4, 95%-CI 1.5–8.1, p = 0.005), repeated (>3) surgical revisions (OR 5.0, 95%-CI 2.1–11.8, p < 0.001), no surgical debridement and/or inadequate intravenous treatment (OR 5.5, 95%-CI 2.4–13.0, p < 0.001). Subgroup analysis of 56 patients treated with rifampin before emergence rifampin resistance identified no surgical debridement and/or inadequate intravenous treatment (OR 6.4, 95%-CI 1.9–21.5, p = 0.003) as an independent risk factor and a trend for the use of a cement spacer (OR, 7.9, 95%-CI 0.9–68.0, p = 0.057) in the prosthesis free interval and the administration of rifampin in presence of a sinus tract/fistula (OR 7.5, 95%-CI 0.9–62.3, p = 0.062). To prevent emergence of rifampin-resistance in staphylococcal PJI, bacterial density should be reduced by extensive surgical debridement and intravenous antibiotic treatment, before switch to oral therapy. The success of rifampin treatment should be carefully evaluated since previous rifampin exposure predispose for occurrence of rifampin resistance, especially when given incorrectly.
Methods: Case-control study comparing outcomes of osteo-articular infections due *P. aeruginosa* vs. due to MRSA at Geneva University Hospitals.

Results: A total of 37 osteo-articular MRSA infections and 20 *P. aeruginosa* infections were retrieved in 57 patients (median age: 71 y); arthroplasties (n = 17), other implant materials (28), native joint groups underwent a median number of 2 surgical interventions (p = 0.51), while the median duration of concomitant antibiotic treatment was 87 days for *Pseudomonas* and 58 days for MRSA infections (p = 0.36). Overall, *Pseudomonas* patients showed a tendency for more treatment failures than patients infected with MRSA (8/20, 40% vs. 7/30; 19%; p = 0.09). In multivariate logistic regression analysis adjusting for case mix, odds ratios with corresponding 95%CI regarding outcome cure were as follows: *Pseudomonas* vs. MRSA infection (OR 0.4, 0.1–1.6), number of surgical interventions (0.7, 0.5–1.1), duration of antibiotic treatment (1.0, 0.8–1.1), and age (1.0, 0.9–1.1).

Conclusions: Despite a similar number of surgical interventions and longer antibiotic treatment, osteo-articular infections due to *Pseudomonas* tend to more treatment failures than infections due to MRSA. Our underpowered study warrants confirmation in larger prospective trials.

Duration of post-surgical antibiotic therapy for adult chronic osteomyelitis: a single-centre experience

Methods: Retrospective single-center study at Geneva University Hospitals with a minimal follow-up of two years after treatment. Multivariate logistic regression analysis with exclusion of pediatric cases and of implant-related chronic osteomyelitis.

Results: A total of 49 episodes of implant-free chronic osteomyelitis in 49 adult patients were studied. The median number of surgical interventions was 2 (range, 1–10). The median duration of post-debridement antibiotic treatment related to remission of chronic osteomyelitis was 8 weeks (range, 1–4 weeks). Thirty-nine patients (80%) were in remission after a minimal follow-up of 2 years. In multivariate logistic regression analysis, one week of intravenous therapy had the same remission as 2–3 weeks (0.2, 0.1–1.9) or ≥3 weeks (0.8, 0.1–2.4). More than 6 weeks of total antibiotic treatment equaled ≤6 weeks (0.8, 0.1–5.2).

Conclusions: In chronic osteomyelitis in adults, a post-debridement antibiotic therapy beyond six weeks, or an IV treatment longer than one week, did not show enhanced remission incidences. Prospective randomized trials are required to confirm this observation.

Activity of polymethylmethacrylate (PMMA) bone cement loaded with daptomycin, vancomycin and gentamicin against Staphylococcus epidermidis biofilms

Methods: Staphylococcus epidermidis (strain RP62A, susceptible to daptomycin, vancomycin and gentamicin) at concentration 10^6 bacteria/ml was incubated with 2 g-PMMA block (Palacos, Heraeus Medical, Hanau, Germany) in 25 ml tryptic soy broth (TSB) supplemented with calcium. PMMA blocks were preloaded with daptomycin, vancomycin and gentamicin each at 2 μg/40 mg (= 100 mg/6 g) PMMA. After 72 h-incubation at 35 °C under static conditions, PMMA blocks were rinsed in phosphate-buffered solution (PBS) 5 times and transferred in 4 ml-microcalorimetry ampoule filled with 1 ml

tracr or acute inflammation on tissue histopathology. Outcome analysis was performed at outpatient visits, followed by contacting patients, their relatives and/or treating physicians afterwards.

Results: During the study period, 117 patients with THA were identified. We exclude 2 patients due to missing data. The median age was 69 years (range, 33–102 years); 42% were women. THA was mainly performed for osteoarthritis (n = 84), followed by trauma (n = 22), necrosis (n = 4), dysplasia (n = 2), rheumatoid arthritis (n = 1), osteosarcoma (n = 1) and tuberculosis (n = 2). Three patients died early (≥3 months), 25 delayed (3–24 months) and 63 late (≥24 months after surgery). Infected THA were treated with (i) two-stage exchange in 59 patients (51%, cure rate: 93%), (ii) one-stage exchange in 5 (4.3%, cure rate: 100%), (iii) debridement without change of mobile parts in 18 (17%, cure rate: 83%), (iv) debridement without change of mobile parts in 17 (14%, cure rate: 53%), (v) Girdlestone in 13 (11%, cure rate: 100%), and (vi) two-stage exchange followed by removal in 3 (2.6%). Patients were followed for a mean of 2.3 years (range, 0.1 to 9 years), 7 patients died unrelated to the infected THA, 15 patients (13%) needed additional operations, 1 for mechanical reasons (dislocation of spacer) and 14 for persistent infection; 11 treated with debridement and retention (8 without change and 3 with change of mobile parts) and 3 with two-stage exchange. The mean number of surgery was 2.2 (range, 1 to 5). The infection was finally eradicated in all patients, but the functional outcome remained unsatisfactory in 20% (persistent pain or impaired mobility due to spacer or Girdlestone situation).

Conclusions: Non-responder current treatment concept leads to treatment failure with subsequent operations. Precise analysis of each treatment failures can be used for improving the treatment algorithm leading to better results.

In chronic osteomyelitis in adults, a post-debridement antibiotic therapy beyond six weeks, or an IV treatment longer than one week, did not show enhanced remission incidences. Prospective randomized trials are required to confirm this observation.

Activity of polymethylmethacrylate (PMMA) bone cement loaded with daptomycin, vancomycin and gentamicin against Staphylococcus epidermidis biofilms

Methods: Staphylococcus epidermidis (strain RP62A, susceptible to daptomycin, vancomycin and gentamicin) at concentration 10^6 bacteria/ml was incubated with 2 g-PMMA block (Palacos, Heraeus Medical, Hanau, Germany) in 25 ml tryptic soy broth (TSB) supplemented with calcium. PMMA blocks were preloaded with daptomycin, vancomycin and gentamicin each at 2 μg/40 mg (= 100 mg/6 g) PMMA. After 72 h-incubation at 35 °C under static conditions, PMMA blocks were rinsed in phosphate-buffered solution (PBS) 5 times and transferred in 4 ml-microcalorimetry ampoule filled with 1 ml
Results: Bacterial properties did not differ between antibiotic-loaded and non-loaded PMMA blocks. The mean detection time (± standard deviation) of bacterial heat was 6.5 ± 0.4 h for PMMA without antibiotics (negative control), 13.5 ± 4.6 h for PMMA with daptomycin, 14.0 ± 4.1 h for PMMA with vancomycin and 5.0 ± 0.4 h for PMMA with gentamicin.

Conclusion: Our data indicates that antibiotics at 2 g/40 mg PMMA did not change the biomechanical properties of bone cement. Daptomycin and vancomycin showed more activity than S. epidermidis biofilms when all tested at 2 g/40 mg PMMA. In the next step, higher concentrations of daptomycin and their elution kinetic needs to be determined to optimize its antibiotic activity before using in clinical practice.

Preoperative radiotherapy for the treatment of soft tissue sarcoma of the posterior thigh is associated with a low wound complication

Dr. Matthias Erschbamer1, Franziska Seel1, PD Dr. Gabriela Studer1, Dr. med. Bruno Fuchs2
1 Uniklinik Balgrist, Zürich; 2Radio-Onkologie Universitätsspital Zürich

Introduction: Current standard treatment of soft tissue sarcoma of the extremities consists of surgery combined with radiotherapy. While it is generally accepted that radiotherapy helps preventing local recurrences, it is the topic of an on-going debate if weather radiotherapy should be used pre- or postoperatively. Recent studies imply advantages of preoperative radiotherapy attributed to smaller radiation dosage and volume, and therefore fewer side effects, including less tissue oedema, fibrosis and joint stiffness. On the other side several studies report on the histopathological and functional results. We hypothesize that the presented method is a valuable tool for planning of reconstructive surgery and implant design. We have shown that with a reasonable accuracy of the pelvis SSM in the literature.

Conclusion: Our goal was to analyse the consequences of a humeral head prosthesis with a wound complication rate of 8%, compared to the reported wound complication rates in the literature, which are significantly above 20%.

Quill SRS – QuillTM Self-Retaining System – Description of orthopedic series – case report

Dr. Alexander Fischer
Orthopädische SRO La Chaux-de-Fonds

Background: The method of skin closure has become increasingly important in orthopedic surgery. Wound complications are one of the major sources of morbidity after orthopedic procedures and can prolong the time of hospitalization. The conventional wound suture by the Donati mattress suture is known for good results. The disadvantages are the time consuming tying of the knots and the need for assistance. The objective of good wound closure is rapid skin healing and an acceptable cosmetic result while minimizing the risks of complications such as wound dehiscence or infection. These are reasons for increasing costs. Since December 2010 we used the Quill SRS (Angiotech Pharmaceuticals, Vancouver, British Columbia, Canada) for the continuous superficial dermis suture. It is a knotless, absorbable surgical wound closure system that has tiny barbed hooks on its surface. When the suture is advanced, the hooks penetrate into the surrounding tissue and lock the suture in place without a knot.

Conclusion: In our small case series we found comparable results to the Quill SRS in a series of 30 elective and trauma patients. We investigated the durance of secretion after closure, dehiscence, signs for infection and operating time. The follow up was 1–10 days during the hospitalization and after 6 weeks.

Results: The 30 patients stayed 2–10 days in the hospital. The wound closure with Quill was done in 10 trauma cases and 20 elective interventions. Three of them were hip prosthesis and 4 knee prosthesis. None of them showed wound dehiscence or infection. One wound presented a reactionary reaction of the suture material. The disadvantages are the time consuming tying of the knots and the need for assistance. The aim of this study was to evaluate the benefit of the Quill SRS.

Material and methods: The superficial wound closure was done with the Quill SRS. The operating time for superficial wound closure was shortened by about 30%.

Conclusion: In our small case series we found comparable results to the Donati mattress suture. The operating time for superficial wound closure was shorter. In our opinion the Quill SRS suture material is a valuable tool for orthopedic surgeons. The material has the capacity for saving more cost because it allows the closure of several tissue layers with a single suture. Further investigations should be done.

Anatomic total shoulder arthroplasty: consequences of humeral head malposition

Alain Farron, Silvio Ramondetti, Dominique Piioletto, Alexandre Terrier
Laboratory of biomechanical orthopaedics, EPFL, Lausanne

Introduction: Third generation anatomic total shoulder prostheses offer a wide range of adaptability (size, thickness, retroversion and offset of the humeral head, cervico-diaphyseal angle) in order to reproduce anatomy and biomechanics of the shoulder as normal as possible. The large variability of the implants may also induce malposition. Our goal was to analyse the consequences of a humeral head malposition, which is one of the most frequent placement errors.

Methods: A 3D finite element model of the glenohumeral joint, including the rotator cuff muscles and the deltoid, was used with the Aequallis anatomic prosthesis. Active abduction was simulated. Three humeral head placements were compared: anatomic positioning (A), 5 mm inferior positioning (B), 5 mm superior positioning (C). The effect of humeral head malposition was evaluated through the following quantities: the range of motion free of impingements, the glenohumeral
contact pattern, and the stress within the polyethylene and the cement. **Results:** Inferior positioning (B) of the humeral head produced a superior impingement before 90° of abduction, an inferior eccentric contact point on the glenoid, and 165% increase of cement stress. Superior positioning (C) of the humeral head produced a postero-superior eccentric contact point on the glenoid, 300% increase of glenohumeral contact pressure, 450% increase of polyethylene stress, and 207% increase of cement stress. **Conclusion:** Malposition of the humeral head of anatomic prostheses induces biomechanical consequences that may preclude the glenoid survival. Particular attention must be paid to reproduce the humeral anatomy as normal as possible.

**EMG activity of the supraspinatus muscle during rehabilitation using a new dynamic abduction brace for the shoulder (DABS)**

*Dr. Richard Nyffeler*, *Shahab Sanavi*, *Gere Luther*  
*Orthopädische Klinik, Inselspital Bern; *Institut für Physiotherapie, Inselspital Bern*

**Introduction:** Many shoulder surgeons prescribe an abduction brace or a pillow for the postoperative immobilisation after rotator cuff surgery. The aim of such a device is to decrease the tension in the musculotendinous unit and to protect the tendon repair during the initial phase of healing. The disadvantage is that additional tendons and muscles, which must not be protected, are immobilized too. We therefore designed a dynamic abduction brace for the shoulder (DABS), which allows to place the arm in 40 to 70 degrees of abduction and to perform active and passive movements in the shoulder and the elbow joint. A spring mechanism was used for passive abduction against gravity.

**Methods:**  
Fine wire EMG of the supraspinatus and infraspinatus muscles was performed in 12 volunteers. The EMG data were synchronized with an electronic goniometer. Measurements were made during active ADuction and passive ABduction of the arm in the scapular plane and in the sagittal plane, with use of the dynamic abduction brace. EMG activity was also recorded during maximum isometric contraction of the respective muscles.  

**Results:** The supraspinatus muscle showed almost no activity during active ADduction and passive ABduction of the shoulder.  

**Conclusions:** The dynamic abduction brace may be a useful tool for active rehabilitation after isolated supraspinatus tendon repairs.

**Retraction of the tendon stump and of the musculotendinous junction is the limiting factor when repairing long-standing rotator cuff tears:**

*Dr. Karl Wieser*, *Dr. Mazda Farshad*, *Dr. Nadja Amacker*, *PD. Dr. Dominik C. Meyer*  
*Uniklinik Balgrist*

Musculotendinous retraction is the limiting factor when repairing long-standing rotator cuff tears. To what extent muscle and tendon each contribute to this process is however unknown and of importance when deciding if and how to reconstruct. MRI of 130 shoulders with intact (n = 20) or completely torn supraspinatus tendons were analysed. The quality of the supraspinatus muscle was graded according to Goutallier (Grade 0–4: n = 15, 25, 24, 25, 15 patients respectively). Retraction of the tendon stump and of the musculotendinous junction was measured at the articulatio of the shoulder. Retraction of the tendon end was 3, 21, 26, 37 and 41 mm for the corresponding Goutallier stages 0 to 4 and the length of the tendon stump (distance tendon end to muscle) was 19, 13, 12, 11 and 8 mm in Goutallier stage 0 to 4 respectively. Permanent muscular retraction in chronic rotator cuff tears results from structural shortening of the muscle fibers and of the tendon tissue itself. The here presented data confirm, that the residual tendon stump in a tendon tear does not have the length of the original tendon, and further shortens over time. This may be due to active shortening and contraction of the tendon tissue or due to attrition. However, direct anatomic tendon reinserion will force the muscle to a greater length than what it would have been before the tear. This finding may help in understanding the difficulties when repairing long-standing tendon tears and to find strategies how to address them.

**A modified rabbit model for rotator cuff tendon tears:**

*Dr. med. Mazda Farshad*, *Dr. med. Dominik C. Meyer*, *Dr. vet. Katja MRF Nuss*, *Dr. med. Christian Gerber*  
*Universitätsklinik Balgrist; *Musculoskeletale Research Unit (MSRU)*, Vetsuisse Faculty, University of Zürich  

**Background:** Large animal models are often used to investigate rotator cuff pathology. With current, smaller animal models, quantitative information is often difficult to obtain. A well-defined, reproducible small animal model that allows quantitative assessment of musculotendinous changes would therefore be desirable.  

**Methods:** The supraspinatus tendon was released by osteotomy of the greater tuberosity in 7 New Zealand rabbits. The musculotendinous unit was then allowed to retract during 6 weeks. Measurements of retraction by computed tomography (CT) were validated with measure-
ment of total length of the unit at sacrifice and by correlation to functional and structural properties of the unit at tendon release and at sacrifice.

Results: Retraction of the musculotendinous unit was 1.8 ± 0.2 cm on CT, negatively correlated to the total length at sacrifice (r = –0.87, p = 0.011) but not correlated to CT measurements of atrophy (r = 0.20, p = 0.699) or fatty infiltration (r = 0.13, p = 0.78). Muscle work decreased from 1.6 ± 0.23 Nm to 1.2 ± 1 Nm (p = 0.056). Muscle fiber diameter decreased significantly and was correlated to the amount of fatty infiltration (r = 0.78, p = 0.003).

Conclusion: Tendon release using osteotomy of the greater tuberosity allows to precisely measure musculotendinous retraction and offers the possibility for functional muscular testing. Changes in the rabbit supraspinatus muscle caused by myotendinous retraction correspond to those in established sheep models.

