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Swiss Medical Weekly

Formerly: Schweizerische Medizinische Wochenschrift
An open access, online journal • www.smw.ch

Supplementum 260
ad Swiss Med Wkly
2022;152
June 15, 2022

Swiss Society of Cardiology
Swiss Society for Heart and Thoracic Vascular Surgery
Abstracts of the joint annual meeting

St. Gallen (Switzerland), June 15–17, 2022

EMH Media
SCHWEIZERISCHER ÄRZTEVERLAG
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SWISS SOCIETY OF CARDIOLOGY
SWISS SOCIETY FOR HEART AND THORACIC VASCULAR SURGERY

ABSTRACTS OF THE JOINT ANNUAL MEETING 2022

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RAPID FIRE ABSTRACT SESSION: HEART FAILURE

O02

Relationship between wedge pressure and pulmonary congestion: hemodynamic characterization and prognostic impact in patients with severe aortic stenosis

M. Porsch[1], A. Breuss[1], A. Aschmann[1], L. Weber[1], S. Appert[1], P.K. Haager[1], D. Weilenmann[1], S. Wildermuth[1], H. Rickli[1], M.T. Maeder[1]

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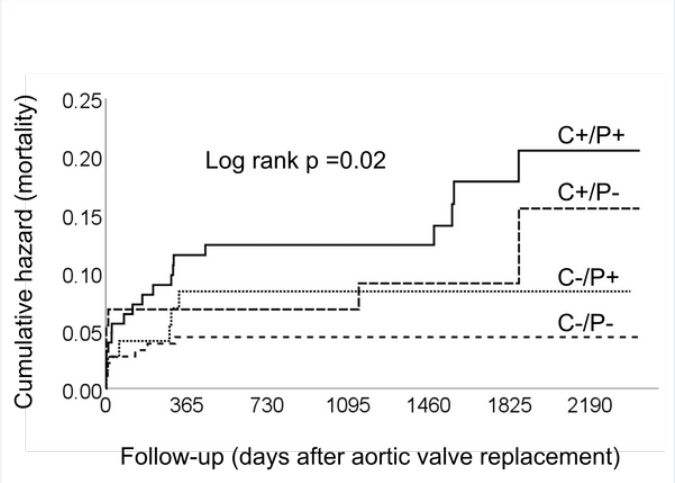
Introduction: In clinical practice, many patients with chronic heart failure syndromes present with elevated filling pressures but without detectable pulmonary congestion. However, this phenomenon has not be systematically evaluated. We assessed the relationship between the mean pulmonary artery wedge pressure (mPAWP) and pulmonary congestion by X-ray and its prognostic impact in patients with severe aortic stenosis (AS) undergoing aortic valve replacement (AVR).

Methods: We studied 471 patients (mean age 74±10 years) with severe AS [indexed aortic valve area 0.42±0.12 cm^2/m^2, left ventricular ejection fraction (LVEF) 58±12%] undergoing cardiac catheterization prior to AVR. All patients underwent upright chest X-ray the day before cardiac catheterization. Two radiologist independently scored all X-rays blinded to hemodynamic and clinical data by an established congestion score, and the average score from the two ratings was calculated. Congestion was defined as a score >1, and the cut-off for an elevated mPAWP was >15 mmHg. Four patterns were defined based on presence/absence of congestion (C + or -) and elevated/normal mPAWP (P + or -) (Table).

Results: Patients with a C+/P+ pattern had the lowest LVEF and tricuspid annular plane systolic excursion (TAPSE) and the worst hemodynamics, while C-/P- patients had the most favourable constellation. By definition, C-/P+ patients had higher mPAWP and thereby mean pulmonary artery pressure than C+/P- patients but LVEF, pulmonary vascular resistance, TAPSE and stroke volume index were similar (Table). After a median post-AVR follow-up of 1361 (957-1878) days mortality was highest in C+/P+ patients [hazard ratio (95%confidence interval) 3.43 (1.50-7.85); p=0.003 versus C-/P- (lowest mortality)]. Mortality of C-/P+ and C+/P- patients was intermediate (Figure).



Conclusions: The relationship between mPAWP and pulmonary congestion is not linear, and both parameters have prognostic implications in severe AS patients undergoing AVR. Further research is needed to define the mechanism determining extravascular pulmonary fluid accumulation in heart failure syndromes.

Conflict of interest to declare? No

	C-/P- n=188	C+/P- n=79	C-/P+ n=75	C+/P+ n=129	P value
Indexed aortic valve area (cm2/m2)	0.44±0.12	0.46±0.15	0.40±0.10	0.39±0.12	<0.001
Left ventricular ejection fraction (%)	62±9	59±10	56±13	52±14	<0.001
Tricuspid plane systolic excursion (mm)	23±4	21±4	21±5	19±5	0.002
Mean right atrial pressure (mmHg)	5±3	5±2	8±3	10±4	<0.001
Mean pulmonary artery pressure (mmHg)	19±4	21±7	29±7	35±9	<0.001
Mean pulmonary artery wedge pressure (mmHg)	10±3	11±3	21±5	24±6	<0.001
Left ventricular end-diastolic pressure (mmHg)	18±6	19±7	26±7	25±7	<0.001
Pulmonary vascular resistance (Wood units)	1.7±0.7	2.0±0.9	2.0±1.5	2.7±1.6	<0.001
Stroke volume index (ml/m2)	41±8	38±9	37±11	32±9	<0.001

O03

Improved vascular function after ventricular device implantation

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Introduction: In advanced heart failure (HF) ventricular assist device (VAD) implantation may be required. Although this results in hemodynamic improvement, the long-term success of these devices is restricted by its complications. Endothelial function is severely impaired in advanced HF. With VAD implantation, particularly with the transition from a pulsatile vascular system to a more continuous blood flow, the effect on vascular function and its relation to the development of complications are unknown.

Methods: In this prospective, observational single centre study, we evaluated endothelial vascular function via flow-mediated vasodilatation (FMD) and flicker-light induced retinal vasodilatation (FID), respectively. 34 patients with a VAD (mean age 58±10 years, 58% male, 74% with ischemic heart disease, 26 with CF-LVAD, 8 pulsatile bi-VAD, mean 336.73 ± 315.69 days after implantation) were compared to 45 patients (mean age 64±9 years, 85% male, 58% with ischemic heart disease) with advanced HF.