Anabolic steroids prevent muscle damage caused by rotator cuff tendon tear – An experimental study in rabbits

Prof. Dr. med. Christian Gerber1, Dr. med. Dominik C. Meyer2, Dr. vet. Katja MR Nuss3, Dr. med. Mazda Farshad4

1Universitätsklinik Balgrist; 2Musculoskeletal Research Unit (MSRU), Vetsuisse Faculty, University of Zürich

Background: Following tear of their tendon, rotator cuff muscles undergo retraction, atrophy and fatty infiltration. These changes are inevitable, considered irreversible and limit the potential of successful repair of musculotendinous units. It was the purpose of this study to test the hypothesis that administration of anabolic steroids can prevent these muscular changes following experimental supraspinatus tendon release in the rabbit.

Methods: The supraspinatus tendon was released in 20 New Zealand rabbits. The seven animals in group I had no additional intervention, six animals in group II had local and seven animals in group III had systemic administration of nandrolone decanoate during six weeks of retraction. At the time of sacrifice, in-vivo muscle performance as well as radiologic and histologic muscle changes were investigated.

Results: Supraspinatus retraction was significantly higher in group I (1.8 ± 0.2 cm) than in group II (1.5 ± 0.3 cm, p = 0.044) or III (1.2 ± 0.3 cm, p = 0.001). Histologically, there was no fatty infiltration in the treated groups II (p = 1000) and III (p = 0.812), but in the untreated group I (p = 0.0312). The work of the respective muscle decreased markedly in groups I and II, and also but less so in group III.

Conclusion: Experimental, systemic administration of Nandrolone decanoate substantially prevents deterioration of muscle performance and structure after tendon release and muscle retraction.

Osteochondral glenoid allograft for biological resurfacing of the glenoid – biomechanical comparison of novel design concepts

Prof. Dr. med. Christian Gerber1, Prof. Dr. Jess G. Snedeker2, Alexandra S. Krause3, Andreas Appenzeller4, Dr. med. Mazda Farshad5

1Universitätsklinik Balgrist; 2Synthes GmbH, Solothurn, Switzerland

Introduction: Biological resurfacing of the glenoid has hitherto failed to adequately restore the geometry and biology of the glenoid. We present a new concept for a press-fit osteochondral allograft glenoid replacement intended to restore the anatomical geometry of the glenoid with primary stability guaranteed by the construct through press-fit fixation alone.

Material and Methods: Five sawbone models of human scapulae and five models using sheep scapulae were prepared for testing of three different interface designs (cross, rectangle and dovetail). Micromotion at the graft interface was assessed in response to 1000 cycles of 30N shear and 100N compressive load, and maximal cineradiographic force was determined under 500N compressive load.

Results: In sawbones, micromotion ranged from 38 µm (cross) to 208 µm (rectangle) and decreased to 29 µm (cross) to 104 µm (rectangle) after 1000 cycles of applied shear force. In sheep bone, the range of micromotion was significant (dovetail) to 51 µm (cross) and decreased to 15 µm (dovetail) to 44 µm (cross) after 1000 cycles; with the rectangle design, it decreased from 32 µm to 16 µm.

Conclusion: The concept of an osteochondral allograft for glenoid reconstruction is both technically feasible and demonstrates adequate primary stability in vitro. Micromotion decreases with exposure to repetitive shear forces, and this “graft seating” is a desirable effect.
The glenohumeral joint has the greatest range of motion of any joint in the human body and is prone to dislocation. To advance our understanding of this condition and other clinical problems of the shoulder, we have designed and implemented a highly accurate and precise system capable of differentiating motion trajectories of the entire shoulder girdle in an automated and repeatable fashion. To that end, the objective of this project is to validate the implementation of a system designed to study shoulder motions with high accuracy and precision. Using five high-speed, mechanically-driven, computer-programmable motion pattern is motion tracking cameras, data are collected in real-time while the testing system is superior to current methods, because it evaluates both the glenohumeral and scapulothoracic articulations. Additionally, this system allows for the analysis of basic and complex shoulder motions with high accuracy and precision. Using five high-speed, motion tracking cameras, data are collected in real-time while the mechanically-driven, computer-programmable motion pattern is repeated several times. Sequential repetitions (3 repetitions) and experimental conditions are readily compared and contrasted for kinematic deviations.

Prediction of Acute Cervical Myelopathy after a Minor Trauma to the Cervical Spine
Prof. Dr. med. Nikolaus Aebli, Dr. Jörg Krebs
Schweizer Paraplegiker Zentrum Nottwil

Introduction: Spinal canal stenosis has been identified as a risk factor for acute cervical myelopathy following a minor trauma (i.e. no fracture, no disc-ligamentous injury) to the cervical spine. The spinal-canal-to-vertebral-body ratio (Torg-Pavlov ratio) is often used to assess canal stenosis on conventional radiographs. However, the ratio does not appraise soft tissue stenosis and canal narrowing at the level of the intervertebral disc. We have therefore investigated the Torg-Pavlov ratio and the spinal canal diameter at the level of the intervertebral disc in patients suffering from acute cervical myelopathy after a minor trauma to the cervical spine. Secondly, the relevance of these parameters for predicting the risk of myelopathy and the severity and course of symptoms was investigated.

Methods: Conventional radiographs and T2-weighted MR images of the cervical spine (C3 to C7) were analyzed to determine the Torg-Pavlov ratio values and the spinal canal diameters at the level of the intervertebral disc in 52 patients with acute cervical myelopathy following a minor trauma (i.e. no fracture, no disc-ligamentous injury) to the cervical spine and in 131 control patients. Receiver operating curves were calculated for evaluating the classification accuracy of these parameters for predicting the risk of myelopathy and the severity and course of symptoms.

Results: The Torg-Pavlov ratio values and the disc-level spinal canal diameters in the myelopathy group were significantly (p<0.05) larger than in the control group. A cut-off value of 4.5 mm for the minimal sagittal disc-level canal diameter yielded the largest positive likelihood ratio for predicting myelopathy. Magnetic resonance imaging is recommended for assessing cervical spinal canal stenosis. Patients at risk of acute cervical myelopathy following a minor trauma to the cervical spine can be identified by applying a disc-level canal diameter cut-off value of 8 mm.

Influence of pedicle screw placement on the development of the immature vertebrae: a prospective study using an in vivo porcine model
Dr. Tamas Fekete1, Dr. Frank Kleinstück2, PD Dr. Anne Mannion1, Dr. Zsolt Kendik1, Dr. Dezso Jaszczyszki1
Schultess Klinik; 1Szent Istvan University, Faculty of Veterinary Science

Introduction: There is increasing awareness of the need for pedicle screw constructs in the treatment of spinal deformities in very young children. However, the long-term effects of pedicle screws on the immature spine are not well understood. We used a porcine model to analyze the morphological changes of the spinal canal and vertebral body in response to the placement of pedicle screws.

Methods: Thirteen newborn pigs were operated on. Each pig received a single pedicle screw at the L2 level. After a 10-fold increase in body weight (7 months later) the symmetry of the spinal canal and vertebral body was measured on CT scans of the investigated (L2) and control (L3) levels in terms of the angulation in the axial plane of the instrumented and non-instrumented halves of the vertebral body and spinal canal.

Results: After 7 months, the vertebral body (VBA) angle had reduced on the non-screw side and increased on the screw side, indicating asymmetry in vertebral body growth in the axial plane. The difference was significant (p = 0.009). However, there was no significant difference between the screw and non-screw sides for the spinal canal (SCa) angles at the L2 level at either the intraoperative or 7-month follow-up assessment (p > 0.05).

Discussion: Pedicle screws in the immature porcine spine have a significant effect on the development of the vertebral body. However, no corresponding alteration of the morphology of the spinal canal is observed. Our results may help to make decisions in favour of using pedicle screw instrumentation in very young children when considering the treatment options and weighing up the risks of surgery and observation.

Does lumbar facet joint effusion on MRI reflect instability in lumbar degenerative spondylolisthesis?
Dr. Friederike Lattig1, Prof. Dieter Grob1, Dr. Tamas Fekete2, Dr. Frank Kleinstück1, PD Dr. Anne F. Mannion1
RKU – Universitätss- und Rehabilitationskliniken Ulm;
1Schultess Klinik

Introduction: The term “segmental instability” of the lumbar spine is not clearly defined, even for lumbar degenerative spondylolisthesis (LDS). This makes it difficult to compare outcomes after different types of surgical treatment. Facet joint effusion observed on supine MRI and its relationship to the difference in slip between standing and supine postures was investigated as a possible sign of instability in LDS.

Patients and Methods: Patients that had undergone decompression only or decompression with instrumented fusion for LDS with different degrees of narrowing of the spinal canal, were identified retrospectively from our spine surgery database, part of the SSE Spine Targo Registry. All had preoperative upright x-rays in ap and lateral views as well as supine MRI. The imaging studies were assessed for the following parameters: percent slip, absolute value of...
facet joint effusion (separately on right and left sides), facet angles, degree of facet degeneration and spinal canal narrowing, disc height, and the presence of facet cysts.

**Results:** 160 patients fulfilled all admission criteria (119 female, 41 male; mean age 68.8 years, range 38.8 to 89.3 years). 40 patients showed no facet joint effusion, and in these the difference in the values for the percentage slip on upright x-ray and percentage slip on supine MRI was ≤3%. A further 12 patients also showed a difference ≤3%, but showed some fluid in the joints (0.44 ± 0.38 mm). In 108 patients, the extent of effusion showed a high, significant correlation with the relative slip difference between x-ray and MRI (r = 0.82, p = 0.0001).

**Conclusion:** Facet joint effusion is clearly correlated with spontaneous reduction of the extent of slippage in the supine position compared to the upright position. Where either of these signs might serve as an indication for fusion in LDS will be investigated in a subsequent clinical study.

---

**Type II Odontoid Fractures in the Elderly Patient:**

Dr. Oliver Fiebig, Dr. Gregory Jost, PD Dr. Stefan Schären, Prof. Dr. Bernard Jeanneret

**Universitysspital Basel**

**Introduction:** Type II odontoid fractures have the tendency nearly always to develop a pseudarthrosis. Consecutive chronic mobility can lead to cervical myelopathy. Therefore this type of lesion is usually stabilized operatively by anterior screw fixation or atlantoaxial fusion. The risks of such procedures in the elderly are high, with a mortality rate of up to 10%. We therefore raise the question if a type II odontoid fracture in the elderly, particularly in inactive patients with several comorbidities, may as well be treated conservatively considering the fact, that a cervical myelopathy due to a dens pseudarthrosis evolves if at all with a latency of 10 or more years.

**Material/Methods:** In this retrospective cohort study, we followed up all patients with a type II odontoid fracture treated conservatively in our hospital from 2000 to 2009. All patients were at the time of the fracture (mostly falls) 70 years of age or older (70–93 years; average 84.5). The reasons for a conservative treatment at the time were inactive patients with comorbidities causing a high perioperative risk or a refusal of the suggested surgery. Treatment was with a SOMI-Brace, a Philadelphia collar or a soft collar for 8–12 weeks. For the radiologic evaluation, ap, lateral and open mouth as well as lateral radiographs in extension and flexion were done. The clinical assessment consisted of a clinical exam, the European Myelopathy Score, the Neck Disability Index.

**Results:** At the time of follow up in 2010, 19 of 32 patients had died of non fracture-related causes (i.e. cardiac, pneumonia, tumors, etc.). The mean survival time was 13.5 months (2 to 37 months). The mean follow up of the 13 patients who survived was 54 month (17–109 months). Only 3 patients reported some mild neck pain with no regular use of analgetics. All fractures developed a pseudarthrosis with a maximal translation of 6 mm. In none of the patients there was clinical evidence of a cervical myelopathy.

**Conclusion:** The conservative treatment of type II odontoid fractures in elderly, low demand patients especially with comorbidities and a high risk of perioperative complications is acceptable even considering the fact that a more or less mobile pseudarthrosis will almost certainly develop. In all other patients an operative stabilisation should be the treatment of choice.

---

**Influence of the morphology of the dural sac on surgical decision making in lumbar spinal stenosis**

Constantin Schizas, Nikolaos Tzinieris, Gerit Kulik

CHUV, Lausanne

**Introduction:** Surgical decision making in lumbar spinal stenosis (LSS) takes into account primarily clinical symptoms as well as concordant radiological findings. We hypothesized that a wide variation of operative threshold would be found in particular as far as judgment of severity of radiological stenosis is concerned.

**Patients and methods:** The number of surgeons who would proceed to decompression was studied relative to the perceived severity of radiological stenosis based either on measurements of dural sac cross sectional area (DSCA) or on the recently described morphological grades as seen on T2 MRI imaging. A link to an electronic survey page with a set of ten axial T2 MRI images taken from ten patients with either low back pain or LSS were sent to members of three national or international spine societies. Those 10 images were randomly presented initially and re-shuffled on a second page including this time DSCA measurements in mm², ranging from 14 to 226 mm², giving a total of 20 images to appraise. Morphological grades were ranging from grade A to D. Surgeons were asked if they would consider decompression given the radiological appearance of stenosis and that symptoms of neurological claudication were severe in patients who were otherwise fit for surgery. Fisher’s exact test was performed following dichotomization of data when appropriate.

**Results:** A total of 142 spine surgeons (113 orthopedic spine surgeons, 29 neurosurgeons) responded from 25 countries. A substantial agreement was observed in operating patients with severe (grade C) or extreme (grade D) stenosis as defined by the morphological grade compared to lesser stenosis (A&B) grades (p<0.0001). Decision to operate was not dependent on number of years in practice, medical density in practicing country or specialty although more neurosurgeons would operate on grade C stenosis (p<0.005). Disclosing the DSCA measurement did not alter the decision to operate. Although 20 surgeons only had prior knowledge of the description of the morphological grading, their responses showed no statistically significant difference with those of the remaining 122 physicians.

**Conclusions:** This study showed that surgeons across borders are less influenced by DSCA in their decision making than by the morphological appearance of the disc. Classifying LSS according to morphology rather than surface measurements appears to be consistent with current clinical practice.

---

**A high pelvic incidence and low lumbar lordosis predispose to adjacent segment degeneration after lumbar spinal fusion**

Dr. med. Daniel A. Müller, PD Dr. med. Kan Min, Dr. med. et Dr. sc. nat. Dominique A. Rothenfluh

Uniklinik Balgrish

**Introduction:** Adjacent segment degeneration (ASD) is a commonly observed long-term consequence after spinal fusion. The significance of the spinal sagittal profile has been suggested before, but no correlation of spino-pelvic parameters such as pelvic incidence with ASD has been established so far. Here, we report on a pelvic incidence-lordosis imbalance in patients that developed ASD vs. patients without ASD over a 10 year follow-up period.

**Methods:** 140 patients were identified with a 10 year follow-up after lumbar spinal fusion. Out of the 140, 21 patients (15%) had revision surgery due to ASD. Of 13 patients with one or two-segment fusions radiographs could still be retrieved after 10 years and were therefore included in the study (ASD; n = 13). An age- and gender-matched control group was selected (CTRL; n = 13). In 5 patients the patients who did not have lumbar revision surgery in the follow-up period, which was also matched according to preop MRI. The average age in both groups is 61 years and 9 patients are female in each group. Several radiographic parameters were measured on pre- and postoperative radiographs including lumbar lordosis (LL), pelvic incidence (PI) and tilt (PT) and lumbar sagittal balance. Statistical analysis was carried out using SPS 18 for Mac.

**Results:** The patients in the ASD group underwent revision on average after 58 months (20-125). PI, LL and lumbar sagittal balance did not change from preop to postop in both groups. Significant differences between the groups were seen for PI (63.8° ± 6.3, CTRL 49.9° ± 13.0; p = 0.004) and sagittal lumbar balance (ASD 9.35 mm ± 10.2; CTRL 0.4 mm ± 11.6; p = 0.02). In the CTRL group, lumbar lordosis corresponded to pelvic incidence (r = 0.56; p = 0.04), which was not the case for the ASD group (r = 0.07; p = 0.81). The difference of PI and LL was significant between the two groups (ASD 20° ± 11.2, CTRL 4.75° ± 12.1; p = 0.04). If a difference of >=20° is chosen as a predisposing factor, 7 patients are identified in the ASD as opposed to 1 patient in the CTRL group (specificity 92%, sensitivity 54%, positive predictive value 88%, relative risk 14).

**Conclusion:** In degenerative disease of the lumbar spine a high pelvic incidence with low lumbar lordosis and positive lumbar sagittal imbalance seems to predispose to adjacent segment degeneration after spinal fusion. A pre-operative difference between pelvic incidence and lumbar lordosis >=20° is associated with a higher risk of adjacent segment degeneration.

---

**Direct Comparison of Two Biomechanically Different Total Disc Replacement Devices: 5- to 7 Year Followup Comparing ProDisc versus Charité**

Dr. Christian Etter¹, Dr. Emin Aghayev²

Hirslanden Klinik Aarau; ¹Institut für Evaluative Forschung in der Medizin

Randomized trials have reported total disc replacement (TDR) to produce results similar or superior to lumbar fusion. Reported results for various TDRs appear to be similar, but differences in study designs and outcome measures make device comparisons difficult and inaccurate. The study was started in 2000 comparing the unconstrained Charité total disc with the semi-constrained ProDisc, and interrupted in
Changes in Health Related Quality of Life (HRQL) after Spinal Fusion and Scoliosis Correction in Patients with Cerebral Palsy

PD Dr. med. Kan Min1, Christina Bochtz2, Dr. med. Andreas Meyer-Heim2
1Klinik Balgrist, Zürich; 2Univ.-Kinderspitzenklinik Zürich

Background: Literature is scarce on the impact of spinal fusion for scoliosis in patients with cerebral palsy (CP) regarding the health related quality of life (HRQL). The purpose of this study was to evaluate the outcome of surgical scoliosis correction measured by the subjective change in the HRQL and the objective radiological changes. Factors that could influence the subjective outcome were examined to investigate their correlation to the results of HRQL.

Methods: A retrospective review of 50 consecutive patients with CP, who had spinal fusion for scoliosis with minimal 2 year follow-up. Radiographic data were obtained from preoperative, postoperative and last follow-up examinations. The assessment of the HRQL was done through a modified version of the Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD) questionnaire, assessed by the caregivers of the patients.

Results: There was a significant improvement (p = 0.001) of HRQL after the operation. The satisfaction rate of the patients with the outcome of the operation was 84.6%. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable. No significant difference for comparison of any of the outcome measures showed no significant differences, though the power of comparisons was low due to low patient numbers. The long-term investigation found the devices producing both excellent and stable clinical outcome. The reoperation rates at the index and adjacent levels were comparable.

Level of Evidence: Therapeutic-level IV, retrospective study.
The position and orientation of total knee components: a comparison of conventional radiographs, transverse 2D-CT slices and 3D-CT

Dr. med. Michael T. Hirschmann¹, MD Praveen Konala¹, MD Farhad Iranpour², Prof. Dr. Justin Cobb², Prof. Dr. med. Thomas F. Friedrich²
Kantonsspital Bruderholz; ¹Imperial College London, Musculoskeletal Surgery; ²Klinik für Orthopädische Chirurgie und Traumatologie des Bewegungsapparates, Kantonsspital Bruderholz

Routine assessment of component position after TKA is performed on radiographs or 2D-CT. The rotational alignment may be more accurately assessed on 3D-CT. The purpose of this study was to evaluate which method is best for determining in vivo rotational alignment of the femoral component.

Methods: A prospective study with 178 consecutive cases (160 patients) in 3 clinical centers in Europe and Australia was established. Surgical treatment was done between 11/2003 – 12/2005, the indications were primary gonarthrosis (89%), secondary gonarthrosis (5%) and M. Ablhüü (6%). Patients were treated with fixed (n = 54) or mobile (n = 124) bearing PE (balanSys® UNI, Mathys AG Bettlach). During implantation a calibrated ligament tensor was used, which allows osteotomy under defined tension force. To keep kinematic conditions during implantation the instrument takes over the extension gap into the flexion gap. Clinical and radiological results were reviewed 6 weeks, 3, 6, 12, 24 and 60 months postoperatively.

Results: Preoperative perfectly aligned knees were reviewed 5 years postoperatively. The mean passive flexion gap did not change from pre- to postoperative (124° and 125°, respectively). KSS improved from 121 points (42–108) preoperative to 186 points (125-200) postoperative. Complications occurred in 6 cases (12.5%) with the mobile bearing system, 6 prostheses had to be revised. No clinical difference was seen after 2 and 5 years between the mobile and fixed bearing inlay. After 5 years there was also no significant difference in KSS between the clinical centers.

Conclusion: The soft tissue balancing technique with the use of the ligament tensor achieves satisfying and reproducible clinical results. No difference was seen between fixed and mobile bearing PE inlay. Long term results are required to analyse PE wear rates and survivorship.

The impact of femoral component rotation on patellar tracking: Does internal rotation of the femoral component always lead to disturbed patellofemoral positioning?

A prospective analysis

MSc Dr. Anna Carolina Rienmüller, Dr. Thomas Guggi, Dr. Fabian von Knoch, Dr. Tomas Drobny, Dr. Stefan Preiss
Schulthess-Klinik Zürich

Introduction: Patellofemoral complications remain a very common post-operative problem in association with total knee arthroplasty (TKA). As malrotation of the femoral component is often considered crucial for the outcome, we analyzed absolute rotational femoral alignment in relation to patellar tracking pre- and postoperatively and matched the results with the two year functional outcome.

Methods: Femoral rotation and component rotation was assessed by axial radiography using condylar twist angle (CTA). The lateral patellar displacement, patellar tilt and Insall-Salvati index were measured on conventional radiographs. All assessments were done pre-operatively and 2 years postoperatively. A prospective study with 178 consecutive cases (178 patients, 27 women) performed at a single high-volume joint-replacement center in 2008. All operations were performed using a tibia first-first approach. Surgical treatment was done between 11/2003 – 12/2005, the indications were primary gonarthrosis (89%), secondary gonarthrosis (5%) and M. Ablhüü (6%). Patients were treated with fixed (n = 54) or mobile (n = 124) bearing PE (balanSys® UNI, Mathys AG Bettlach). During implantation a calibrated ligament tensor was used, which allows osteotomy under defined tension force. To keep kinematic conditions during implantation the instrument takes over the extension gap into the flexion gap. Clinical and radiological results were reviewed 6 weeks, 3, 6, 12, 24 and 60 months postoperatively.

Results: Preoperative CTA showed 6.4°±2.5° (X±SD) of internal femoral rotation (IR) (range, 1° of external rotation (ER) to 12° of IR) postoperatively compared to preoperative CTA of 3.9° ± 2.98° (X±SD) of IR (range, 9.5° IR to 3.8° ER) Preoperative patella lateral displacement showed a mean of 1.7 mm (–2 mm, 6 mm), compared to postoperative patella lateral displacement with a mean of 1.7 mm (–3 mm, 6 mm). Postoperative mean patella tilt was 6.65° (18°, 11.7°) postoperatively compared to 8.55° (4.3°, 11.5°) preoperatively. No correlation was found between CTA post surgery and patella positioning (r = 0.034, 95% CI). IR of the femoral component >3° did not show increased patella lateral displacement/tlt compared to 0° or ER. No correlation was found between the Kujala score and internal rotation of the component (r = 0.082, p = 0.05). At 2 year post OP KSS reached >185 of max. 200 points in over 82% of patients.

Conclusion: The influence of IR of the femoral component on patellofemoral kinematics remains controversial. As demonstrated, IR does not always lead to patella maltracking and/or patellofemoral complications. Functional outcome in this series shows that relative rotation of the femoral component in accordance with natural varia- tions as seen in the pre-operative assessment allows for good and excellent results.

Ligament balanced unicondylar knee prosthesis: first 5 year follow up results in a multicenter study of 178 cases

Dr. med. Andreas Schuster¹, Dr. med. David Campbell², Marlen Lüthi³, Dr. med. Frank Hoffmann³
¹Zieglerspital Bern Orthopädie; ²Wakefield Orthopaedic Clinic; ³Mathys AG, Bettlach; ⁴RoMed Klinikum Rosenheim

Introduction: Advantages of unicondylar knee replacement surgery are reduced bone resection and better postoperative rehabilitation seen in Knee Society Score (KSS). But surgical technique is demanding and revision surgery is often considered difficult even when surgery is a soft tissue balancing technique with use of a ligament tensor was estab- lished. Aim of this study was to prove if the intraoperative use of the tensor achieves constant and reproducible results in implanting unicondylar knee prosthesis.

Methods: A prospective study with 178 consecutive cases (160 patients) in 3 clinical centers in Europe and Australia was established. Surgical treatment was done between 11/2003 – 12/2005, the indications were primary gonarthrosis (89%), secondary gonarthrosis (5%) and M. Ablhüü (6%). Patients were treated with fixed (n = 54) or mobile (n = 124) bearing PE (balanSys® UNI, Mathys AG Bettlach). During implantation a calibrated ligament tensor was used, which allows osteotomy under defined tension force. To keep kinematic conditions during implantation the instrument takes over the extension gap into the flexion gap. Clinical and radiological results were reviewed 6 weeks, 3, 6, 12, 24 and 60 months postoperatively.

Results: Postoperatively perfectly aligned knees were reviewed 5 years postoperatively. The mean passive flexion gap did not change from pre- to postoperative (124° and 125°, respectively). KSS improved from 111 points (42–108) preoperative to 186 points (125-200) postoperative. Complications occurred in 6 cases (12.5%) with the mobile bearing system, 6 prostheses had to be revised. No clinical difference was seen after 2 and 5 years between the mobile and fixed bearing inlay. After 5 years there was also no significant difference in KSS between the clinical centers.

Conclusion: The soft tissue balancing technique with the use of the ligament tensor achieves satisfying and reproducible clinical results. No difference was seen between fixed and mobile bearing PE inlay. Long term results are required to analyse PE wear rates and survivorship.

Hot Patella And Secondary Patellar Resurfacing: Outcome, Risk Factors And Analysis Of Factors Predicting Outcome

Dr. Patrick Sussmann¹, Dr. Stephanie Noelle¹, Dr. Thomas Guggi¹, Dr. Gideon Heinert², Dr. Stefan Preiss²
¹Schulthess Klinik; ²Endoklinik

Abstract: The role of secondary patellar resurfacing in patients with persistent anterior knee pain following an unreversed total knee replacement (TKR) remains unclear. In an attempt to find factors predicting the outcome of secondary resurfacing we analysed 173 TKRs. Outcome, risk factors and demographic characteristics of 32 knees who had secondary resurfacing after an unreversed Inneox TKR. 27 knees had a preoperative bone scan showing a hot patella in 26 knees. The rate of secondary resurfacing was 10%. The knees were compared to a matched control group of the remaining non resurfaced TKRs (n = 3470) and primarily resurfaced TKRs (n = 105). The second- aryly resurfaced knees had hardly any benefit after the initial TKR (KSS pre TKR: 115 ± 27, post TKR: 125 ± 20), but had substantive improvement after secondary resurfacing (2ndyPR), achieving knee scores (173 ± 22) statistically not different to the remaining unreversed (180 ± 24) and primarily resurfaced TKRs (183 ± 22). Pain scores (1 to 5) on walking (post TKR: 4.1 ± 1.0, post 2ndyPR: 1.7 ± 0.9) and stair climbing (post TKR: 3.8 ± 0.9, post 2ndyPR: 1.7 ± 1.1) improved dramatically, but were slightly worse than the unreversed (post TKR Walking: 1.2 ± 0.5, Stairs: 1.3 ± 0.6) and primarily resurfaced knees (post TKR Walking: 1.2 ± 0.4, Stairs: 1.2 ± 0.4). 29 of 32 knees had an improvement in the KSS score of more than 20 points. The knees that benefitted from secondary resurfacing had a larger patellar tilt and overhang compared to a matched control group. No differences with respect to age, sex, BMI, valgus/varus alignment, height of joint line, patellar thickness and patellar height were found.
Early Results of 209 Consecutive Journey BCS® Knee Replacements

Dr. med., M.H.A. Bernhard Christen¹, Dr. med. Bertram Rieger², Frau Dr. med. Michal Sarah Neukamp³
¹Orthopädische Klinik Bern; ²Bruderholzhospital; ³Institute for Evaluate Research in Medicine

Introduction: New designs in total knee replacement are expected to lead to better function with more flexion due to better biomechanics. Whereas this is still not proven the question remains if more aggressive kinematics in TKR could lead to more complications and a steeper learning curve.

Methods: In 178 patients (118 female, 60 male) with a mean age of 67.8 years with gonarthrosis 209 Journey BCS® total knee arthroplasties were implanted (Smith & Nephew, Memphis, USA). All operations were performed by one single surgeon. The first 103 cases were operated with a conventional instrumentarium. The following 106 knees were operated with computer navigation (PI Galileo®, Smith&Nephew, Aarau, Switzerland).

Results: The mean flexion increased from in mean 111° to 126° and 130.3° 2, 4 and 12 months respectively. The mean KSS was 115.6 points preoperatively and 174 points after 1 year. Overall 17 complications had to be registered. These consisted in 5 friction of the iliotibial band and 4 soft tissue injuries. The excellent Journey BCS® knee kinematics seems to lead to a less forgiving system which leads to a steeper learning curve with an increased complication rate.

Radiological Evaluation of 194 Consecutive Journey BCS® Knee Replacements

Dr. med., M.H.A. Bernhard Christen¹, Dr. med. Bertram Rieger², Dr. med. Michal, Sarah Neukamp³
¹Orthopädische Klinik Bern; ²Bruderholzhospital; ³Institute for Evaluate Research in Medicine

Introduction: The value of computer navigation in total knee replacement is still under discussion concerning precision and clinical outcome. Major interest is focused on the restoration of axis and a correct tibial slope as the rotational alignment of the femoral component is still debated.

Methods: In 178 patients (118 female, 60 male) with a mean age of 67.8 years with gonarthrosis 209 Journey BCS® total knee replacements (TKR) were implanted (Smith & Nephew, Memphis, USA). All operations were performed by one single surgeon. The first 103 cases were operated with a conventional instrumentarium. The following 106 knees were operated with computer navigation (PI Galileo®, Smith&Nephew, Aarau, Switzerland).

Results: 194 TKR's could be included in this study. In the non-navigated group (99 TKR) the mean age was 68.8 years, in the navigated group (95 TKR) 65.6 years. The femoral component angle for varus/valgus and flexion/extension did not differ between the non-navigated and the navigated group. In 97% the medial femoral angle ranged between 95° and 100° and the flexion angle between 87° to 95°. The tibial components were placed with a medial angle from 89° to 91° in 82% of the cases in both groups. Even the tibial flexion angle did not differ significantly and ranged from 87° to 90° in 85% of the cases.

Conclusion: In 99 non-navigated and 95 navigated TKR the radiological results did not differ significantly for varus/valgus or flexion/extension alignment of the femoral and tibial components respectively. The conventional instrumentation with extramedullary alignment at the tibia and intramedullary at the femur seem to give consistently accurate results which could not be improved by the use of a time consuming CT-less navigation.

The Clinical Effect of Radiosynoviorthesis in Painful Total Knee Arthroplasty in mid term follow up

Dr. Sven Hoppe¹, Dr. med. Sandro Kohl², Dr. med. Bernd Klaeser³, Prof. Dr. med. Stefan Eggli⁴, Dr. med. Matthias Zumstein⁵
¹Inselspital Bern / Klinik für Orthopädische Chirurgie; ²Inselspital Bern / Klinik für Kniechirurgie; ³Klinik Sonnenhof Bern

Introduction: The painful total knee arthroplasty is a problem influenced by many factors. In the last years chronic synovialitis was addressed as one of the main factors causing persisting postoperative knee pain. The radiosynoviorthesis of inflammatory joints is one of the standard procedures in rheumatology. It was the aim of this retrospective study to analyze the clinical effect of intraarticular radiosynoviorthesis in the treatment of painful total knee arthropathies regarding to its postinterventional outcome.

Methods: At a mean follow-up interval of 3.6 years, we retrospectively analyzed 38 knees in 38 patients with painful total knee arthropathies treated with radiosynoviorthesis. In all cases the common reasons for persisting pain like infection, instability, malpositioning and subsequent mechanical problems (malrotation, component loosening) were excluded by clinical- and radiographical analyses (x rays and rotation CT) and puncture and joint of the history. The persisting pain in all cases was longer than 6 months. Prior to invention all patients got an full body 3-phase-scintigraphy to confirm the diagnosis of a synovitis. All patients underwent radiosynoviorthesis with a standard protocol with Yttrium-90. Postinterventional complications, number of re-interventions and clinical outcome were analyzed.

Results: No complications were registered in the postinterventional period. No full regression of pain could be achieved by radiosynoviorthesis. Patients were conducted for a triple injection therapy but they abandone in 32 of the cases. There was a mean of 1,7 injections per knee and patient(6 cases (16%), 5 cases (35%) 2 injections, and in 18 cases (47%) 1 injection). In 20/38 patients(53%), the knee was re-operated (18 x change of prosthesis, 2 x debridement) even if no mechanical problem was obvious. In 5/38 patients(13%) analyitics were extended, in 4/38 cases (11%) other reasons for persisting pain (1x patellar dislocation, 3x component loosening) were later found up to mid-term follow up. In 9/38 patients(24%) we couldn't find any reasons for persisting pain.

Conclusion: The painful total knee arthroplasty is a multifactorial problem which has to be achieved precisely. In these patients, radiosynoviorthesis has no complications and no or little clinical effect. The reasons for the unsatisfying results even with proven synovialitis remain unclear and have to be investigated in further studies.

Reinforcement of the Extensor Apparatus with a Polyester Ligament in Revision Knee Arthroplasty

Dr. med., M.H.A. Bernhard Christen¹, Dr. med. Bertram Rieger²
¹Orthopädische Klinik Bern; ²Bruderholzhospital

Introduction: The failure of the extensor apparatus (rupture of the patellar ligament and or the quadriceps tendon) is a serious complication after a primary or revision total knee arthroplasty.

Methods: We report about 4 cases out of 27 revision knee arthroplasties operated between September 2008 and December 2010 where the extensor apparatus was reinforced or reconstructed with a polyester ligament (LARS, Vertriebs GmbH, Vienna, Austria). The proximal fixation was performed with non-resorbable sutures to the muscle belly and tendon of the quadriceps including 2 transosseous non-resorbable sutures at the level of the patella and at the tibial tuberosity respectively.

Results: In all 4 cases the reconstruction led to an excellent function of the extensor apparatus. No rerupture of less than 10° and regaining the capacity to walk and mount stairs.