Results: Endothelial function at the larger artery level (FMD) was significantly better in VAD patients (7.2±4.6% and 5.2±3.52% respectively, p=0.033), whereas microvascular function was not different compared to patients with advanced HF (FIDa = 0.99 ±1.43% and 1.11±1.63%, respectively, p 0.746). The arterio-venous ratio (AVR) was significantly higher in the VAD group (0.90±0.06 vs 0.85±0.09, respectively, p=0.006) – reflecting

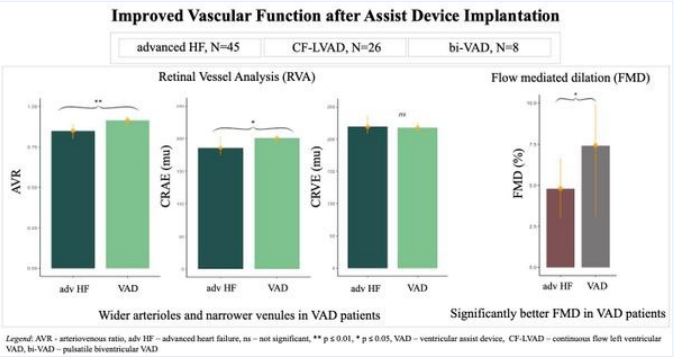
wider retinal arteriolar and narrower venular diameters in VAD patients. AVR was negatively associated with transpulmonary gradients, pulmonary resistance and right atrial pressure. There was no difference in micro- and macrovascular function between patients with CF-LVAD and bi-VAD.

Conclusion: While VAD implantation was associated with better endothelial function at the level of larger arteries, the effect on the microcirculation is more complex. Although FID was not different between the groups, a significant effect on AVR was observed – with wider arterioles and narrower venules. This may be a reflection of an improved hemodynamic state and better decongestion in patients on VAD support.

Definition of advanced HF criteria

Clinical
• NYHA III-IV * or
• NYHA II and ≥ 1 hospitalisation due to HF
Echocardiography
• LVEF ≤ 30% or
• Severe LV diastolic dysfunction including sPAP >35mmHg +- RV-Dysfunction
Reduced exercise capacity°
• pVO2max <12mL/kg/min or
• <50% predicted value)

**persistent NYHA III or NYHA IV despite optimal medical treatment*
°estimated to be of cardiac origin
(Legend: LVEF – left ventricular ejection fraction, LV – left ventricular, HF – heart failure, NYHA – New York Heart Association Functional Classification, pVO2 – peak oxygen uptake, sPAP - systolic pulmonary artery pressure)



Legend: AVR - arteriovenous ratio, adv HF – advanced heart failure, ns – not significant, ** p ≤ 0.01, * p ≤ 0.05, VAD – ventricular assist device, CF-LVAD – continuous flow left ventricular VAD, bi-VAD – pulsatile biventricular VAD

Conflict of interest to declare? No

O04

Direct oral anticoagulants compared to vitamin K-antagonists in patients with left ventricular thrombus

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Introduction: In the setting of left ventricular thrombus (LVT) direct oral anticoagulants (DAOC) are poorly studied. This retrospective multicenter study compared thrombus resolution and clinical outcomes of patients with LVT treated with DOACs or VKAs.

Methods: From an echocardiography database of three teaching hospitals in Switzerland, patients diagnosed with LVT between 2015 and 2021 were identified. All echocardiograms and outcomes were reviewed by independent physicians. Thrombus resolution rate and clinical outcomes were compared according to the underlying anticoagulation regimen.

Results: Overall, 101 patients (17.8% females, mean age 63.3±13.2 years) were included. Among those, 50.5% had a recent myocardial infarction, 38.6% chronic ischemic heart disease and 10.9% suffered from non-ischemic cardiomyopathy. At hospital discharge, 48 (47.5%) were treated with DOACs and 53 (52.5%) with VKAs. Initial left ventricular ejection fraction was 38±13%. 93.1% patients presented with apical wall motion abnormalities, mean wall motion score index was 1.91 ± 0.39. Initial thrombus size was comparable in both groups (table1).

Median follow-up was 799 (354;1236) days and the clinical composite endpoint combining stroke, systemic embolism, bleedings, myocardial infarction and death was comparable in the VKA (22.6%) and DOAC (27.1%) group, respectively. There was no difference in major (4% vs. 6.3%) and minor (13.5% vs. 4.3%) bleeding events, neither for stroke and systemic thromboembolism (14.3% vs 14.9%) or death (11.3% vs 8.5%). Thrombus resolution rate after 1 year was similar in the VKA and DOAC group (75.5% vs. 76.7%), but early thrombus dissolution (1st month) was faster in the VKA arm (p=0.049). In each group, 3 subjects had thrombus recurrence after cessation of anticoagulation.

Conclusion: Among patients with LVT, DOACs appear to be a safe and effective alternative to vitamin K antagonists, but thrombus seems to dissolve slower in the first month. An adequately powered randomized trial is needed to confirm these findings.