Conclusions: The incidence of extensor apparatus problems (rupture, insufficiency of patellar ligament and or quadriceps tendon) in our small collective of 27 revision knee replacements was 15%. The polyester ligament is an excellent option to reconstruct or reinforce the extensor apparatus at the knee level. A further augmentation with viable tissue is not necessary even when no other local structures are left. The ligament is a synthetic ligament (Arthrex) and patient(In 6 cases (16%) 3 injections, in 14 cases (37%) 2 injec-

Patellar tracking before and after a Patellofemoral joint replacement (Depuy Sigma) – a cadaveric study using computer navigation

Dr. Patrick Sussmann¹, Dr. Gideon Heinert², Dr. Klauswer Wolfgang³, Dr. Ulrich Frei⁴, Dr. Philipp Preis⁵
¹Schulthess Klinik; ²Endoklinik

Introduction: Patellofemoral replacements (PFR) have had a recent resurgance in the treatment of isolated patellar arthrosis. The patellar tracking in total knee replacements has been extensively studied, but little is known about the patellar tracking in isolated patellofemoral replacements. To our knowledge there is only one limited study which looked at the tracking of four different patellofemoral replacements in one cadaver each (n = 1) and has thus a limited value (Amis et al. 2005). We compared patellar tracking and the position of the patellar groove in the natural knee, followed by implantation of the femoral and patellar component of the PFR.
PFR (PFR-P) and in the same knee with the femoral and patellar component of the PFR (PFR+P; patella resurfaced) (Depuy Sigma PFR). The form and position of the trochlea in the natural knee and the patellar groove of the femoral component of the PFR was also analysed. Values are means ± SD, two tailed Student’s t-test for paired samples.

Results: With a PFR-P the patella had a slightly more lateral tilt than the natural knee (1.5 ± 0.9° to 2.8 ± 2.5° at 40–90° of flexion, pNo differences in patella rotation were seen between the three groups. In the PFR-P group the patella tracked a little more medially compared to the natural knee (1.1 ± 1.3 mm to 2.5 ± 2.6 mm, pWhen analysed relative to the patellar groove of the trochlea/femoral component the patella in the PFR-P group was 0.6 ± 1.7 mm to 2.8 ± 2.0 mm, pThe patella groove on the natural knee and the implanted femoral component of the implanted PFR had the same radius, inclination relative to the femoral mechanical axis, antero-posterior position and medio-lateral orientation.

Discussion: The patella groove on the femoral component of the PFR reproduces the natural trochlear anatomy well, Patella tracking in the PFR-P shows only minor differences compared to the natural knee. Resurfacing of the patella in the PFR+P group causes the patella to tilt a little more laterally and track a little more medially, but this allows the patella to follow the patellar groove on the femoral component better than in the natural knee.

Osteosynthesis of distal femoral fractures by locking compression plates
Dr. Matthieu Ehlinger, Philippe Adam, Lamine Abane, François Bonnomet, Yvan Arlettaz CHU Strasbourg, France

Introduction: Authors report a retrospective serie of distal femoral fractures. The goal is to present the short term results of locking compression plate treatment in these complex fractures.

Material and methods: From January 2005 to December 2008, 45 patients (27 females, 18 males), accounting for 47 fractures have been treated. Mean age of the cohort was 26.0 ± 17.1 years at 50–100 pThe patella groove on the natural knee and the implanted femoral component of the implanted PFR had the same radius, inclination relative to the femoral mechanical axis, antero-posterior position and medio-lateral orientation.

Discussion: The patella groove on the femoral component of the PFR reproduces the natural trochlear anatomy well, Patella tracking in the PFR-P shows only minor differences compared to the natural knee. Resurfacing of the patella in the PFR+P group causes the patella to tilt a little more laterally and track a little more medially, but this allows the patella to follow the patellar groove on the femoral component better than in the natural knee.

Results: On revision, we report 6 deceased patients and 10 lost of follow up for a total of 29 patients (30 fractures), with an average follow up of 35 months and a minimum of 3 months. Osteosynthesis was performed using anatomical 4.5 distal femur locking compression plates (Synthes).
Osteosynthesis by locking compression plate for periprosthetic fractures of the distal femur after knee arthroplasty

Dr. Matthieu Ehlinger1, Philippe Adam2, François Bonnomet3, Yvan Arletiez4
1 CHU Strasbourg, France; 2 Hôpital du Valais, CHVCs, Sion

Introduction: The authors present a continuous and retrospective series of femoral fractures after knee arthroplasty.

Material and methods: From June 2002 to December 2008, 16 patients were treated, accounting for 17 fractures (1 bilateral case). The study concerned 15 females and 1 male, occurring in 15 TKAs and 1 partially resurfaced knee. Mean age was 79.6 years old (58–89). According to the Sofcot classification, fractures were a B1 type 6 times and a C type 11 times. Osteosynthesis was performed using a locking compression distal femoral plate (Synthesa) overlapping the implant. Rehabilitation protocol consisted in immediate weight bearing, whenever possible.

Results: We report 1 deceased patient before the twelve months follow-up. The most widely used implant was a distal femoral plate each time. Our results are the following: surgery was performed 10 times on a standard table and 7 times on a traction table. Minimally invasive surgery was performed 12 times for 5 classic approaches (in 1 case for a cerclage fixation). Full weight bearing was authorized 11 times, partial weight bearing at 20 kg twice, and no weight bearing for a 6 week period in 4 cases. We report 1 case of pseudarthrosis. No general or infectious complications were reported. No malunion superior to 10° was observed. Knee implants were all stable on revision.

Discussion: The interest of this study resides in the use of locking compression plates through a minimally invasive approach, associated with a full weight bearing rehabilitation whenever possible. This technique combines closed reduction surgery with hematoma preservation and a stable osteosynthesis implant. Rehabilitation protocol was the result of a reflection concerning the nature of the plate. The locking compression plate is an internal fixation with increased stability. Osteosynthesis was considered stable enough for early weight bearing.

Conclusion: The use of locking compression plates in periprosthetic femoral fractures is efficient and allows early weight bearing with a stable result through time.

Osteosynthesis by locking compression plate for malunited talar neck fractures

Dr. med. Thomas Suter, MSc Lilianna Bolliger, Dr. med. Markus Knupp, Prof. Dr. med. Beat Hintermann
Orthopädische Klinik, Kantonsspital Liestal

Background: Malunited talar neck fractures can result in shortening of medial column, which, in turn, causes an adduction and supination position of forefoot. Clinically, patients complain typically painful overload of lateral foot and are significantly disabled in daily activities. Little is known about the feasibility and efficiency of talar neck osteotomy to address this deformity.

Questions/_goals: We hypothesize that the limited sinus tarsi approach allows for anatomic posterior facet reduction through indirect calcaneal osseous reposition using the effect of ligamentotaxis. The goal of this prospective study was to assess postoperative reduction quality and to determine secondary loss of reduction.

Material and Methods: From June 2002 to December 2008, 16 patients had prior surgical treatment of talar neck fracture. A dorsomedial approach was used to expose the talar neck. The osteotome was opened with a distractor mounted over two K-wires until the forefront got a normal position. An allograft (five patients) or autograft from iliac crest (two patients) was used for interposition. One or two fully threaded screws or a small plate was used for fixation. Patients were seen on a regular basis, with a mean follow-up of 2.7 (1–8) years.

Results: There were no perioperative complications. All but one talus healed within 2 to 3 months. The patient with non-union was successfully revised with a subtalar and talonavicular fusion. Radiographically, there was no evidence of avascular necrosis of talar head in no one case. All patients were satisfied with the result. The mean AOFAS Ankle Hindfoot Score was 80.9 (56–100) and for the subscale pain 31.4 (20–40). All patients yielded good or excellent functional results. Good or excellent results were obtained in all 7 patients indicating that reconstitutive osteotomy of talar neck was effective in all, and there was no evidence that beneficial effects reduced over time.

Conclusions: We recommend the use of locking compression plates after displaced calcaneal fractures through a limited sinus tarsi approach – a controlled, prospective CT based study

Discussion: The extended lateral approach is widely used for ORIF of displaced calcaneal fractures. Despite enforced fasciocutaneous flap retraction, subtalar joint visualization may be limited, impairing posterior facet reduction. Furthermore, subperiostal flap preparation separates the lateral wall. Soft tissue damages to the calcaneal vascularization and surrounding tissues may explain the frequently disappointing outcome after ORIF with regard to the obtained reduction. To minimize soft-tissue damage while optimizing reduction, we have routinely used a sinus tarsi approach for posterior facet fixation. We hypothesize that the limited sinus tarsi approach allows for anatomic posterior facet reduction through indirect calcaneal osseous reposition using the effect of ligamentotaxis. The goal of this prospective study was to assess postoperative reduction quality and to determine secondary loss of reduction.

Methods: 24 consecutive patients (21 male, 3 female, mean age 44 ± 16 years, range 16–74) with 25 calcaneal fractures underwent ORIF by using solely a limited sinus tarsi approach. This approach works with small lateral plate and percutaneous intramedullary screw fixation, followed by postoperative continuous passive motion in the subtalar joint. According to Sanders CT classification, there were 14 type III and 11 type II fractures. Postoperative and minimum one year follow-up CT imaging was obtained to assess quality and stability of reduction. Posterior facet reduction was graded excellent, good, fair or poor according to step, defect and angulation (Kurozumi 2003). Any negative change was considered secondary loss of reduction.

Results: Postoperative posterior facet reduction was good or excellent in 72%. At follow-up (mean 31±14 months, range 12–50), no secondary loss of reduction occurred. Moreover, evident posterior facet reduction improvement was observed, resulting in good or excellent reduction in 92%.

Discussion: The limited sinus tarsi approach provided sufficient view and control of anatomic posterior facet reduction, thereby restoring calcaneal geometry, while also providing enough secondary stability. Moreover, posterior facet fixation improved early progressive adaptation. Most patients yielded good or excellent functional results, which may be a proof of minimal soft tissue damaging. Based on these encouraging results, we will continue to use this minimal invasive technique in the operative treatment of calcaneal fractures.
Hindfoot Joint Pressure in acute and recurrent sprains

Dr. Fabian Krause1, Stefanie Blatter1, Dr. Dirk Wächter2, Markus Windolf1, PD Dr. Martin Weber2
1Klinik für Orthopädie Chirurgie, Inselspital Bern; 2AO Research Institute, Davos-Platz, Switzerland; 2Klinik für Orthopädie Chirurgie, Ziegenlispital Bern

Hindfoot instability following acute or recurrent hindfoot sprains may lead to devastating ankle and subtalar arthrosis.

Methods: An acute and recurrent hindfoot supination sprain with successive dissection of ATFL, CFL, LTCL were simulated in cadaver specimens. The center of force (COF) and tibiotalar and subtalar peak pressure at 700 N (acute) and 150 N (recurrent) were recorded using TekScan pressure sensors. At acute sprain peak pressure increased significantly in the ankle (p = 0.046), in the subtalar (medial facet) (p = 0.022, intact ligaments, p = 0.016 all ligaments cut). The ankle COF migrated significantly medially and posteriorly (6 and 13 mm in average). At recurrent sprain peak pressure increased significantly in the ankle (p = 0.036, ligaments intact, p = 0.006, all ligaments cut). Subtalar peak pressure (medial facet) was found significantly higher at sprain (p = 0.047 and p = 0.027). Conclusion: Axial force in acute and recurrent hindfoot supination sprains lead to increased ankle and subtalar (medial facet) joint pressure and posteroomedial migration of the ankle COF. They may account for medial ankle OCL and arthrosis and for posttraumatic subtalar stiffness in patients.

FM81

Outcome of a Modified Broström-Gould Procedure for Lateral Ankle Instability

Dr. Michaela Winkler1, M. Yannick Buerer2, Dr. Alexandre Burn3, Nicolas Vial1, PD Dr. Xavier Crevoisier1
1CHUV Lausanne; 2UNIL Lausanne

Introduction: Ankle sprains affect 200’000 persons/year in Switzerland. Most incidences are successfully treated by conservative means, but 20% require surgical reconstruction for symptomatic chronic lateral ankle instability. This study evaluates the functional outcomes after a modified Broström-Gould technique as measured by different clinical scores and compares the functional outcome of this technique with other surgical treatments of ankle instability.

Methods: This retrospective cohort study evaluates 47 patients who underwent a modified Broström-Gould procedure using suture anchors to refix the lateral ankle capsuloligamentary structures at our institution from 2005 to 2009 with a minimum follow-up of one year (13–72 Mo). All patients were operated on by one single surgeon and evaluated by an independent examiner. The function was assessed using 4 scores including the AOFAS (American Orthopaedic Foot and Ankle Society’s Score) hindfoot score, the FAAM (Foot and Ankle Ability Measure- ment); the CAIT (Cumberland Ankle Instability Tool); and the CAIS (Chronic Ankle Instability Scale).

Results: Six patients were excluded leaving 41 patients for examination. 34 patients (83%) thought that their ankle was more stable after the surgery. 7 (17%) did not feel any different. 27 patients were very satisfied, 11 satisfied and 3 not satisfied. Reasons for non satisfaction included persistent instability and pain. Ankle mobility returned to normal in 95% of patients. Five patients had transient hypoesthesia in the skin of the affected side after surgery. One patient suffered from a superficial infection treated successfully by local measures. 80% had the perception of a normal ankle, 20% thought to be below normal. At follow-up the AOFAS was 89/100 (37–100), the FAAM 85/100% (35–100%), the CAIT 20/30 (5–30), and the CAIS 74/100% (27–100%).

Conclusions: The modified Broström-Gould procedure, which belongs to the anatomic ankle stabilizations is relatively simple and offers good outcome that satisfied 93% of the patients in the present study. No active stabilization was needed anymore. Preservation of the ankle mobility is better and the complication rate is lower than after non-anatomical procedures described in the literature. The CAIT appeared as the most severe score compared to the other scales used in our study.

FM82

The radiological morphology of peritalar instability

Dr. Tomasz Nosewicz, Dr. Markus Knupp, M.Sc. Lillianna Bolliger, Prof. Dr. Beat Hintermann
Kantonsspital Liestal

Introduction: Talar position may be highly confined by the talocrural, subtalar and talonavicular (peritalar) joints. In vitro, the talocrural joint provides up to 100% talar frontal weightbearing stability, implying that ligament incompetence will not affect talar position. However, patients with destabilized ankle joints, e.g. after sprains or fractures, often present with frontal weightbearing misalignment. Obviously, other factors must contribute to talar stability. We hypothesize that loss of peritalar stability allows the talus to shift on the peritalar calcaneonavicular surfaces, thus undergoing a 3-dimensional positional change. To understand this talar dislocation pattern, we assessed weightbearing X-rays in varus or valgus ankle osteoarthritic ankles. The aim was to describe talar malpositioning patterns in all three planes.

Methods: After excluding patients with previous operative hindfoot procedures, 169 consecutive patients (111 male, 58 female, 64 ± 11 years) with 112 varus and 56 valgus osteoarthritic ankles were included. In 71%, a traumatic event (fracture or sprain) preceded. On weightbearing radiography, the amount of frontal misalignment was determined with the tibiotalar surface (TTS) angle. Lateral and horizontal talar position was determined with the lateral talocalcaneal inclination (TCI) angle and horizontal talometatarsal I (TMT I) angle, and compared to neutral ranges obtained in controls (mean ± 2 SD; TCI 22°–39°; TMT I 12°–19°). Talar malpositioning (plantar/ dorsiflexion, ex/endorotation) was defined when outside any range.

Results: Mean TTS in the varus and valgus group was 74 ± 8° (51–95) and 101 ± 7° (90–126). While the talus was solely in varus or valgus in 74 ankles (41%), it was malpositioned in one additional plane in 70 ankles (41%) and in both additional planes in 33 ankles (18%). Nine out of possible 18 malposition patterns were found. The five predominant talar malposition configurations included 78% of all cases (dorsalfixed varus; plantarf lexed valgus; endorotated varus).

Discussion: Although, in peritalar instability, the talus was found to move into various positions, there are five predominant malpositions. This may explain failures in obtaining correct talar position within the mortise after ligament reconstructions, re-aligning osteotomies and total ankle replacements as long as peritalar stability has not been addressed. Further studies are necessary to clarify the underlying pathophysiology.

FM83

Critical evaluation of outcome scales to assess outcome after lateral ankle ligament repair

Dr. Alexandre Burn1, M. Yannick Buerer2, Dr. Michaela Winkler1, Dr. Nicolas Vial1, PD Dr. Xavier Crevoisier1
1CHUV Lausanne; 2UNIL Lausanne

Introduction: Several scores are commonly used to evaluate patients’ postoperative satisfaction after lateral ankle ligament repair, including: AOFAS, FAAM, CAIT and CAIS. Comparing published studies in the literature is difficult, as the same patient can have markedly different results depending on which scoring system is used. The current study aims to address this gap in the literature by developing a system to compare these tests, to allow better analysis and comparison of published studies.

Patients and methods: This is a retrospective cohort study of 47 patients following lateral ankle ligament repair using a modified Broström-Gould technique. All patients were operated between 2005 and 2010 by a single surgeon and followed the same post operative rehabilitation protocol. Six patients were excluded from the study because of concomitant injuries. Patients were evaluated by an independent observer. We used the Pearson correlation coefficient to analyse the concordance of the scores, as well as scatter plots to assess the linear relationship between them.

Results: A linear distribution between the scores was found when the results were analysed using scatter plots. We were thus able to use the Pearson correlation coefficient to evaluate the relationship between each of the different postoperative scores. The correlation was found to be above 0.5 in all cases. Thus an outline of a system to compare these tests, to allow better analysis and comparison of published studies.

Conclusion: This study aims to address this gap in the literature by developing a system to compare different postoperative scores commonly used to evaluate outcome after ankle stabilization surgery. The impact of this study is that it makes comparison of published studies easier, even though they use a variety of different clinical scores, thus facilitating better outcome analysis of operative techniques.