Conflict of interest to declare? No

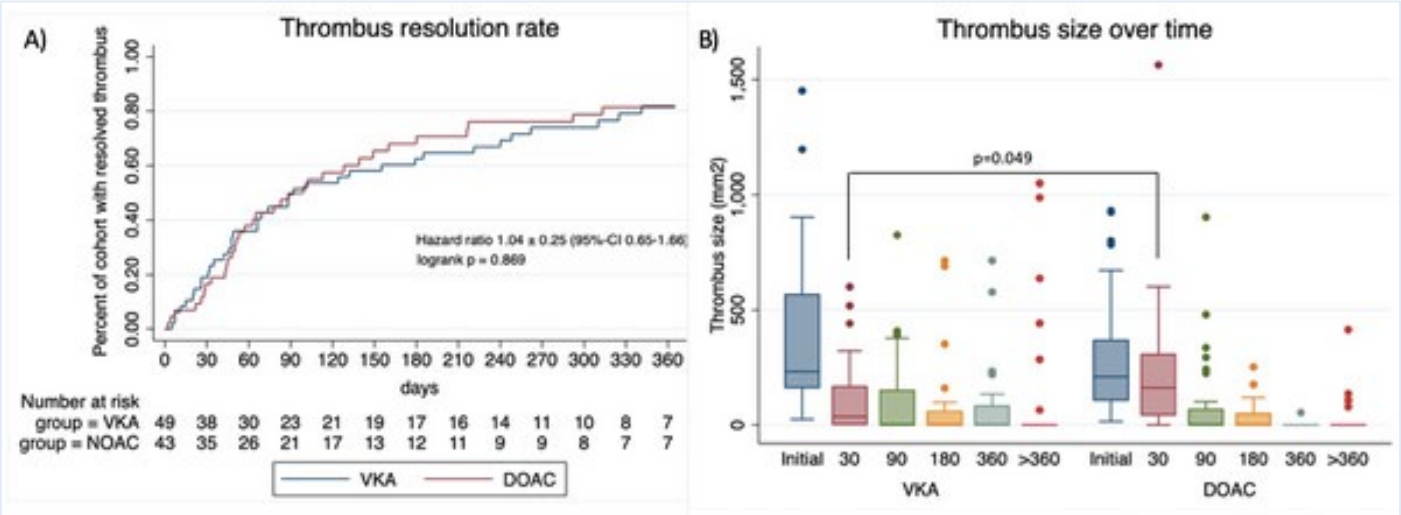

Figure 1: A) The Kaplan-Meier-Failure function displays the percentage of patients with complete thrombus resolution by treatment arm: vitamin K antagonists (VKA) vs. direct oral antagonists (DOAC). Complete resolution after 1, 3, 6 and 12 months was not different between treatment groups. **B)** The box plot illustrates the thrombus area over the time course of anticoagulation therapy. After 30 days of treatment, thrombus area was smaller in patients treated with VKAs compared to DOACs (p=0.049). There were no differences in thrombus area after 90, 180, 360 and >360 days.

Table 1: Baseline characteristics and clinical outcomes of study population. Vitamin K Antagonists (VKA), Direct oral anticoagulants (DOAC), Body mass index (BMI), ejection fraction (EF), ST-segment elevation myocardial infarction (STEMI), Non-ST-Segment elevation myocardial infarction (NSTEMI), coronary artery disease (CAD). *Defined as a composite endpoint of stroke, systemic thromboembolism, MI, all bleedings and death.

	VKA N = 53	DOAC N = 48	p-value
Baseline characteristics			
Age [years]	62.2 ± 14.2	64.3 ± 12.1	0.437
Female [%]	12 (22.6%)	6 (12.5%)	0.186
BMI [kg/m^2]	26.4 ± 4.3	28.2 ± 4.8	0.066
Arterial hypertension	31 (58.5%)	24 (50%)	0.395
Diabetes mellitus	11 (20.8%)	8 (16.7%)	0.601
Dyslipidemia	25 (47.2%)	25 (52.1%)	0.624
Current Smoking	12 (22.6%)	12 (25%)	0.782
Left ventricular EF	34.2 ± 11.7	40.7 ± 14.1	0.007
Left ventricular aneurysm	16 (32%)	10 (23.3%)	0.352
Follow-up – Outcomes			
Thrombus resolution rate after 1 year	75.5%	76.7%	0.869
Recurrent thrombus	3 (6.1%)	3 (7.0%)	1.000
Clinical Composite Outcome*	12 (22.6%)	13 (27.1%)	0.660
Stroke and Systemic embolism	7 (14.3%)	7 (14.9%)	0.610
Minor bleeding	7 (13.5%)	2 (4.3%)	0.561
Major bleeding	2 (4%)	3 (6.3%)	0.300
Myocardial infarction	3 (6.1%)	4 (8.3%)	0.491
Death	6 (11.3%)	4 (8.5%)	0.573

O05

Relationship between estimated glomerular filatration, hemodynamics and long-term mortality in patients with severe aortic stenosis undergoing valve replacement

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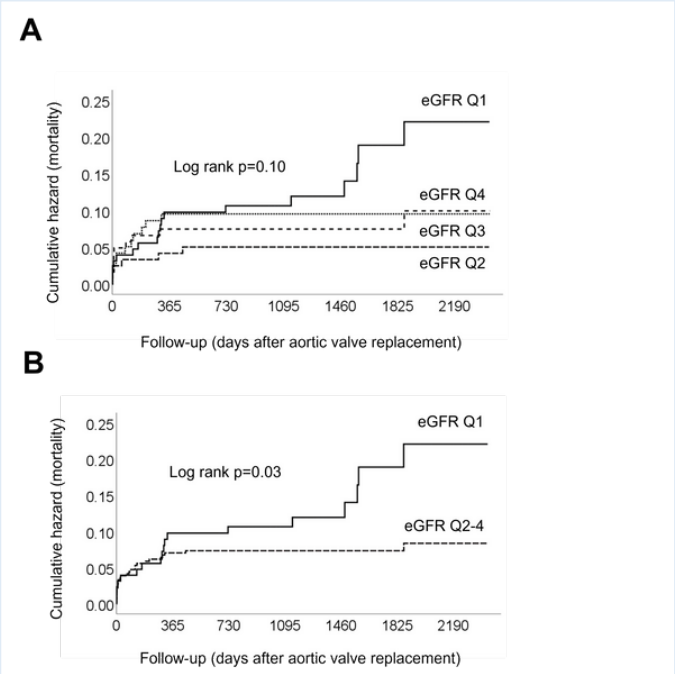
Introduction: Renal dysfunction is an important co-morbidity is many cardiovascular diseases. In heart failure, the estimated glomerular filtration rate (eGFR) predicts mortality. In these patients, eGFR is determined by hemodynamics, in particular right atrial pressure. In the present study, we investigated the correlation between eGFR and a) detailed invasive hemodynamics and b) long-term mortality in patients with severe aortic stenosis (AS) undergoing aortic valve replacement (AVR).

Methods: We studied 503 patients (mean age 74±10 years) with severe AS (indexed aortic valve area 0.42±0.12 cm^2/m^2, left ventricular ejection fraction 57±12%) undergoing right heart catheterization prior to surgical (72%) or transcatheter (29%) AVR. Serum creatinine was measured the day before cardiac catheterization, and eGFR was calculated according to the CKD-EPI formula.

Results: The mean eGFR in the entire population was 66±19 ml/min/1.73 m^2. There were statistically significant but relatively weak correlations between eGFR and the right atrial pressure V wave (RAPV; -0.11; p=0.02), right ventricular end-diastolic pressure (RVEDP; r=-0.12; p=0.009), mean pulmonary artery pressure (mPAP; r=-0.19; p<0.001), mean pulmonary artery wedge pressure (mPAWP; r=-0.17; p<0.001), pulmonary vascular resistance (PVR; r=-0.14; p=0.002), and stroke volume index (SVI; r=0.12; p=0.001). Patients in the lowest eGFR quartile had the highest RAPV, RVEDP, mPAP, mPAWP, and PVR, the lowest SVI (Table). After a median post-AVR follow-up of 1348 (948-1885) days mortality was nearly two-fold higher in patients in the first eGFR quartile compared to the other three quartiles (Figure; hazard ratio 1.94 (95%confidence interval 1.07-3.52); p=0.03). When used as a continuous variable, the association between eGFR and mortality was of borderline statistical significance (hazard ratio 0.985 (95%confidence interval 0.971-1.000); p=0.05).