FM84

Three- or six weeks of K-Wire Transfixation in lesser Toe Surgery?: A prospective and randomized Study

Dr. Georg Klammert1, Dr. Gregor Baumann2, Dr. Beat Moor3, Dr. Madsa Farshad4, Dr. Norman Espinosa5
1Orthopädische Uniklinik BG; 2Kantonsspital Baden; 3Kantonsspital Fribourg

Background: Prolonged percutaneous Kirschner wire (K-wire) transfixation after correction of lesser toe deformities has been associated with an increased rate of complications such as infection, wire
breakage or loss of correction. To date duration of wire transfixation is based mainly on expert opinion. We hypothesized that a transfixation time of three weeks when compared to six weeks would decrease complication rates without an increase in the rate of recurrent deformity.

Materials and Methods: A prospective and randomized study was performed. Fifty-two lesser toes were included into the study and operated on due to symptomatic hammertoe or clawtoe deformity by means of two-stage hallux rigidus surgery. The patients were divided into two groups: Group 1 comprised of 23 patients who had a three week K-wire transfixation and Group 2 comprised of 23 patients who had K-wire transfixation for six weeks. K-wire associated complications rates and the incidence of metatarsophalangeal joint patients were assessed after a short term follow up of three months. Forty-six toes, 23 for each group, were available for final follow up at 12 months.

Results: Pre- and postoperative AOFAS scores showed no statistically significant differences between the two groups. There were no complications found in either group. At three months a clinically more pronounced recurrence and loss of malalignment was seen in Group 1 (11/23 toes, 47.8%) when compared with those in Group 2 (2/23 toes, 8.7%). Interchangeable joint motion was significantly reduced with prolonged K-wire transfixation indicating more stable fibrous union (p = 0.038).

Conclusion: K-wire transfixation for a period of six weeks as opposed to three weeks shows a low recurrence rate of toe deformities and no complications.

---

Cavovarus foot realignment to treat anteromedial ankle arthrosis

Dr. Fabian Krause, Dr. Gilles Pfander, Julia Henning, PD Dr. Martin Weber
Klinik für Orthopädie Chirurgie, Inselspital Bern

Adult patients with cavovarus feet were seen with symptomatic anteromedial ankle arthrosis. Cavovarus foot realignment was performed in an attempt to redistribute joint contact pressures and thus to relieve patients’ symptoms.

Methods: Fourteen patients with cavovarus feet and anteromedial ankle arthrosis (7 neurogenic, 7 idiopathic) were treated by soft tissue procedures, osteotomies, and anteromedial cholecytectomy of the ankle. Results: Failure in two patients was most likely due to postoperative persistent ankle varus tilt. The AOFAS Ankle-Hindfoot Score of the remaining 12 patients improved from preoperative 71 (range 12 to 116) to postoperative 75 (follow-up 69 months), ankle dorsiflexion improved 8°. There was no progression of anteromedial ankle arthrosis at latest follow-up.

Conclusion: Cavovarus foot realignment reliably relieved patients’ symptoms and stabilized the extent of anteromedial ankle arthrosis when correct postoperative ankle alignment was achieved. Realignment and anteromedial cholecytectomy improved dorsiflexion and reduced anterior ankle impingement.
Dorsal 2.4 mm locking plate fixation of intra-articular fractures with articular impaction and dorsal displacement of the distal radius: a propos of 21 cases

Dr. Alexander De Smet, Dr. Stéphane Kämpfen, Dr. Jan Van Aaken, Dr. Jean-Yves Beaulieu
Hôpitaux Universitaires de Genève (HUG)

Introduction: Intra-articular fractures of the distal radius with articular impaction often result from high energy trauma, are difficult to treat and have an elevated risk of post-traumatic arthritis. Often the volar approach and fixation, usually associated with an arthroscopy, is described. The purposes of this retrospective study was to compare the outcome of intra-articular fractures with articular impaction and dorsal displacement with minimal volar metaphyseal injury operated by dorsal approach in 2008 and 2009.

Methods: Twenty-one patients with a mean age of 44 years were included. A single dorsal approach and a posterior interosseous nerve denervation were carried out in all cases. Sixteen required bone graft. Two low profile locking 2.4 mm plates were used. A first plate was placed between the 1st and 2nd compartments. Immobilization (antebrachial or brachial-antebrachial, depending on associated lesions) lasted 2–4 weeks and was followed by progressive mobilization.

Results: The minimum follow up was 12 months. In seven cases the plates were removed for dorsal pain or stiffness at a mean delay of 7.7 months. No tendon ruptures were observed. For subjective evaluation, the QuickDASH and PWRE scores were used. Objective evaluations included wrist range of motion, grip strength and preoperative and postoperative radiographs. There was no secondary displacement of the plates. Five patients developed a premature post-traumatic arthri,

Conclusion: This dorsal approach and stabilisation with locking plates plating is technique to consider for treatment of this type of intra-articular fracture. Direct visualization of the articular surface ensures anatomic reduction to prevent post-traumatic arthritis. Even-associated carpal lesions or dorsal extrinsic ligament lesions (not visible by arthroscopy) can be repaired. The use of locking plates allowed with the buttress effect of dorsal plating improves stability and permits early mobilization to help avoid stiffness. Our results are similar to those in the literature.

Can clinical examination cause a Stener lesion in patients with skier’s thumb?

Tom Adler1, Dr. Ingo Eisenbarth2, Dr. Michael Tobias Hirschmann1, Prof. Dr. Magdalena Müller-Gerbl1, Dr. Renato Fricker1
1Orthopädische Klinik Luzern AG; 2Kantonsspital Bruderholz/Handchirurgie; *Anatomisches Institut/Universität Basel

Background: Approximately one third of all injuries of the upper limb and 7% of all injuries in alpine and cross country skiing are injuries to the ulnar collateral ligament of the thumb. According to many authors it is also known as “skier’s thumb”. In some patients the collateral ligaments are displaced proximally over the adductor aponeurosis, resulting in the so-called Stener lesion and surgical treatment is indicated in these cases. We hypothesized that a Stener lesion could be provoked by clinical stability testing in patients with a skier’s thumb and wanted to investigate this in a cadaver study.

Methods: We performed an anatomical study on 10 Thiel fixed cadaver hands. Previous instability was ruled out by clinical testing on intact radial collateral and ulnar collateral ligaments before the testing was started. An adequate knowledge of the stabilizers of the DRUJ is essential in understanding treatment options.

Patients and Methods: In 2010 we treated 3 patients for chronic distal DRUJ instability following treatment of complex wrist injuries. All patients had an ulnar foveal detachment of the triangular fibrocartilage complex (TFCC) according to an injury pattern Palmer 1B which was evaluated in 2 cases by MRI and arthroscopy and by open surgery in 1 case. The first patient sustained a transstyloideal-transstyloidal carpal fracture dislocation which was anatomically reduced and fixed. One year later the DRUJ remained unstable with discomfort. The second patient was treated for a Galeazzi-type radial fracture with initial immobilization of the DRUJ. 5 months after the DRUJ remained unstable and troublesome. The third patient presented with a persisting instability DRUJ after corrective intraarticular osteotomy of an intraarticular malunion of the distal radius with displaced nonunion of the ulnar styloid. In each case the TFCC was accessed via a dorsal approach through the 5th extensor compartment and a bony refixation of the TFCC to the ulnar fovea was performed with an anchor with the wrist in neutral position. A radioulnar pin transfixation was carried out once. Pronosupination was prohibited for 6 weeks with an above elbow cast.

Results: Intraoperatively the DRUJ was clinically stable in all positions after refixation of the TFCC and remained stable after 3 months. Grip strength, pain relief and patients’ satisfaction improved in all patients. No further complications were noted.

Conclusion: In cases where injuries and instabilities to the DRUJ were not detected or initially could not be treated adequately due to the complexity of the wrist injury a stabilizing procedure can still be performed within a year after the initial trauma with good improvement in stability, power grip and hand function. A prerequisite for a direct repair is a repairable TFCC and reducible and congruent DRUJ while arthroscopy is the best tool to evaluate the integrity of the TFCC.

Non-Surgical Treatment of Mallet Finger Fractures involving more than one third of the joint

Dr. med. Maja Schürch, Dr. med. Helen Segmüller
Spitalzentrum Biel

The purpose of this study was to evaluate the clinical and radiological outcome of nonsurgical treatment of mallet finger fractures involving more than one third of the joint surface of the distal phalanx without concomitant initial subluxation of the DIP joint. We retrospectively reviewed a consecutive series of 35 patients with a mallet fracture involving one third up to two thirds of the DIP joint surface. There was no initial subluxation of the distal phalanx. They were treated with dorsal padded aluminium splints during 4–6 weeks. In 2 cases a thermoplastic custom-made splint was made by the hand therapist, and in 2 cases a long dorsal splint including the PIP joint in 50 degrees flexion was used during the night. Splinting during the night continued for 8 weeks totally. Mean follow-up time was 12 months. Functional results were very good, with a mean extensor lag of 3 degrees (0–10 degrees). 13 patients (43%) did not show any extensor lag at all. Flexion was excellent with a mean flexion of 80 degrees (60–90 degrees). All patients were highly satisfied. Radiologically there is remodelling of the DIP joint surface with excellent joint congruency even in cases with initially up to 3 mm fragment displacement and 1.5 mm step off of more than 1 mm. There was no secondary palmar subluxation of the distal phalanx. We conclude, that the nonoperative treatment of mallet finger fractures involving a third to one half of the joint surface shows excellent clinical and radiological results. No secondary palmar subluxation occurs in correctly splinted fingers.

Management of chronic distal radioulnar joint instability in the setting of complex wrist trauma

Dr. Nicole Badur, PD Dr. med Esther Vögelin
Inselspital Bern/Handchirurgie

Introduction: Instability of the distal radio-ulnar joint (DRUJ) can be isolated or combined with complex wrist pathologies, further they can be acute or chronic. Substantial ongoing disability can arise should these injuries go unrecognized and untreated. Clinical examination is the best method to diagnose and stabilize trauma and subsequent DRUJ. An adequate knowledge of the stabilizers of the DRUJ is essential in understanding treatment options.

Patients and Methods: In 2010 we treated 3 patients for chronic distal DRUJ instability following treatment of complex wrist injuries. All patients had an ulnar foveal detachment of the triangular fibrocartilage complex (TFCC) according to an injury pattern Palmer 1B which was evaluated in 2 cases by MRI and arthroscopy and by open surgery in 1 case. The first patient sustained a transstyloideal-transstyloidal carpal fracture dislocation which was anatomically reduced and fixed. One year later the DRUJ remained unstable with discomfort. The second patient was treated for a Galeazzi-type radial fracture with initial immobilization of the DRUJ. 5 months after the DRUJ remained unstable and troublesome. The third patient presented with a persisting instability DRUJ after corrective intraarticular osteotomy of an intraarticular malunion of the distal radius with displaced nonunion of the ulnar styloid. In each case the TFCC was accessed via a dorsal approach through the 5th extensor compartment and a bony refixation of the TFCC to the ulnar fovea was performed with an anchor with the wrist in neutral position. A radioulnar pin transfixation was carried out once. Pronosupination was prohibited for 6 weeks with an above elbow cast.

Results: Intraoperatively the DRUJ was clinically stable in all positions after refixation of the TFCC and remained stable after 3 months. Grip strength, pain relief and patients’ satisfaction improved in all patients. No further complications were noted.

Conclusion: In cases where injuries and instabilities to the DRUJ were not detected or initially could not be treated adequately due to the complexity of the wrist injury a stabilizing procedure can still be performed within a year after the initial trauma with good improvement in stability, power grip and hand function. A prerequisite for a direct repair is a repairable TFCC and reducible and congruent DRUJ while arthroscopy is the best tool to evaluate the integrity of the TFCC.

The painful TMC-joint of the thumb treated by a modified Brunelli – APL capsuloplasty

Dr. Michael Sturzenegger
Centre Medical de VD/ Chirurgie de la main

From 1994 to 2010, 29 painful, hypermobile and/or unstable thumb basal joints in 24 patients were stabilized by a slightly modified Brunelli-type ligamentoplasty to reconstruct the I-II intermetacarpal ligament, using one third of the long abductor tendon of the thumb. The study includes the 21/25 joints in 18/21 patients treated from 1994 to 2007. 3 patients were lost for follow up, the more recent cases not included because of a follow up of only 1 year. Preoperatively, the
patients were investigated by a fluoroscopic stress test and an intraar- ticular infiltration of Xylocaine. Radiologically all joints were classified without or only slight (stage Dell I) arthritic changes. The outcomes of the 21 capsuloplasties were evaluated by a further fluoroscopic stress test as well as a questionnaire filled out by all patients after a mean period of 4.1 (1.5–11) years after the operation. The double tendineous sling between the first and second metacarpal bone produces encouraging results concerning pain relief, daily living activities and stability. The initially obtained stability did not seem to get lost over time. Few complications were noted. However, the ability of such operations to prevent degenerative osteoarthritis in these joints cannot be definitively answered.

Should aspirin be stopped before carpal tunnel surgery? A prospective study
Dr. Luca Deabate, Dr. Cesare Fusetti, Dr. John Petri, Dr. Guido Garavaglia
Servizio di Ortopedia e Traumatologia di Bellinzona

Aim: There are no studies on intra- and postoperative complications of hand surgery in patients who take aspirin peri-operatively. To investigate the effects of aspirin in patients undergoing hand surgery, we performed a prospective study to determine whether patients who continued to take aspirin during carpal tunnel release (CTR) had an increased incidence of clinically significant complications.

Materials and method: Between January 2008 and January 2010, 104 patients were included in the study: 51 patients remained on aspirin peri-operatively (GROUP 1), while 53 patients continued to take aspirin (GROUP 2). The control group (GROUP 3) comprised 50 patients who never used aspirin and had undergone a similar procedure. Incidence of clinically significant peri- or post-operative complication was recorded and divided in local and cardio-cerebrovascular complications. Local complications were successively divided into minor and major according to Pagé and Stern. Local haematoma was evaluated at 2 (before aspirin) and 14 days (after resumed aspirin) after the operation. The Patient portion (PP) of the Patient and Observer Scar Assessment Scale (POSAS) was used for the final control at 90 days for a subjective and numerical evaluation of the scar.

Results: A total of 3 complications (1 minor, 2 major complications) and 27 haematomas (19 minor/8 major) were recorded. There was no significant difference in the incidence of complications and/or haematoma in the groups. The PP-POSAS score is uninfluenced by continuation or suspension of aspirin.

Conclusion: Our study shows that continuation of aspirin did not increase the risk of local or general complications. Continuation of aspirin did not influence the subjective scar assessment. It is concluded that it is unnecessary to stop aspirin before CTR when good meticulous surgical techniques are used.

The patient’s point of view about informed consent (IC): a prospective study in carpal tunnel surgery
Dr. Florence Unno-Veight, Dr. Guido Garavaglia, Dr. John Petri, Dr. Cesare Fusetti
Servizio di Ortopedia e Traumatologia di Bellinzona

Aim: The patient’s perception of IC is not well known and our experience suggested that many patients tend to view consent as an administrative act, neglecting the rule of decision making instrument of patient’s wishes and needs. To investigate the patient’s perception of IC, a questionnaire was sent to 188 consecutive patients. Questions focused on patient’s recall information about risks, benefits, alternative options, preferences about decisions process and global satisfaction with IC.

Results: A total of 137 patients (73% responded). Information was rated excellent or good in more than 90% of cases. 87% of patients did not need more information about surgery. Risk’s recall rate was 50%. IC reduced preoperative anxiety in 65% and the influence of IC in patient’s decision was relevant in 55% of cases. Patients have limited understanding of the legal consequences of the consent. Patient’s understanding of the legal consequences of the IC was analysed.

Conclusion: Patient involvement in medical decision care is a key aspect of patient-centred care. The actual form of combined written and oral preoperative information presented is adapted to patient’s wishes and needs, provide an adequate legal proof and allows a structured conversation. There is a substantial uncertainty about legal implication of IC, leading to potential discord. We strongly recommend to explain to patient that consensus serve primarily their interest.

Reconstruction versus Conservative Treatment after Rupture of the Anterior Cruciate Ligament – A cost effectiveness analysis
Dr. med. Mazda Farshad\*, Prof. Dr. med. Christian Gerber\*, Dr. med. Dominik C. Meyer\*, Alexander Schwabi\*, Prof. Dr. med. Thomas Szucs\* (Universitätsspitalklinik Balgrist, Institute of Pharmaceutical Medicine, University of Basel, Basel, Switzerland)

Background: The decision whether or not to surgically reconstruct a torn anterior cruciate ligament (ACL) of the knee is an ongoing subject of debate. A critical evaluation of benefits and expenditures of both treatment options as in a cost effectiveness analysis providing valuable information for treating physicians and health care policy makers seems emerging.

Methods: A systematic literature review identified 4 out of 7410 articles providing sufficient outcome probabilities on simultaneously both treatment options for decision making. An expert opinion of 27 orthopedic surgeons was used to derive utilities from available evidence. Cost data were based on average figures of the first author’s institution and reinforced by the Swiss national statistics. A decision tree was derived to derive cost effectiveness of each strategy and tested for robustness using Monte-Carlo simulation.

Results: Decision tree analysis revealed a cost effectiveness of 16’038 USD/0.78 QALY for ACL reconstruction and 15466 USD/0.66 QALY for conservative treatment. A 1% increase in the incremental cost effectiveness of 4890 USD/QALY for ACL reconstruction. Sensitivity analysis of utilities did not change the trend.

Conclusion: ACL reconstruction for reestablishment of knee stability seems cost effective in the Swiss setting based on the currently available evidence. This, however, should be reinforced with randomized controlled trials comparing both strategies.