Conclusions: In patients with severe AS, there is a statistically significant albeit relatively weak association between eGFR and several key hemodynamic parameters. In these patients, eGFR is a predictor of long-term mortality after AVR.



Conflict of interest to declare? No

	eGFR Q1 (n=128)	eGFR Q2 (n=123)	eGFR Q3 (n=122)	eGFR Q4 (n=128)	P value
Indexed aortic valve area (cm2/m2)	0.42±0.12	0.42±0.13	0.41±0.11	0.45±0.13	0.09
Left ventricular ejection fraction (%)	57±12	57±12	59±11	57±12	0.51
Tricuspid annular plane systolic excursion (mm)	20±5	22±5	21±5	21±5	0.48
Right atrial pressure V wave (mmHg)	9±5	9±4	8±4	7±3	0.04
Right ventricular end-diastolic pressure (mmHg)	9±5	9±3	9±4	8±3	0.02
Mean pulmonary artery pressure (mmHg)	28±11	26±11	25±10	23±9	0.001
Mean pulmonary artery wedge pressure (mmHg)	17±8	17±8	15±7	14±7	0.001
Pulmonary vascular resistance (Wood units)	2.4±1.7	2.0±1.2	2.1±1.1	1.9±1.1	0.01
Stroke volume index (ml/m2)	36±10	37±9	39±10	37±10	0.06

RAPID FIRE ABSTRACT SESSION: CORONARY ARTERY DISEASE

O06

Quantitative Flow Ratio to predict non-target-vessel-related events at 5-years in STEMI patients undergoing angiography-guided revascularization

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Introduction: In ST-segment-elevation myocardial infarction (STEMI), angiography-based complete revascularization is superior to culprit-lesion-only percutaneous coronary intervention (PCI). Quantitative Flow Ratio (QFR) is a novel, non-invasive, vasodilator-free method to assess the hemodynamic significance of coronary stenoses. We aimed to investigate the incremental value of QFR over angiography in non-culprit lesions (NCL) in STEMI patients undergoing angiography-guided complete revascularization.

Methods: This was a retrospective post-hoc QFR analysis of untreated non-target vessels (any degree of diameter stenosis (DS)) from the randomized, multicenter COMFORTABLE AMI trial by assessors blinded for clinical outcomes. The primary endpoint was cardiac death, spontaneous non-target vessel myocardial infarction (non-TV-MI) and clinically indicated non-target vessel revascularization (non-TVR) (i.e. ≥70%DS by 2D-Quantitative Coronary Angiography (QCA) or ≥50%DS and ischemia) at 5 years.

Results: Out of 1161 STEMI patients, 946 vessels in 617 patients were analyzable by QFR. At 5 years the rate of the primary endpoint was significantly higher in patients with QFR ≤0.80 (n=35 patients, n=36 vessels) vs. QFR >0.80 (n=582 patients, n=910 vessels) (62.9% vs. 12.5%, HR 7.33, 95%-CI 4.54–11.83, p<0.001), driven by higher rates of non-TV-MI (12.8% vs. 3.1%, HR 4.38, 95%-CI 1.47–13.02, p=0.008) and non-TVR (58.6% vs. 7.7%, HR 10.99, 95%-CI 6.39–18.91, p<0.001) with no significant differences for cardiac death. Multivariable analysis identified QFR ≤0.80, but not ≥50%DS by 3D-QCA as independent predictor of the primary endpoint. Results were consistent including only >30%DS by 3D-QCA.

Conclusion: Our study suggests incremental value of QFR over angiography-guided PCI for NCL among STEMI patients undergoing primary PCI.

Conflict of interest: Dr. Bär reports research grants to the institution from Medis Medical Imaging, Abbott, and Bangerter-Rhyner Stiftung

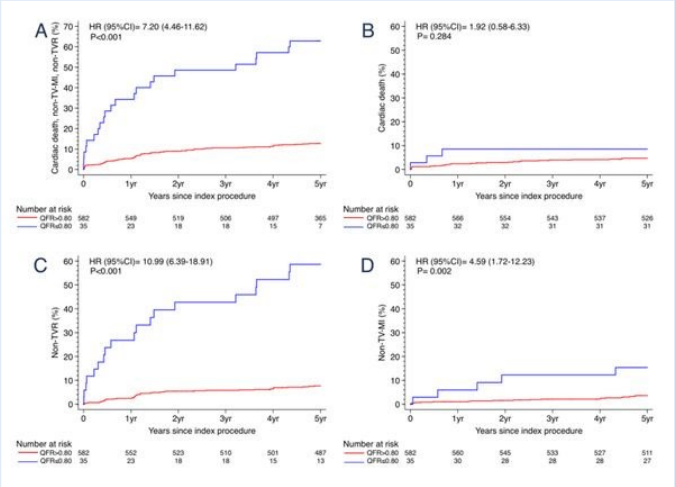
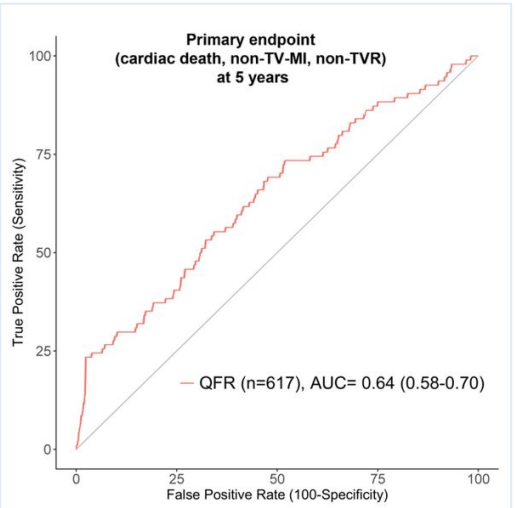


Figure 1. Kaplan-Meier Curves of the Primary Endpoint



QFR cut-off	0.80
Accuracy, %	86.1
Sensitivity, %	23.2
Specificity, %	97.5
Positive predictive value, %	62.9
Negative predictive value, %	87.5

Figure 2. ROC Analysis for the Primary Endpoint

Table 1. Clinical Outcomes at 5 Years

	QFR≤0.80 (N=35)	QFR>0.80 (N=582)	HR (95% CI)	p-value
Cardiac death, non-TV-MI, non-TVR, n (%)	22 (62.9)	72 (12.5)	7.33 (4.54-11.83)	<0.001
Cardiac death or MI (any), n (%)	10 (29.6)	55 (9.7)	3.58 (1.82-7.02)	<0.001
Cardiac death, n (%)	3 (8.6)	27 (4.7)	1.92 (0.58-6.33)	0.284
Non-TV-MI, n (%)	4 (12.8)	17 (3.1)	4.38 (1.47-13.02)	0.008
Non-TVR, n (%)	19 (58.6)	43 (7.7)	10.99 (6.39-18.91)	<0.001
MI (any), n (%)	7 (22.4)	32 (5.8)	4.38 (1.93-9.92)	<0.001

Depicted are number of patients (%) and hazard ratios (HR) with 95% confidence intervals (CI) from univariable Cox proportional hazards regressions with p-values. MI = myocardial infarction, non-TV-MI = non-target vessel myocardial infarction, non-TVR = non-target vessel revascularization, TV-MI = target vessel myocardial infarction, TVR = target vessel revascularization, QFR = Quantitative Flow Ratio.