A concept to avoid dislocations of total hip prosthesis
Dr. med. Josef Emil Brandenberg, Dr. med. Martin Ellenberger, Dr. med. Carlo De Simoni, Prof. Dr. med. Peter Emir Ochsner Orthopädische Klinik Luzern

The dislocation of a hip prosthesis is a dramatic incident for any patient, usually connected with a narcosis for reposition purposes. Literature claims that the frequency of such complications with primary hip prosthesis is between 1–9%. According to Blom et al. 58% of these first luxations tend to repeated luxations which lead to revision operations. After the infection, dislocation is the most frequent reason for re-operations – which is connected with high costs. The so called “anti-dislocation concept” (antero-lateral MIS or Baur approach, navigation of cup and stem) was tested with this underlying prospective, consecutive study.

408 primary THP (2007–2010) have been implanted by one single orthopaedic surgeon. 38 risk-patients have received a constraint prosthesis (9.3%). 370 patients (90.7%) have received a non-constrained cementless THP. 405 patients have been inspected radiologically and clinically after 6 weeks, 3, 6, 12 months. 3 patients of the risk-group have died within the first 3 months after the operation. During the observation period, 407 patients (99.76%) stayed clear of any luxations. One patient of the non-risk-group, due to circulatory collapse, tumbled on the fifth post-op-day and luxated the THP. After reposition, the patient did not suffer relapse. This equals a luxation-rate of 0.24%. There were no re-operations due to dislocations. The risk-group as well as the non-risk-group, after every time, showed equal leg-lengths and regained ample mobility. The cost-saving amounts to approx. CHF 50.000 per 100 primary THP. The consistent appliance of this concept (1. patients’ selection, 2. preoperative instruction, 3. anti-dislocation technique) has proved to be of great value. Dislocations have nearly disappeared in our hospital. The economic benefit is significant.
Free communications

Do non-scientific factors influence citation rates of orthopedic journal articles?

**Dr. med. Mazda Farshad, Dr. med. Claudia Maier, Prof. Dr. med. Christian Gerber**
Universitätsklinik Balgrist

**Introduction:** The number of scientific articles is immense and the reader often relies on the prestige of a journal to identify the most relevant articles in his field. One factor defining the prestige of a journal is the impact factor, which is calculated on the base of citation rates of its published articles. We studied associations of scientific and non-scientific criteria with the citation frequency of articles in the orthopedic literature.

**Methods:** The most (76 citations /5 years) and least cited (1.7 citations /5 years) articles published between 2000 and 2004 of a general orthopedic journal were identified and categorized into scientific (e.g. study design and type, sample size, quality of statistics etc.) and non-scientific determinants (e.g. industry favouring results, industrial funding, structural characteristics of the article, etc.) on the citation rate was quantified.

**Results:** RCTs, cohort studies as well as multicenter studies with large sample sizes were clearly more frequent in the high citation group. High-cited articles had a 4.8 times higher odds to be sponsored by industry than low-cited articles. The speciality seems to be relevant only for hand and knee surgery, for trauma surgery.

**Discussion:** The results of this study suggest that beside scientific factors, non-scientific factors such as industrial sponsorship influence the citation rate of published articles.

---

Prevention in Geriatric Fracture Patients? More than Osteoporosis Treatment!

**PD Norbert Suhr¹, Raphael Kaelin², Patrick Studer², Mena Pretto³, Marcel Jakob³**
¹Universitätsklinik Basel; ²Orthopädische Klinik Bruderholz; ³Abteilung für Klinische Pflegewissenschaft

**Hypothesis:** Geriatric hip fracture patients are at risk to suffer from postoperative complications. Dementia and malnutrition are risk factors towards postoperative delirium and towards decline of serum albumin respectively, and therefore for worse overall outcome. Our geriatric fracture centre offers prevention programmes to geriatric fracture patients in order to reduce the frequency of these complications. We investigated efficacy of the prevention measures by documentation of risk factors and of the related negative postoperative conditions and by comparison of our results with the literature.

**Patients & Methods:** The 186 geriatric hip fracture patients aged 65+ were included into the prospective cohort study: Age [average ± standard deviation]: 84.2 ± 7.4 years; gender m:f [%]: 45:55; fracture type femoral neck fracture [percentage]: 62.76; fracture type trochanteric fracture [percentage]: 35.7. In the emergency department we checked for dementia and we evaluated the patient’s nutritional status by means of the Mini Nutritional Assessment (MNA). During the postoperative phase, the «Postoperative Delirium Prevention» programme assures documentation of the patient's cognitive status by means of the Delirium Observation Scale (DOS). Risk factors known to cause postoperative delirium were identified and stopped if possible. The prevention programme «Malnutrition» identifies such patients with an MNA score below 12 points. Protein enriched food is offered to them. The effect is monitored by means of serum albumin levels.

**Results:** Dementia was found in 39% of our patients on admission. While being in hospital, 26% of our patients suffered from a postoperative delirium. 44% of our patients reached a MNA <12 points indicating preoperative malnutrition. Serum albumin level declined from 34.1 g/l preoperatively to 24.7 g/l postoperatively.

**Discussion:** The risk factors frequently occur amongst the study population. This confirms our prevention programmes are applied to a high risk population. In the literature, postoperative delirium is reported to occur as frequent as in 5% to 62% of patients. The rate observed in our population therefore is relatively low. Serum albumin below 35 g/l is looked upon as a marker for malnutrition. This means more than 50% of our patients suffered from malnutrition already preoperatively. Prevention programmes described above can only reduce the number of postoperative complications but do not succeed to prevent them in a 100% of geriatric hip fracture patients.

---

Clinical Midterm Outcome of combined Reversed Shoulder Prosthesis and Latissimus Dorsi Transfer

**Dr. Gábor János Puskás, PD Dr. Berhard Jost, Sabrina Catanzaro, Prof. Christian Gerber**
Uniklinik Balgrist

**Introduction:** In elderly patients with rotator cuff arthropathy reverse shoulder prosthesis is a standard treatment with reliable pain relief and regain of shoulder function. However, often an external rotation lag due to infraspiatus insufficiency cannot be restored by reverse shoulder prosthesis with the deltoid as the only remaining muscle. Latisisimus dorsi transfer provides a functional benefit for active external rotation in

---

Evaluation of the economical efficiency of health economists as specialists in DRG coding in orthopedic and trauma surgery

**Dr. med. Dipl. oec. med. Pierre Göbel**, Dr. med. Matthias Wimmer¹, Univ.-Prof. Dr. med. Dieter C. Wirtz², Dr. med. Sascha Gravius³, Dipl. oec. med. Maren Walgenbach²
¹Universitätsklinikum Bonn / Klinik für Orthopädie und Unfallchirurgie; ²Universität Witten Herdecke / Lehrstuhl für Chirurgische Forschung, Institut für Forschung in der Operativen Medizin (IFOM)

**Introduction:** The DRGs will provoke fundamental changes in Swiss health system. Aim of our study was to quantify the effectiveness in DRG coding of health economists in comparison to coding residents, this especially regarding maximum care hospitals of orthopaedic and trauma surgery.

**Materials & Methods:** In a prospective study, 200 in-patient cases were reviewed by a health economist. Primary coding was blinded to avoid a Hawthorne effect. Outcome of the review coding was compared to previous results and between the two groups. Especially the pre- and post-coding DRG weight and the time of optimisation were analysed.

**Results:** The proceeds per patient generated by the health economist were significantly higher than the control group with 2472.5 ± 537 Euro (p <0.05). Overall cumulized increase was 494 500 Euro with an average time of optimization of 11 min. This means higher proceeds of 218 ± 38 Euro per minute due to better coding.

**Discussion & Summary:** In the clinics and maximum care hospitals with a wide medical range and widely spread DRGs, health economists as specialists for DRG coding are without doubt very necessary for economic well-being of the hospital. The data of the current study prove, that we found to be the health economists for optimizing DRG coding of in-patients. CMs and total revenue per case could be increased significantly by a review coding. To reflect the high standard of care of maximum care hospitals in their reimbursement, health economic professionals showed significantly better results than the average resident.
irreparable infraspinatus tears. Therefore the senior author concluded that in combination with reverse total shoulder prosthesis the latissimus dorsi transfer can help to regain the active external rotation in patients with rotator cuff arthropathy and relevant external rotation lag. In this study the complication rate after this procedure and present the clinical outcome at 2 and 5 year follow up time.

Methods: From 2003 until 2008 forty patients with a mean age of 70 years underwent this combined procedure for a total of 41 shoulders. 7 patients (8 shoulders) were not available for follow up and 2 patients were excluded from the study due to revision surgery with implant removal. All the remaining 31 patients have complete clinical follow up data (constant score) at 2 years and 10 patients additionally at 5 years.

Results: There were 6 orthopedic complications for the 41 procedures: 2 infection (1 with implant removal), 2 transient partial plexus paresis, 2 dislocations, 1 glenoid component loosening (conversion to a hemiarthroplasty) and one shoulder stiffness in one of the two patients with a transient neurological complication. The age-related constant score improved from preoperatively 44% to 91% at 2 year follow up time and the subjective shoulder value from 32% to 72%. For the 10 patients with a follow up time of 5 years the post-operative constant score remained stable on a high level (41% preoperatively, 95% at two and 96% at five years respectively) as did the subjective shoulder value (30%, 91%, 91%). The active external rotation improved from 6° to 27° in the 2 year collective and in the 5 year collective from 13° to 25° at 2y and 15° at 5y.

Conclusion: Even though it has a high complication rate, the combined reversed shoulder prosthesis and latissimus dorsi transfer restores active external rotation and yields to good and stable clinical and subjective results in patients with rotator cuff arthropathy with relevant infraspinatus insufficiency.

Revision of Reversed Total Shoulder Arthroplasty. Indications and Outcome

Dr. med. Mazra Farshad, Dr. med. Marion Grögl, Sabrina Catanazaro, Prof. Dr. med. Christian Gerber
Universitätsklinik Balgrist

Background: The complications of reversed total shoulder arthroplasty (RTSA) requiring surgical revision, their treatment options and outcomes have recently been highlighted. It was the purpose of this retrospective study to identify the reasons for revision of RTSA and to report outcomes.

Methods: 441 consecutively performed RTSA implanted between 1996 and 2008 were screened. Sixty-seven of these cases had to be revised to treat a complication. Causes for surgical revision were identified in these 67 cases and the outcome of the first 37 revised patients who could be followed for more than 2 years after their first revision was analyzed.

Results: Of 441 RTSA, 67 cases (15%) were revised at least once, 30 of them needed a second, 11 a third and 4 a fourth revision. The most common complication requiring a first intervention was instability (18%), followed by superficial wound complications (15%) and complications of the glenoid component (12%). Patients benefited from RTSA despite the need of revisions as indicated by an average increase in total Constant Score from 23 points before reverse total shoulder arthroplasty to 46 points at final follow-up (p = 0.0001; 95% CI: 17; 13).

Conclusions: Instability, hematoma or superficial wound complications and complications of the glenoid component are the most common complications after RTSA. Patients undergoing a revision as treatment of these complications profit significantly as long as the prosthesis remains in place.

Early outcomes of proximal Humerus Fractures treated with reverse total shoulder arthroplasty

Dr. med. Stipe Krajnovic, PD Dr. med. Martin Majewski
Department of Orthopedics and Traumatology, University of Basel

Introduction: In the primary care of complex proximal humeral fractures there’s still no standard procedure if decided to treat surgically. In four-part and comminuted displaced fractures of the proximal humerus the controversies about the proper treatment are enormous, moreover because they occur in elderly patients. Up to now different reconstruction techniques have been published. The purpose of this study was to evaluate early outcomes of reverse total shoulder arthroplasty for four part humerus fractures and proximal comminuted displaced humerus fractures.

Methods: Between July 2008 and February 2010, 19 patients underwent reverse total shoulder arthroplasty with the use of Delta X-Tend shoulder prosthesis (Depuy). All patients were evaluated clinically and radiologically using the Constant & Murley score.

Results: All patients, 9 man, 10 woman, were seen at clinics. The mean age was 79 years (71–89 years). Mean duration of follow up was 18 months with a range of 12 month to 29 months of follow up. The gender and age corrected Constant Murley Score was above 75. No complications have been observed.

Discussion: In our study we have shown that the reverse total shoulder replacement might be a successful alternative method for the treatment of complex fractures of the proximal humerus in elderly patients.
component and one after a fracture of the scapular spine. In two other shoulders a fracture of the scapular spine was treated conservatively. In terms of pain, the seven shoulders with complications showed higher pain levels compared to the three shoulders without complications (p = 0.012). The mean follow-up was 70.7 months.

Conclusion: The short-term results of RSA seem to be a logical option in selected cases. However, the removal of a firm implanted humeral stem may prove difficult. Some modular implants such as the Affinis® can be reversed and adjusted during the revision surgery. A revision was attempted in 20 patients for various reasons.

Results: In 8 patients (Group A), the stem was retained. In 12 patients (Group B), the stem had to be removed and replaced by a new one. In group G, 5 patients were included with an Articulai® or an Affinis® stem which could not be converted. The other primary implants were of other designs and stem removal was therefore indispensable. Mean age was 79.2 years in group A and 68.6 years in group B. Constant score increased by 50.8 points in group A (76.2 adjusted for age and gender) and 50.8 points in group B (adjusted 70.7). Mean operating time was 93.8 min. in group A, and 152.5 min. in group B. There were no complications reported. Radiological results showed no scapular notching. Failure rate was 0% at 2 years and 1% at 3 years.

Conclusion: For conversion, the ability to shorten the humeral construct and to reset the retroversion are crucial elements for success. In 8 out of 13 suitable Affinis® Fracture or Articulai® cases, the humeral stem could be left in place. Operating time was then considerably reduced, while clinical and radiological results remained similar.

Do inferior scapular osteophytes have an influence on the outcome following reversed shoulder arthroplasty?

Dr. med. Ben Schultz, MD Christos Vassos, MD, PhD Yuichi Nagase, Dr. med. Hans-Kasper Schwzyyen, Dr. med. Matthias Flury1

Introduction: Osteophytes developing at the inferior aspect of the scapular neck following reversed shoulder arthroplasty (RSA) are rarely described in the literature. In addition, the impact of these osseous formations on the clinical outcome remains unclear. The goal of this study was to identify the incidence of scapular osteophytes within a 2-year follow-up period in two cohorts with different designs of RSA, and to evaluate their influence on the clinical outcome.

Material and Methods: Two prospectively followed cohorts with more than 100 patients in each were radiographically and clinically evaluated at the 2-year follow-up after RSA implantation. Radiographic assessment was performed by two independent observers including identification of osteophytes distinguished from heterotopic bone ossifications, classification of scapular notching, and measurement of the prosthetic scapular neck angle. Clinical assessment included the Constant Score (CS) and the presence of complication with patient-reported outcome values (Quick-DASH, SPADI) and was stratified for radiological findings.

Results: Scapular osteophytes were identified at the 2 year follow-up in both cohorts: in 36% of the cases and in 22%, respectively. No significant differences were seen between the patient groups with and without osteophytes regarding shoulder function and pain (SPADI), function of the upper extremity (Quick-DASH), range of motion or in the CS (>0.05). In one of the cohorts, a higher scapular angle was significantly associated with the development of osteophytes (<0.01). Glenoidal notching was also frequently seen (50% and 37% resp.) and correlated significantly with the presence of osteophytes (both cohorts p = 0.01).

Conclusion: Inferior scapular osteophytes can often be detected after RSA but apparently without any significant influence on the functional outcome. The short-term scapular notching angle in the presence of scapular notching seem to be associated with a higher incidence of osteophytes. The underlying etiology remains unclear: it appears that osteophytes can evolve directly by traction forces but also as a secondary ossification of the inferior capsule with adhesion to the scapular neck. A longer follow-up is needed to exclude any influence of this radiographic phenomenon on the clinical outcome.

Comparison of Clinical outcomes of Reverse Total Shoulder Arthroplasty performed with 36 mm standard CoCrMo and 44 mm cross-linked UHMWPE Glenosphere in a multicentre study

Dr. Hans-Rudolf Bloch1, Dr. Andreas Bischof, Dr. Alex Castagna1, Dr. Jens D. Agneskirchner1, Dr. Piero Budassi2

1Department of Orthopaedics University of Rostock, Germany; 2Orthopaedie am Rosenberg Heiden (CH); 3Istituto Humanitas Milano (Italy); 4Sportsclinik Hannover (Germany); 5Istituti Ortopedici Cremona (Italy)

Background: Reverse total shoulder arthroplasty (RSA) performed with 36-mm standard CoCrMo, 36-mm eccentric CoCrMo and 44 mm eccentric UHMWPE glenospheres have been encouraging, but the procedure is not without its complications, scapular notching and instability, correlated with poorer clinical outcomes. SMR Reverse minimises these limitations with new designs and materials (SMR HP), reducing the prosthesis-scapular neck angle (PSNA) with a distal eccentric overhang and the polyethylene debris with the inversion of materials. The aim of this multicentre retrospective study is to compare range of motion, pain level, incidence of scapular notching and implant stability of reverse shoulder arthroplasty (RSA) performed with 36-mm standard CoCrMo, 36-mm eccentric CoCrMo and 44 mm eccentric X-UHMWPE glenospheres.