Table 2. Independent Predictor Analysis

Primary endpoint (cardiac death, non-TV-MI, non-TVR)	Univariable analysis N=617 HR (95% CI)	p-value	Multivariable analysis N=571 HR (95% CI)	p-value
Sex (female)	1.23 (0.78-1.94)	0.374		
Age, years (per 1 year increase)	1.03 (1.02-1.05)	<0.001	1.02 (1.00-1.04)	0.061
BMI, kg/m2 (per 1 kg/m2 increase)	1.02 (0.97-1.07)	0.515		
Diabetes mellitus	2.15 (1.34-3.43)	0.001	1.63 (0.95-2.83)	0.079
Hypertension	1.66 (1.11-2.50)	0.015	1.14 (0.71-1.84)	0.588
Hypercholesterolemia	1.26 (0.83-1.92)	0.277		
Family history of CAD	0.83 (0.53-1.29)	0.402		
Killip III or IV	7.71 (2.83-20.99)	<0.001	3.03 (0.89-10.33)	0.077
Left ventricular function, % (per 5% decrease)	1.29 (1.17-1.43)	<0.001	1.25 (1.13-1.39)	<0.001
MI SYNTAX Score (per 5 points increase)	1.39 (1.25-1.54)	<0.001	1.19 (1.05-1.34)	0.007
QFR ≤0.80	7.33 (4.54-11.83)	<0.001	7.75 (3.89-15.42)	<0.001
DS ≥50% by 3D-QCA	2.63 (1.59-4.35)	<0.001	0.60 (0.28-1.28)	0.187

BMI = body mass index, CAD = coronary artery disease, DS% = diameter stenosis by 3D-QCA, MI SYNTAX Score = Myocardial Infarction TAXus and Cardiac Surgery Score, non-TV-MI = non-target vessel myocardial infarction, non-TVR = non-target vessel revascularization, QFR = Quantitative Flow Ratio, 3D-QCA = 3D-Quantiative Coronary Angiography

O07

Low-density lipoprotein electronegativity but not quantity determines mortality risk in acute coronary syndromes

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Introduction: Electric properties of low-density lipoprotein (LDL) particles have been causally linked to pro-atherogenic effects. We aimed here to study whether LDL levels or changes in its electronegativity predict fatal events following acute coronary syndromes (ACS).

Methods: We designed a case-cohort study using the data from 2'619 ACS patients prospectively recruited in the investigator-driven, multicentre SPUM-ACS study (ClinicalTrials.gov Identifier: NCT01000701). Plasma LDL levels were quantified at baseline and LDL was chromatographically resolved into 5 subfractions (L1-L5), with the L1/L5 ratio serving as a proxy for LDL electronegativity. By employing least-squares ordinary regression models determinants of plasma L1, L5, and the L1/5 ratio were studied, and the association with mortality of both LDL levels and its electronegativity were estimated using weighted Cox regression models.

Results: Higher L1/L5 ratios were associated with increased risk of death from any and cardiovascular causes at both 30-day (adjusted [adj.] hazard ratio [HR], 2.35, 95% confidence interval [CI], 1.81-3.03, and 2.37, 95% CI, 1.83-3.07, per standard-deviation [SD] increase) and 1-year intervals (adj. HR, 1.88, 95% CI 1.43-2.46 per SD increase), whereas higher LDL levels were not associated with fatal events (adj. HR, 1.20, 95% CI, 0.64-2.24, and 1.35, 95% CI, 0.69-2.63 per SD increase). These observations were independent of age, sex, cardiometabolic risk factors and baseline risk, as assessed by the updated GRACE score. The highest-ranked determinants of the L1/L5 ratio were total cholesterol, LDL, high-density lipoprotein, age and triglycerides. When compared with established risk factors (cardiometabolic risk factors, hsTnT levels, Killip class, kidney function), the L1/L5 ratio superseded several risk factors as an independent predictor of fatal events following ACS.

Conclusion: High L1/L5 ratios independently and strongly predict fatal events following ACS, whereas higher LDL levels do not. Our results suggest that LDL quality rather than quantity provides predictive utility after the index ACS.

Conflict of interest to declare? No

O08

Radiation protection systems in cardiac catheterization laboratories

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Background: Rising numbers and complexity of cardiac catheterization procedures necessitate optimal radiation protection to minimize radiation dose for the operator. Radiation exposure during cardiac catheterization can cumulatively promote the development of skin lesions, cataracts, or even brain tumors, while the weight of the lead vests can promote orthopedic injuries. Intending to mitigate the received fluoroscopic scattered radiation, Suspended Radiation Protection Systems (SRPS) and Scatter-Radiation Absorbing Drapes (PADs) have been developed. In this study, we investigated the radiation protection properties of a SRPS and a PAD compared with conventional lead aprons and thyroid shields in the cardiac catheterization laboratory.

Methods: 154 cardiac catheterization procedures were included in this study. For each procedure, exposure data were collected from the primary operator, wearing three real-time dosimeters at eye, chest and upper arm level and the assistant, wearing two real-time dosimeters at eye and chest level. All primary operators either wore a lead apron with thyroid shielding with or without using an additional PAD, or the SRPS. The assistants always wore a lead apron with thyroid shielding. Standardized operator exposure (SOE) was calculated by normalizing operator exposure to the dose area product.

Results: The SRPS and the PAD were able to significantly reduce the received SOE compared to the conventional lead apron (relative reduction: 92.35%, p<0.0001 and 77.82%, p<0.0001, respectively). In addition, the SRPS significantly reduced the SOE of assistants (SOE reduction: 70,69%,

p= <0,0001). The SRPS achieved a significantly higher protection from scattered radiation compared with the PAD, particularly at eye level.