Methods: Between 2003 and 2008, 133 patients (average age 69.2 years, 31% male, 69% female) treated with a reverse shoulder prostheses in 5 hospitals were divided in 3 groups: 63 (45%) patients treated with a 36 mm standard CoCrMo glenosphere (Group A), 21 (16%) with a 36 mm eccentric CoCrMo glenosphere (Group B) and 52 (39%) with a 44 mm X-UHMWPE glenosphere (Group C). The average follow up was 38.3 ± 17.4 months. Mainly primary diagnosis were: cuff tear arthropathy (Group A: 85%, B: 76%, C: 75%), secondary osteoarthritis (Group A: 3%, B: 14%, C: 15%) and cuff tears in endoprosthesis (Group A: 7%, B: 0%, C: 8%). The Constant score increased significantly from preoperative assessment to all postoperative time-points for all 3 groups (Wi-test: p < 0.001). Nevertheless the preoperative average CS of Group C was significantly lower than Group A and B (Wk = 0.003). Group C showed an average CS percentage increase much more relevant than the other two groups (Group A: CS: +31%, Group B CS: +43% and Group C: CS: +50%; Wi: p = 0.001) at the last follow-up. Furthermore, 44 mm X-UHMWPE glenospheres confirmed higher ROM.After 12 and 24 months, patients of Group C and B had less pain than Group A (p = 0.05). Group C had a significantly lower scapular notching than Group B (Wi-test: p = 0.001) and Group A (Wi-test: p = 0.009) at 12 and 24 months. The same trend was confirmed after more than 30 months from surgery. No progressive radiolucent lines have been observed. Group A had 5 (8.3%) early complications and Group C had 4 (7.6%) early complications and Group C had 4 (7.6%) early complications and Group C had 4 (7.6%) early complications and Group C had 4 (7.6%) early complications.

Conclusions: We found significantly higher scores, better outcomes and a lower rate of complications with the use of 44 mm X-UHMWPE and 36 mm eccentric CoCrMo glenosphere than with the 36 mm standard CoCrMo one. We attribute these results to the decrease of the inferior notching with eccentric design (36 mm and 44 mm glenospheres) and for the convenience of the materials in the 44 mm glenosphere that allows a lower functional range of motion even with an initial worse preoperative conditions. Additional, long-term studies are needed to evaluate the survivorship of the implants.
Total Shoulder Arthroplasty: Importance of the Thickness of the Polyethylene Glenoid Component

Alexandre Terrier1, Dominique Pioletti2, Alain Faron2
1Laboratory of biomechanical orthopaedics, EPFL, Lausanne;
2Service of orthopaedic and trauma surgery, CHUV, Lausanne

Introduction: Wear of the articular surface of the glenoid polyethylene (PE) is related to the production of debris and may eventually lead to the component loosening. The effects thickness of the PE component used in total shoulder arthroplasty (TSA) are not well known. Therefore the goal of this study was to analyze the effect of the thickness of the PE glenoid component on the cement and PE stress.

Methods: A numerical musculoskeletal model of the shoulder was used. The model included the scapula, the humerus and 6 scapulo-humeral muscles: middle, anterior, and posterior deltoid, supraspinatus, subscapularis and infraspinatus combined with teres minor. Arm motion and joint stability were achieved by muscles. An anatomic prosthesis (Aequalis, Tornier Inc) was inserted. The effect of three glenoid components with different thicknesses: 2 mm, 4 mm (reference) and 6 mm. For the 3 configurations, a movement of abduction in the scapular plane was simulated. The gleno-humeral force and contact pattern, the stress developed within the glenoid PE and cement mantle were evaluated.

Results: The contact pressure was about 150% higher with the 2 and 6 mm compared to the reference 4 mm thickness and consequently induced an increase of stress within the PE for both configurations. For PE and PE plus cement mantle, the stress was about 150% higher with the 2 mm PE, but 60% lower with the 6 mm PE. Conclusion: This work confirms that the thickness of the PE is also a parameter implicated in the mechanisms of glenoid wear and loosening after TSA. Based on the results of this biomechanical study we recommend avoiding polyethylene component thinner than 4 mm.

Arthroscopic Hill-Sachs Remplissage: Anatomical and Functional Results

Prof. Dr. med. Pascal Boileau1, Dr. med. Kieran O’Shea1, Dr. med. Miguel Pinedo2, Dr. med. Jason Old1, Dr. med. Matthias A. Zumstein2
1Department of Orthopaedic Surgery and Sports Traumatology L’Archet Hospital II, University of Nice-Sophia-Antipolis; 2Department of Orthopaedic Surgery and Sports Traumatology, University of Bern

Background: Large defects of the posterior-superior humeral head, commonly known as Hill-Sachs lesions, can engage the glenoid rim and be a cause of recurrent instability after arthroscopic Bankart repair. Filling of the humeral head defect with the posterior capsule and infraspinatus tendon (i.e., Hill-Sachs ‘remplissage’), is an additional arthroscopic procedure recently proposed.

Hypothesis: The capsulo-tenodesis heals in the humeral bone defect without severe adverse effect on shoulder mobility, allowing return to pre-injury sporting activity.

Methods: Forty-seven consecutive patients with recurrent traumatic anterior shoulder instability underwent arthroscopic labral repair combined with posterior capsulo-tenodesis using suture-anchors. Nine patients returned for failures of prior instability surgery; 3 failed Bankart repairs and 6 failed open Latarjet. At arthroscopy, all had a large Hill-Sachs lesion (Calandra Grade III), engaging over the glenoid rim, without glenoid bone loss. Age at the time of surgery was 29 ± 5.4 years. Postoperatively, patients were prospectively evaluated. The mean follow up was 21 months (12–42). Comparative shoulder motion was precisely measured using digital photographic images. Capsulo-tenodesis healing was assessed at least 6 months after surgery in 42 patients (38 CT-arthrograms, 4 MRI).

Results: Healing of the capsulo-tenodesis was observed in all 42 cases. In 31 cases (66%), remplissage of the defect was ≥75%. Only one patient (2%) had a recurrent dislocation and was disappointed. Compared to the normal contralateral side, the mean deficit of external rotation was 8° ± 7° with the arm at side (ER1) and 9° ± 9° in abduction (ER2). There was a mean reduction of 2° ± 6° in active forward elevation, 5° ± 6 degrees in IR2, and 0.5 points in IR1. Of 41 patients involved in sports, 37 (90%) were able to return at the same level, including overhead activities.

Conclusion: The posterior capsulo-tenodesis heals predictably in the humeral defect. Despite a slight limitation of external rotation, return to sporting activity is possible in 90% of the cases. The procedure is indicated for patients with isolated humeral bone loss. It may also be useful for revision of previous failed instability surgery in patients without glenoid bone deficiency.

One technique for 3 problems: open suture anchor stabilization for lateral clavicular fractures and severe acute and chronic AC joint dislocations

Dr. med. Emanuel Benninger, Dr. med. Christian Spross, PD Dr. med. Bernhard Jost
Ortopädische Klinik, Klinik für Traumatologie, Balgrist

Background: There is no well established technique for the operative treatment of lateral clavicle fractures and AC joint dislocations. We use an open suture anchor technique for all these injuries. Preliminary results are presented.

Method: Retrospective analysis included all patients after surgical treatment with this technique for Neer type II fractures and acute and chronic Rockwood type III–VI AC joint dislocations from 2004 to 2010.

Results: 28 patients (mean age 38 years) were included. In the 6 patients with a lateral clavicle fracture radiological consolidation was achieved after a median time of 18 weeks. One patient with additional AC joint arthritis was secondarily addressed with arthroscopic joint resection. Twenty patients (8 acute, 12 chronic) had Type III and V AC joint dislocations. Satisfactory and stable reduction could be achieved in all but one patient who failed early after surgery and was reoperated. At follow-up the lateral clavicles were found to be symmetrical in 16 (80%) patients and a mild elevation without clinical/cosmetic complaints in 3 (15%). At latest follow-up 18/20 patients had no or mild pain and normal shoulder function.

Discussion: Open suture anchor stabilization seems to be a good option for treatment for lateral clavicle fractures and AC joint dislocations. It provides reliable and good clinical results with a low complication and revision rate. The presented technique can be used for three different problems without the need for implant removal.
Complications after Locking Plate Fixation of Fractures of the Proximal Humerus
Prof. Dr. med. Christian Gerber, Dr. med. Christian Spross, Dr. med. Holger Gren, PD. Dr. med. Bernhard Jost
Uniklinik Balgrist

Introduction: Locking plates for open reduction and internal fixation (ORIF) of proximal humerus fractures are widely used. An unusually high number of patients with complications has been referred to our institution in recent years. It was the purpose of this study to report these complications and their treatment options.

Material and methods: From 2003 to 2010 all patients treated with complications after ORIF of proximal humeral fractures with locking plates were prospectively collected and retrospectively analyzed. In patients necessitating revision surgery the clinical outcome was assessed with the Constant Score (CS), the radiographic evolution with standardized radiographs.

Results: 121 consecutive patients (67 women, 54 men) with an average age of 59 years were referred at an average of 15 months after primary looking plate ORIF. 80% of these patients initially had a 3- or 4-part fracture. The complications observed were (% of patients): initial malreduction (55%), malunion (63%), avascular necrosis (68%), nonunion (13%) and infection (6%). Perforation of screws into the glenohumeral joint was seen in 69% (83 patients) with (partial) destruction of the glenoid in 40 patients. There was an average of 3 (1 to 6) complications per patient. 107 patients needed a mean of 1.5 (1 to 6) revision surgeries, anatomical hemi- or total shoulder arthroplasty (n = 37) improved the mean CS from 27 to 49 points and reverse shoulder arthroplasty (n = 29) from 20 to 44 points after perforated screws, so that hemiarthroplasty was performed.

Conclusion: An intriguingly high number of patients with complications after ORIF of proximal humerus fractures using locking plates has been referred to our center. Most complications are major, needing single or multiple revision surgeries including arthroplasty in more than 50% of the cases. Shoulder function can be improved but no longer restored in the vast majority of patients. Complete destruction of the glenoid by locked perforating screws was the most devastating and previously almost unseen complication. ORIF of proximal humerus fractures using locking plates should be carried out with the awareness that at least one large referral center observes an intimidating number of often severe complications using this technique.

Intramedullar Bone Graft for Medial Support in Locking Plate Fixation of Proximal Humeral Fractures – an in vitro Study
Dr. Georg Oehmichen1, Dr. Ing. (ETH) Daniel Baumgartner2, Dipl. Ing. EPFL Philippe Favre3, Prof. Dr. Guido A. Warner4, Prof. Dr. Hans-Peter Simmen5, PD Dr. Clément M.L. Werner6, PD Dr. Clément M.L. Werner4, PD Dr. Clément M.L. Werner4
1Klinik für Unfallchirurgie, Universitätsspital Zürich; 2Institut für Biomechanik, ETH Zürich; 3Orthopädische Biomechanik, Uniklinik Balgrist, Zürich

Introduction: In comminuted proximal humeral fractures, missing medial support can result in varus malalignment and cut through of the proximal screws when using locking plates. The aim of the present study was to assess the influence of an additional intramedullar fibula graft on the biomechanical characteristics of proximal humeral fractures stabilized by locking plate fixation in a synthetic bone model. The anterior cruciate ligament (ACL) has limited stiffness of the bone-implant construct and reduces migration of the graft. The healing course was evaluated by an independent senior radiologist and radiological results in 10 sportive patients with acute ACL rupture (2 women, 8 men, mean age: 26.4 years; range: 19-41 years) were followed for at least 12 months following DIS treatment. Knee function was documented using the Lysholm and Tegner scores. Anterior/posterior (AP) translation was measured with a standardized goniometer. The healing course was evaluated by an independent senior radiologist performing an magnetic resonance tomography (MRT) at 3, 6 and 12 months.

Results: None of the 10 patients experienced intraoperative complications. One patient ruptured the same ACL while playing soccer 4 months postoperative and was excluded from the study. All patients reported normally knee function prior to ACL rupture, with a Lysholm score of 100 and a Tegner score of 6.1 (range: 4–9). Twelve months postoperative all patients had regained a Lysholm score of 100 and a Tegner score of 6.1 (range: 5–9). The anterior increase of AP translation was +1.2 mm (range: +0–3 mm) compared to the healthy contralateral side. In only 3 patients did the anterior movement have a high endpoint. The MRI studies showed a continuous ligamentous structure in all injured knees after 12 months indicating the healing of the acl.

Conclusion: The first results using the DIS showed a continuous ligamentous healing of the acl. Clinically the patients returned to full sportive activity with normal knee function scores. We consider this novel technique as a promising new pathway to treat acl injuries.

Anatomic restoration of anteroposterior translation in ACL reconstruction failed at midterm
Salvatore Tomagra1,2,3, Dr. Dominik Bastian4, Dr. Stefan Wuerger5, Dr. Andreas J Schuster1,2, Dr. Matthias A. Zumstein5
1Department of Orthopedic Surgery, University of Bern, Inselspital, Bern, Switzerland; 2Sonnenhof Clinic, Radiology Centre, Bern, Switzerland; 3Department of Orthopedic Surgery, Spital Netz Bern-Zugler, Bern, Switzerland

Introduction: The outcome after reconstruction of the anterior cruciate ligament depends on the initial tension applied to the graft at the time of fixation. Anteroposterior translation (APT) of the transplant was adjusted intraoperatively to that of the contralateral healthy ACL. A loss in APT with time, the clinical and radiological outcome were evaluated.

Methods: In a prospective study, the clinical and radiological outcome were evaluated. Anatomic restoration of anteroposterior translation (DIS) – 12 Month Results of the first 10 Patients
Dr. med. Sandro Kohl1, Dr. med. Hendrik Kohlhof2, Dr. med. Philipp Henle3, PD Dr. Harald Bole4, Prof. Dr. Stefan Eggli5
1Universitätsklinik für Orthopädische Chirurgie, Inselspital Bern; 2Universitätssklinik für Orthopädische Chirurgie, Inselspital Bern, Bern, Klinik für Orthopädische und Traumatologische Chirurgie; 3Universitätsklinik Bern, Klinik für Diagnostische und Interventionelle Radiologie

Introduction: The anterior cruciate ligament (ACL) has limited self-healing potential. To date a torn ACL is removed and replaced by a graft. The drawbacks of this treatment is diminished proprioceptivity, secondary instability and donor-site morbidity. We developed a Dynamic IntraLigamental Stabilisation (DIS) technique that successfully induced self-healing of ACL ruptures in a large animal model. In this study we adapted the DIS system for treatment of the human knee and present the results of the first 10 patients.

Patients and Methods: In a prospective study, the clinical and radiological results in 10 sportive patients with acute ACL rupture (2 women, 8 men, mean age: 26.4 years; range: 19–41 years) were followed for at least 12 months following DIS treatment. Knee function was documented using the Lysholm and Tegner scores. Anterior/posterior (AP) translation was measured with a standardized goniometer. The healing course was evaluated by an independent senior radiologist performing a magnetic resonance tomography (MRT) at 3, 6 and 12 months.

Results: None of the 10 patients experienced intraoperative complications. One patient ruptured the same ACL while playing soccer 4 months postoperative and was excluded from the study. All patients reported normally knee function prior to ACL rupture, with a Lysholm score of 100 and a Tegner score of 6.1 (range: 5–9). The anterior increase of AP translation was +1.2 mm (range: +0–3 mm) compared to the healthy contralateral side. In only 3 patients did the anterior movement have a high endpoint. The MRI studies showed a continuous ligamentous structure in all injured knees after 12 months indicating the healing of the acl.

Conclusion: The first results using the DIS showed a continuous ligamentous healing of the acl. Clinically the patients returned to full sportive activity with normal knee function scores. We consider this novel technique as a promising new pathway to treat acl injuries.
Conclusion: The presented technique provides ACL reconstruction with intraoperative anatomic restoration of the APT. APT length, if measured by Rollimeter, was not maintained at midterm. However, in the monopodal stance test, when the periglenoidal musculature was activated, and full anterior tibial translation was not confirmed. Patients might have learned to muscle compensate the ligamentous laxity. In terms of APT restoration, the indication for ACL reconstruction has to be reconsidered.

Comparison of All-Inside Meniscal Repair Devices with Matched Inside-Out Suture Repair

Introduction: Intraoperative arthroscopic assessment of the anatomic position of the tibial tunnel is crucial for ACL reconstruction. Minimally invasive and reproducible tibial tunnel placement is the key to ACL surgery. Recent advances in computer navigation show promising results. However, a novel technique using a combination of image guidance, bone-tunnel interface, and feedback devices is a step forward to achieve an uncompromised bone-tunnel interface. The purpose of this study is to introduce a novel standardized SPECT/CT algorithm in these patients and evaluate its clinical application and reliability.

Methods: A novel SPECT/CT localization scheme consisting of 9 SPECT/CT was introduced and standardized SPECT/CT was used to evaluate the tunnel placement in 3D-CT using standardized frames of reference and the modified quadrant method introduced by Bernard and Hertel (femoral) and modified Stäubli technique (tibial). The median inter- and intrasession variability of the femoral and tibial tunnel position were 3.9 mm and 2.8 mm, respectively.

Conclusion: 3D-CT is used to accurately evaluate the tunnel placement in patients after ACL reconstruction. SPECT/CT additionally promises to accurately evaluate the tunnel placement in patients after ACL reconstruction. 3D-CT is used to accurately evaluate the tunnel placement in patients after ACL reconstruction. SPECT/CT additionally promises to accurately evaluate the tunnel placement in patients after ACL reconstruction.
Vitamin C plasma values reduced after orthopaedic surgical intervention in patients with total knee arthroplasty and prosthesis revision operation

Dr. med. Harald Lengnick, Dr. med. Karlmeinrad Giesinger, Prof. Dr. med. Markus Kuster, Dr. med. Henrik Behrend
Orthopädie Kantonsspital St. Gallen

Introduction: Vitamin C is the specific agent in the formation of intercellular substance and is needed in the collagen synthesis activating the enzyme prolyl-hydroxylase. It is involved in the process of wound and bone healing. Its deficiency is linked to wound healing complications, diseases of connective tissues and hypothetically to arthrofibrosis after total knee arthroplasty (TKA) (1, 2). To our knowledge no data exist concerning perioperative vitamin C concentrations in orthopedic patients. The aim of this study was to investigate whether vitamin C plasma levels can be observed in patients undergoing orthopedic surgery depending on the extent of the surgical intervention.