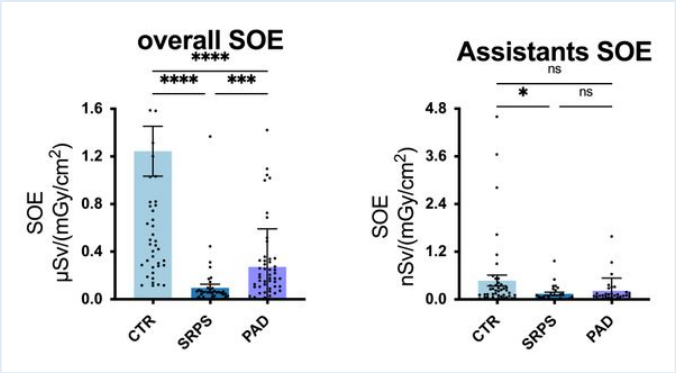

Figure 1. The overall SOE of the primary operator and the assistant.

Conclusion: In summary, our results further support the use of an SRPS and PADs in cardiac catheterization laboratories. The SRPS was beneficial in terms of protection, especially at the pertinent eye level SOE, and has the added benefit of reducing physical strain on the primary operator.

Conflict of interest to declare? No

O09

Combining ECG criteria with the ESC 0/1h-hs-cTnT algorithm for the early diagnosis of non-ST-elevation myocardial infarction

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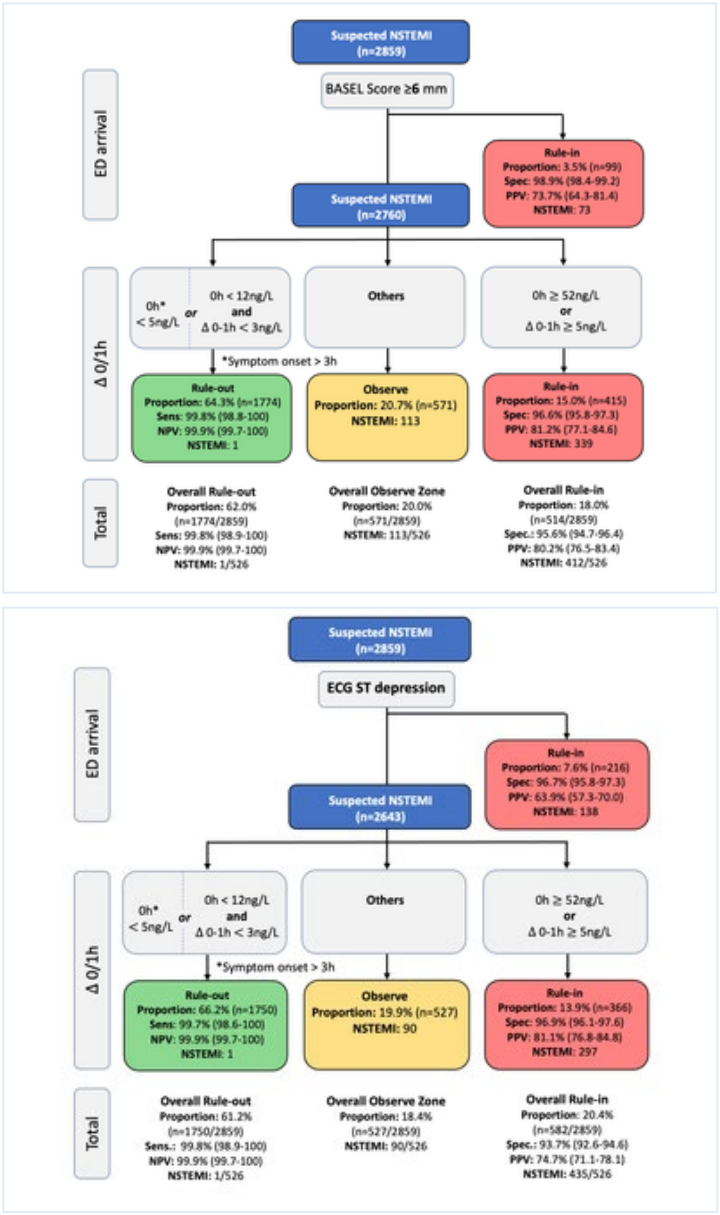
Introduction: The ECG is one of the three main diagnostic tools recommended for the assessment of patients with suspected non-ST elevation myocardial infarction (NSTEMI). However, it is unknown how established qualitative or novel quantitative ECG criteria can best be combined with high-sensitivity cardiac troponin (hs-cTn)-based diagnostic algorithms, such as the ESC 0/1h-algorithm, for the early diagnosis of NSTEMI.

Methods: ST-segment depression, T-wave inversion, and the quantitative *Better Analysis of ST-segment Elevations and Depressions in a 12- Lead-ECG* (BASEL)-Score were assessed blinded to all clinical data among unselected patients presenting with acute chest discomfort to the emergency department in an international multicenter diagnostic study. Final diagnoses were centrally adjudicated by two independent cardiologists based on complete cardiac workup, cardiac imaging and serial hs-cTn. Direct rule-in thresholds for the BASEL-Score achieving a positive predictive value (PPV) of >70% justifying early coronary angiography as the therapeutic consequence, were derived, validated and compared to ST-segment depression and T wave inversion applied 1) alone and 2) in combination with the ESC 0/1h-hs-cTnT-algorithm.

Results: Among 3299 eligible patients, NSTEMI was present in 581 (17.6%) patients. No routinely used ischemic ECG criteria reached the minimum predefined PPV of 70% (e.g. ST-segment depression had a PPV of 60.5% while T-wave inversion of 38%). The BASEL-Score was significantly higher in NSTEMI patients (median [IQR] 1.7 [0.7-3.8] mm) compared to non-STEMI patients (0.5 [0.1-1.3] mm; P<0.001). A BASEL-Score ≥6mm triaged 108 patients (3.3%) towards direct rule-in upon ED arrival, resulting in a PPV of 71.3% (95%CI 62.1-79.0) and a specificity of 98.9% (95%CI 98.4-99.2). Bootstrap internal validation confirmed the robustness of these findings. Most of the patients ruled-in by ST-segment depression or a BASEL-Score ≥6mm would have been also ruled-in by the ESC 0/1h-hs-cTnT-algorithm, albeit 1-2h later. Combining ST-segment depression or a BASEL-score ≥6mm with the ESC 0/1h-hs-cTnT-algorithm accelerated the rule-in in those identified already by the ECG-criteria, and resulted in a modest number of reclassifications from rule-out or observe to rule-in.

Conclusion: Combining either ST-segment depression or a BASEL-Score ≥6mm with the ESC 0/1h-hs-cTnT-algorithm accelerated and improved the early diagnosis of NSTEMI.