Material and methods: Twenty patients were divided into four same-size groups. Group A underwent ORIF for an ankle fracture, group B un/reverted primary TKA, group C had hip or knee revision surgery for aseptic loosening. Five healthy volunteers (group D) without any surgical intervention were sampled as reference group. Vitamin C plasma values were measured one day preoperatively (d-1) and on day 1, 3 and 7 (d1,d3,7) postoperatively.

Results: Mean age and operation time was 54y and 34 min in group A, 73y and 94 min in group B, 77y and 122 min in group C. Healthy volunteers were on average 52 years old. Patients undergoing primary TKA showed significant lowering of vitamin C levels in the postoperative course compared to preoperative values (d-1: 10.0 ± 6.7 mg/l, d7: 1.7 ± 2.6 mg/l, p-value = 0.007). A strong tendency of vitamin C depletion in patients after extended orthopedic surgical intervention. Hypothetically this is associated with accumulated oxidative stress and higher metabolic activity. Further studies are necessary to examine the role of vitamin C in the healing and rehabilitation process and its effect on improved postoperative function of musculoskeletal system in orthopedic patients.

The Lausanne Experience with the Wichita Fusion Nail for Arthrodesis of the Knee

Aron Graziozi, Rayan Baalbaki, Olivier Borens
CHUV

Background: Arthrodesis of the knee by intramedullary fixation has been reported to have a higher rate of success than external fixation or open compression nailing however can lead to complications due to the different diameters of the medullary canals, fractures during insertion, poor rotational stability, breakage of the IM-nail and insufficient compression at the fusion site.

Method: This study reports the trauma fusions performed by the same orthopaedic surgeon with the Wichita (Stryker) fusion nail (WFN) from 2004 to 2010. The Wichita nail is a short nail with a device at the knee which allows for coupling of differently sized and interlocked femoral and tibial components and at the same time for compression of the fusion.

Results: We report of 18 patients with a mean follow up of 28 months (range 3–71 months). Infected TKA was the most common indication for arthrodesis in 9 cases. The remaining reasons included aseptic failed TKA in 3 cases, 2 patients after fracture, 1 patient with neurological instability after knee dislocation, 1 patient after tumoral resection and 1 non union after failed arthrodesis with long antegrade nail. Finally 1 patient with bilateral congenital knee dislocation operated on both sides. As expected, patients receiving the WFN had undergone a large number of previous knee surgeries with a mean of 3.8 (range 0–9) procedures per patient. The complication rate was 27% (5 of 18). Two patients had persistent pain requiring revision surgery to increase stability with plating. One case of periprosthetic fracture needed open reduction and internal fixation. 2 patients with superficial hematoma were treated with physiotherapy. Infection was eradicated in all septic cases, we found no new infection and the fusion rate was 100%.

Conclusion: The results of these different cases are satisfying and we think that this technique is a valid alternative to the other known techniques of knee fusion in patients with a bone stock and fragile soft tissues.

Rupture of the popliteal artery complicating medial opening wedge high tibial osteotomy

Dr. med. Marc Attinger1, Dr. med. Laszlo Molnar2, PD Dr. med. Karl Stoeffel2
1Kantonsspital St. Gallen; 2Kantonsspital Graubünden

Introduction: The popliteal artery is vulnerable to injury during surgeries performed around the knee joint. Pseudoaneurysm of the popliteal artery following a high tibial osteotomy is rare, but has been published in literature yet. Complete rupture as a complication after a lateral closing wedge high tibial osteotomy has never been reported so far.

Case report: Our patient underwent an uneventful medial opening wedge high tibial osteotomy for medial osteoarthritis of the knee which was fixed with a Tomofix plate. The procedure was performed under tourniquet, which was released for five minutes before closing the wound in order to produce a blood clot within the osteotomy gap. After wound closure we routinely checked the distal pulses which were significantly decreased. Twelve hours postoperatively, the patient experienced strong pain and a swelling of the entire lower leg. The sensation over the sole was decreased and the motor function of the foot was impaired. A femoral angiogram revealed a complete rupture of the popliteal artery at the level of the osteotomy site (pars III). Open vascular surgery with resection of the stumps and end-to-end anastomosis using a reversed contralateral saphenous vein interposition graft was performed. During the vascular surgery, a sharp transsection of the popliteal artery could be revealed, which undoubtedly occurred while using the oscilating saw during opening wedge high tibial osteotomy.

Discussion: Vascular complications during or after lateral closing wedge high tibial osteotomy are rare, but range from vascular thrombosis over compartment syndrome to laceration of the popliteal artery. This complication may be a rarity, nevertheless it is severe and should be kept in mind when performing this procedure. Careful placement of retractors around the osteotomy site during sawing and flexing the knee to lessen the stress on the popliteal artery could be a measure obtained from the operation site are recommended to prevent this complication. To our knowledge, this is the first report of a complete rupture of the popliteal artery occurring after a medial opening wedge high tibial osteotomy.
Comparison of electromyographic temporal analysis during gait in patients after total knee arthroplasty receiving a midvastus or mini-midvastus approach

Regina Ullmann, Dr. med., MSc. Karineinrad Giesinger, Prof. Dr. Siegfried Leuchte1
1Labor für Bewegungsanalyse, Kinderspital and Kantonsspital, St. Gallen; 2Klinik für Orthopädische Chirurgie und Traumatologie des Bewegungsapparates; 3Institut für Medien, Kommunikation und Sport, Department Sportwissenschaft, Martin-Luther-Universität Halle-Wittenberg

Introduction: Quantitative gait analysis including surface electromyography (SEMG) is a recognized and valuable tool in the assessment of gait disorders. The aim of the study is to compare the midvastus and the mini-midvastus approach by means of SEMG in patients after total knee arthroplasty (TKA) at comparable walking speeds.

Material and methods: In this prospective study 18 patients resp. 22 patients (66 ± 8.9 yrs, 61.2 ± 7.8 yrs) with symptomatic unilateral gonarthrosis who underwent TKA (Journey®, smith&nephew) using a mini-midvastus (MIS) resp. midvastus (MIS) standard approach were compared. A healthy control group of 20 subjects (59.6 ± 6.3 yrs) was sampled. For each patient 20 gait cycles were averaged preoperatively, 6, 13, and 26 weeks postoperatively. Bilateral SEMG was obtained from 3 muscles (M. vastus medialis (Med), M. vastus lateralis (Lat), M. biceps femoris (Bic)). To compare the longitudinal results a step frequency of 90 steps/minute was given by a metronome. For statistical analysis unpaired t-tests and linear mixed models were used.

Results: Walking speed at a given frequency of 90 steps/minute did not differ significantly between the three groups at any of the time points. There were no significant differences in temporal electromyographic analysis of the parameters ‘Bic’ (p = .824), ‘Lat’ (p = .275), ‘Med’ (p = .202) between the MIS and standard group 6, 13, and 26 weeks postoperatively. Bic, Lat, and Med of the operated side showed significantly longer activities in all patients during stance phase compared to the control group 26 weeks postoperatively (Bic, Lat, Med: p

Conclusion: There were no significant differences in electromyographic analyses at comparable walking speeds between the MIS and the standard group. However, patients showed significantly longer muscle activities during stance phase than the healthy control group even six months postoperatively. It is important to better understand patients’ utilisation of the major muscles surrounding the knee joint in order to evaluate gait rehabilitation after minimally invasive TKA.
<table>
<thead>
<tr>
<th>First Name</th>
<th>Last Name</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrassart</td>
<td>S</td>
<td>8 S</td>
</tr>
<tr>
<td>Adler</td>
<td>T</td>
<td>23 S</td>
</tr>
<tr>
<td>Aebli</td>
<td>N</td>
<td>14 S</td>
</tr>
<tr>
<td>Aghayev</td>
<td>E</td>
<td>16 S</td>
</tr>
<tr>
<td>Albers</td>
<td>C E</td>
<td>3 S</td>
</tr>
<tr>
<td>Arlettaz</td>
<td>Y</td>
<td>8 S</td>
</tr>
<tr>
<td>Attinger</td>
<td>M</td>
<td>31 S</td>
</tr>
<tr>
<td>Badur</td>
<td>N</td>
<td>23 S</td>
</tr>
<tr>
<td>Baunach</td>
<td>D</td>
<td>28 S</td>
</tr>
<tr>
<td>Benninger</td>
<td>E</td>
<td>28 S</td>
</tr>
<tr>
<td>Betz</td>
<td>M</td>
<td>3 S</td>
</tr>
<tr>
<td>Biedert</td>
<td>R</td>
<td>30 S</td>
</tr>
<tr>
<td>Biedert R M</td>
<td></td>
<td>19 S</td>
</tr>
<tr>
<td>Bloch</td>
<td>H-R</td>
<td>27 S</td>
</tr>
<tr>
<td>Boileau</td>
<td>P</td>
<td>28 S</td>
</tr>
<tr>
<td>Brandenberg J E</td>
<td></td>
<td>24 S</td>
</tr>
<tr>
<td>Buchegger</td>
<td>T</td>
<td>9 S</td>
</tr>
<tr>
<td>Bühlert</td>
<td>T</td>
<td>2 S, 26 S</td>
</tr>
<tr>
<td>Burn</td>
<td>A</td>
<td>21 S</td>
</tr>
<tr>
<td>Christen</td>
<td>B</td>
<td>18 S</td>
</tr>
<tr>
<td>Christofilopoulos</td>
<td>P</td>
<td>5 S</td>
</tr>
<tr>
<td>Claus M</td>
<td></td>
<td>9 S</td>
</tr>
<tr>
<td>De Smet A</td>
<td></td>
<td>23 S</td>
</tr>
<tr>
<td>Deabate</td>
<td>L</td>
<td>24 S</td>
</tr>
<tr>
<td>Djahangiri A</td>
<td></td>
<td>12 S</td>
</tr>
<tr>
<td>Ehltinger M</td>
<td></td>
<td>19 S, 20 S</td>
</tr>
<tr>
<td>Erschbamer M</td>
<td></td>
<td>2 S, 11 S</td>
</tr>
<tr>
<td>Etter C</td>
<td></td>
<td>15 S</td>
</tr>
<tr>
<td>Farron</td>
<td>A</td>
<td>11 S</td>
</tr>
<tr>
<td>Farshad</td>
<td></td>
<td>12 S, 24 S, 25 S, 26 S</td>
</tr>
<tr>
<td>Fekete</td>
<td>T</td>
<td>14 S</td>
</tr>
<tr>
<td>Flebitig</td>
<td>O</td>
<td>15 S</td>
</tr>
<tr>
<td>Fischer</td>
<td>A</td>
<td>11 S</td>
</tr>
<tr>
<td>Fleury R</td>
<td></td>
<td>10 S</td>
</tr>
<tr>
<td>Gerber</td>
<td>C</td>
<td>13 S, 29 S</td>
</tr>
<tr>
<td>Göbel</td>
<td>P</td>
<td>25 S</td>
</tr>
<tr>
<td>Gravius</td>
<td>S</td>
<td>10 S</td>
</tr>
<tr>
<td>Graziol A</td>
<td></td>
<td>31 S</td>
</tr>
<tr>
<td>Grisch</td>
<td>D</td>
<td>26 S</td>
</tr>
<tr>
<td>Hersche</td>
<td>O</td>
<td>7 S</td>
</tr>
<tr>
<td>Hirschmann M</td>
<td></td>
<td>17 S</td>
</tr>
<tr>
<td>Holzer N</td>
<td></td>
<td>6 S, 22 S</td>
</tr>
<tr>
<td>Hoppe</td>
<td>S</td>
<td>18 S</td>
</tr>
<tr>
<td>Horisberger M</td>
<td></td>
<td>32 S</td>
</tr>
<tr>
<td>Klammer G</td>
<td></td>
<td>21 S</td>
</tr>
<tr>
<td>Kohl S</td>
<td></td>
<td>29 S</td>
</tr>
<tr>
<td>Kohut G</td>
<td></td>
<td>27 S</td>
</tr>
<tr>
<td>Krajnovic S</td>
<td></td>
<td>26 S</td>
</tr>
<tr>
<td>Krajnovic M</td>
<td></td>
<td>13 S</td>
</tr>
<tr>
<td>Krause</td>
<td>F</td>
<td>21 S, 22 S</td>
</tr>
<tr>
<td>Krieg A</td>
<td></td>
<td>5 S, 11 S</td>
</tr>
<tr>
<td>Lädermann A</td>
<td></td>
<td>12 S</td>
</tr>
<tr>
<td>Lattig</td>
<td>F</td>
<td>14 S</td>
</tr>
<tr>
<td>Lengnick H</td>
<td></td>
<td>4 S, 31 S</td>
</tr>
<tr>
<td>Lücherbach C</td>
<td></td>
<td>30 S</td>
</tr>
<tr>
<td>Lübbeke A</td>
<td></td>
<td>7 S, 25 S</td>
</tr>
<tr>
<td>Mathis</td>
<td>D</td>
<td>30 S</td>
</tr>
<tr>
<td>Meriem</td>
<td>S</td>
<td>10 S</td>
</tr>
<tr>
<td>Mertens A</td>
<td></td>
<td>7 S</td>
</tr>
<tr>
<td>Meyer D C</td>
<td></td>
<td>13 S</td>
</tr>
<tr>
<td>Min K</td>
<td></td>
<td>16 S</td>
</tr>
<tr>
<td>Müller D A</td>
<td></td>
<td>15 S, 16 S</td>
</tr>
<tr>
<td>Naal F D</td>
<td></td>
<td>4 S</td>
</tr>
<tr>
<td>Neubauer G</td>
<td></td>
<td>5 S</td>
</tr>
<tr>
<td>Neuhüttler S</td>
<td></td>
<td>2 S</td>
</tr>
<tr>
<td>Neumann M V</td>
<td></td>
<td>2 S</td>
</tr>
<tr>
<td>Nosewitz T</td>
<td></td>
<td>20 S, 21 S</td>
</tr>
<tr>
<td>Nyfeler R</td>
<td></td>
<td>12 S</td>
</tr>
<tr>
<td>Osterhoff G</td>
<td></td>
<td>29 S</td>
</tr>
<tr>
<td>Petek D</td>
<td></td>
<td>8 S, 19 S</td>
</tr>
<tr>
<td>Pflüger G</td>
<td></td>
<td>8 S</td>
</tr>
<tr>
<td>Prof A</td>
<td></td>
<td>14 S</td>
</tr>
<tr>
<td>Puskas G J</td>
<td></td>
<td>25 S</td>
</tr>
<tr>
<td>Rahm S</td>
<td></td>
<td>22 S</td>
</tr>
<tr>
<td>Riemmüller A C</td>
<td></td>
<td>7 S, 17 S</td>
</tr>
<tr>
<td>Rosso C</td>
<td></td>
<td>13 S, 30 S</td>
</tr>
<tr>
<td>Sariadi E</td>
<td></td>
<td>6 S</td>
</tr>
<tr>
<td>Schizas C</td>
<td></td>
<td>15 S</td>
</tr>
<tr>
<td>Schulz B</td>
<td></td>
<td>27 S</td>
</tr>
<tr>
<td>Schürch M</td>
<td></td>
<td>23 S</td>
</tr>
<tr>
<td>Schuster A</td>
<td></td>
<td>17 S</td>
</tr>
<tr>
<td>Seghrouchni K</td>
<td></td>
<td>9 S</td>
</tr>
<tr>
<td>Sigg A</td>
<td></td>
<td>19 S</td>
</tr>
<tr>
<td>Stepacher S D</td>
<td></td>
<td>3 S</td>
</tr>
<tr>
<td>Studer D</td>
<td></td>
<td>9 S</td>
</tr>
<tr>
<td>Sturzenegger M</td>
<td></td>
<td>23 S</td>
</tr>
<tr>
<td>Suhm N</td>
<td></td>
<td>25 S</td>
</tr>
<tr>
<td>Sussmann P</td>
<td></td>
<td>17 S, 18 S</td>
</tr>
<tr>
<td>Suter T</td>
<td></td>
<td>20 S</td>
</tr>
<tr>
<td>Terrier A</td>
<td></td>
<td>28 S</td>
</tr>
<tr>
<td>Thalmann C</td>
<td></td>
<td>6 S</td>
</tr>
<tr>
<td>Tharakan S</td>
<td></td>
<td>5 S</td>
</tr>
<tr>
<td>Tomagra S</td>
<td></td>
<td>29 S</td>
</tr>
<tr>
<td>Trampuz A</td>
<td></td>
<td>10 S</td>
</tr>
<tr>
<td>Turcot K</td>
<td></td>
<td>31 S</td>
</tr>
<tr>
<td>Ullmann R</td>
<td></td>
<td>32 S</td>
</tr>
<tr>
<td>Unno-Weig F</td>
<td></td>
<td>24 S</td>
</tr>
<tr>
<td>Vincenti M</td>
<td></td>
<td>22 S</td>
</tr>
<tr>
<td>Vlachopoulos L</td>
<td></td>
<td>4 S</td>
</tr>
<tr>
<td>Von Knoch F</td>
<td></td>
<td>7 S</td>
</tr>
<tr>
<td>Weidner J</td>
<td></td>
<td>3 S</td>
</tr>
<tr>
<td>Wieser K</td>
<td></td>
<td>6 S, 12 S</td>
</tr>
<tr>
<td>Winkler M</td>
<td></td>
<td>21 S</td>
</tr>
<tr>
<td>Zdenek K</td>
<td></td>
<td>20 S</td>
</tr>
<tr>
<td>Ziebarth K</td>
<td></td>
<td>4 S</td>
</tr>
</tbody>
</table>