Conflict of interest to declare? No



O10

Drug-coated balloons for treatment of chronic total occlusions– insights from a prospective registry

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Introduction: Treatment of chronic total occlusions (CTO) is challenging. Despite use of modern drug eluting stents (DES), many patients experience target vessel failure (TVF) due to restenosis or stent thrombosis. In the setting of in-stent restenosis and de novo small vessels, drug coated balloons (DCB) have shown promising results. However, data about their use in CTO lesions is lacking. From a prospective registry, we analysed outcomes of patients who have undergone CTO-PCI with DCBs.

Methods: Consecutive patients with CTO lesions from the SIROOP Study (Study to evaluate the outcomes of coronary artery disease patients treated with SIROlimus Or Paclitaxel eluting balloons, ClinicalTrials.gov identifier: NCT04988685) were analysed. Analysed outcomes included, target lesion failure (TLF), target vessel myocardial infarction (TV-MI), target vessel revascularization (TVR) and death.

Results: 61 patients (mean age 67±10 years) underwent successful CTO-PCI with DCBs, predominantly (47 (77%)) with the Selution SLR® sirolimus-coated DCB (MedAlliance, Switzerland). The mean J-CTO score was 1.8±0.7, 46 (75%) lesions had moderate-severe calcifications and 55 (90%) were native CTO lesions No major periprocedural complications occurred and no acute vessel closure was observed. After a median follow-up time was 6.8 (IQR: [2.6; 9.2]) months, 3 patients (5.2%) presented with TLF and 1 (1.6%) with TVR. No death occurred during follow-up. TLF was attributable to restenosis in 2 cases and to non-healed dissection in 1 case. Further baseline, lesion, procedural characteristics and clinical outcomes are shown in Table 1 and 2. (Additionally, we will present angiographic and intravascular imaging data at the meeting.)

Conclusions: Our data suggests promising midterm outcomes in patients undergoing CTO-PCI with DCBs. Those findings warrant further investigation in a dedicated randomized trial.

Conflict of interest: Matthias Bossard has received consulting and speaker fees from Amgen, Astra Zeneca, Bayer and Mundipharma. Florim Cuculi has received consulting and speaker fees from SIS Medical and Abbott Vascular.

Baseline, lesion and procedural characteristics	***No. of patients/lesions*** *(n=61 /n=61)*
Age (years)	66.9±9.6
Males (%)	56 (92)
Diabetes mellitus (%)	16 (26)
Type of CTO (%)	
Native	55 (90)
In-sent occlusion (%)	6 (10)
Mean syntax score (mean±SD)	23±9.7
Strategy of PCI (%)	
Hybrid (DES+DCB)	44 (72)
DCB-only	17 (28)
Intimal approach	61 (100)
Type of technique (%)	
Anterograde	49 (80)
Retrograde	12 (20)
Mean J-CTO score (mean±SD)	1.8±0.7
Moderate to severe calcification (%)	46 (75%)
Type of DCB used (%)	
Selution SLR ®	47 (77)
Sequent please ®	12 (20)
Magic Touch ®	2 (3.3)
Mean number of DCB used per lesion (%)	1.6±0.8
Mean DCB diameter (mm, mean)	2.7±0.4
Cumulative mean DCB length per lesion (mm, mean)	51.6±29.3
Hybrid (DCB+DES)	49.7±27.6
DCB only	56.3±33.8
Mean DCB inflation pressure (atm, mean)	8.6±3.3
Mean number of stents implanted per lesion (%)	1.8±0.8
Cumulative stent length (mm, mean)	57± 25.4
Stent post-dilatation (%)	*35 (43)*
Mean maximal post-dilatation balloon size (mm, mean)	3.8±0.66
Mean maximal post-dilatation pressure (atm, mean)	21.6±8.7
Use of intravascular imaging (%)	19 (31)
OCT	18 (95)
IVUS	1 (5)
Vascular site complication (%)	1(1.6)
Dissection (%)	14
Minor	12 (86)
Major	2 (14)
Perforation (%)	3 (5)
Ellis I	2 (67)
Ellis II	1 (33)

Table 1: Clinical and angiographic characteristics

Data are mean (standard deviation), median (interquartile range) or number (percentage), as appropriate. CABG=coronary artery bypass grafting; CTO= chronic total occlusion; DCB= drug coated balloon; MI = Myocardial infarction; No. = Number.

Clinical outcomes	***6 months***
Patients at follow-up (%)	58/61 (95)
Median follow-up time (days)	208 (78; 280)
Follow-up angiography (%)	21 (34)
Primary endpoint (%)	
TLF	3 (5.2)
TLR	3 (5.2)
TV-MI	0 (0)
Cardiac death	0 (0)
TVR	1 (1.7)
CABG	1 (1.7)
All-cause death	0 (0)
Mechanism of DCB failure (%)	
Restenosis	2 (75)
Relevant dissection	1 (25)
Dyspnea (%)	
NYHA I	41 (71)
NYHA II	16 (27)
NYHA III	1 (2)
NYHA IV	0 (0)
Angina:	
No angina	40 (69)
CCS I	15 (26)
CCS II	2 (3.4)
CCS III	1 (1.6)
CCS IV	0 (0)

Table 2: Clinical outcomes

Data are mean (standard deviation), median (interquartile range) or number (percentage), as appropriate. CABG= coronary artery bypass graft; CCS= canadian cardiovascular society; DCB=drug coated-balloon; TLF=target lesion failure; TLR= target lesion revascularisatioon; TV-MI= target vessel myocardial infarction; TVR= target vessel revascularization; CTO= chronic total occlusion; DCB= drug coated balloon.

O11

Diagnostic performance of cardiac magnetic resonance segmental myocardial strain for detecting microvascular obstruction and LGE in patients presenting after a ST-elevation myocardial infarction

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Introduction: Microvascular obstruction (MVO) and Late Gadolinium Enhancement (LGE) assessed in cardiac magnetic resonance (CMR) are associated with adverse outcome in patients with ST-elevation myocardial infarction (STEMI). Our aim was to analyse the diagnostic performance of segmental strain for the detection of MVO and LGE.

Method: Participants were enrolled in the CARE-AMI trial, with the inclusion criteria being anterior STEMI and CMR performed after primary percutaneous coronary intervention (PCI) (mean 3.0±1.5 days). Segmental circumferential peak strain (SCS) was measured and characterized based on MVO and LGE presentation. The diagnostic performance of SCS to discriminate against MVO+, LGE+ and LGE- segments was assessed in a derivation and validation cohort.

Results: Forty-eight STEMI patients (62±12 years old), 39 (81%) males were included. All patients presented with LGE and in 40 (83%) patients, MVO was additionally present. Mean LGE extent was 38.9 ± 11.7% in the MVO+ group versus 27.9 ± 13.7% in the MVO- group (p=0.064). On a segmental level, 146 (19%) segments were LGE+/MVO+, 308 segments (40%) were LGE+/MVO-, and 314 (41%) segments were LGE-. SCS for detecting MVO+ segments was AUC=0.764 with an optimal cut-off value of -11.2%, resulting in a sensitivity of 78% and a specificity of 67% with a positive predictive value (PPV) of 94% and a negative predictive value (NPV) of 30% when tested in the validation group. For LGE+ segments, SCS with AUC=0.848 and a cut-off value of - 13.8% yielded a sensitivity of 76%, a specificity of 74%, a PPV of 70% and a NPV of 81%.

Conclusion: Segmental strain in STEMI patients was associated with good diagnostic performance for detection of MVO+ segments and very good diagnostic performance for LGE+ segments. Segmental strain may be useful as a potential contrast-free surrogate marker to improve early risk stratification in patients after primary PCI.

Conflict of interest to declare? No

Parameter	Cut-off value	Sensitivity [%]	Specificity [%]	NPV [%]	PPV [%]	P-value
Segmental Values LGE+/MVO+ vs LGE-						
Peak Strain (%)						
Circumferential	-11.2	78 (64-92)	67 (59-76)	30 (22-38)	94 (89-97)	<0.001
Longitudinal	-11.5	80 (67-94)	51 (45-56)	24 (17-31)	92 (86-96)	<0.001
LGE+ *(i.e. LGE+/MVO+ and LGE+/MVO-)* vs LGE-						
Peak Strain (%)						
Circumferential	-13.8	76 (68-86)	74 (61-86)	81 (74-86)	70 (61-77)	<0.001
Longitudinal	-13.5	84 (76-92)	57 (47-66)	73 (66-79)	71 (61-80)	<0.001

O12

Lower diagnostic accuracy of hs-cTnI in patients with prior coronary artery bypass grafting

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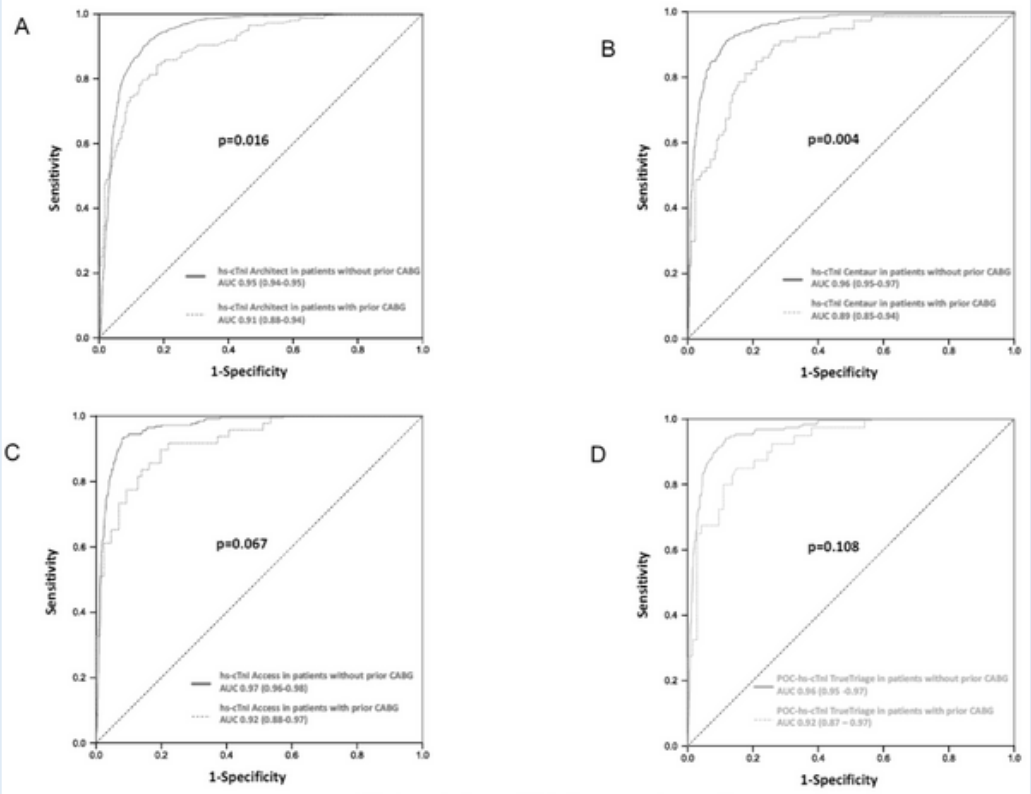
Introduction: High-sensitivity cardiac troponin T (hs-cTnT) and the ESC 0/1h-hs-cTnT-algorithm have worse performance in the early diagnosis of myocardial infarction (MI) in patients with prior coronary artery bypass grafting (CABG). It is unknown, whether this concern applies also to hs-cTnI, the most widely used analyte worldwide.

Methods: In an international multicenter diagnostic study, two cardiologists centrally adjudicated the final diagnosis in patients presenting to the emergency department with symptoms suggestive of MI. The objective was to compare the diagnostic accuracy of four different hs-cTnI assays and their performance within the ESC hs-cTnI 0/1h-algorithms in patients with versus without prior CABG. Diagnostic performance of the ESC hs-cTnI-0/1h-algorithms was assessed by safety for rule-out (sensitivity and negative predictive value), accuracy for rule-in (specificity and positive predictive value), and overall efficacy quantified by the percentage of patients triaged towards rule-out or rule-in.–Findings were externally validated in an U.S. multicenter diagnostic study.

Results: A total of 392/5'200 patients (8%) had prior coronary artery bypass grafting (CABG). Diagnostic accuracy of hs-cTnI as quantified by the area under the receiver-operating characteristics-curve (AUC) in these patients was high, but lower versus patients without prior CABG (e.g. hs-cTnI-Architect 0.91 versus 0.95; p=0.016). Sensitivity/specificity of rule-out/in by the European Society of Cardiology (ESC) 0/1h-hs-cTnI-algorithms remained very high [e.g. hs-cTnI-Architect 100% and 93.5%], but efficacy was lower (52% versus 74%, p<0.01). External validation (n=2113) confirmed these findings in 192 patients with prior CABG using hs-cTnI-Atellica, with 52% versus 36% (p<0.001) remaining in the observe zone not receiving a definitive triage within 1 hour.

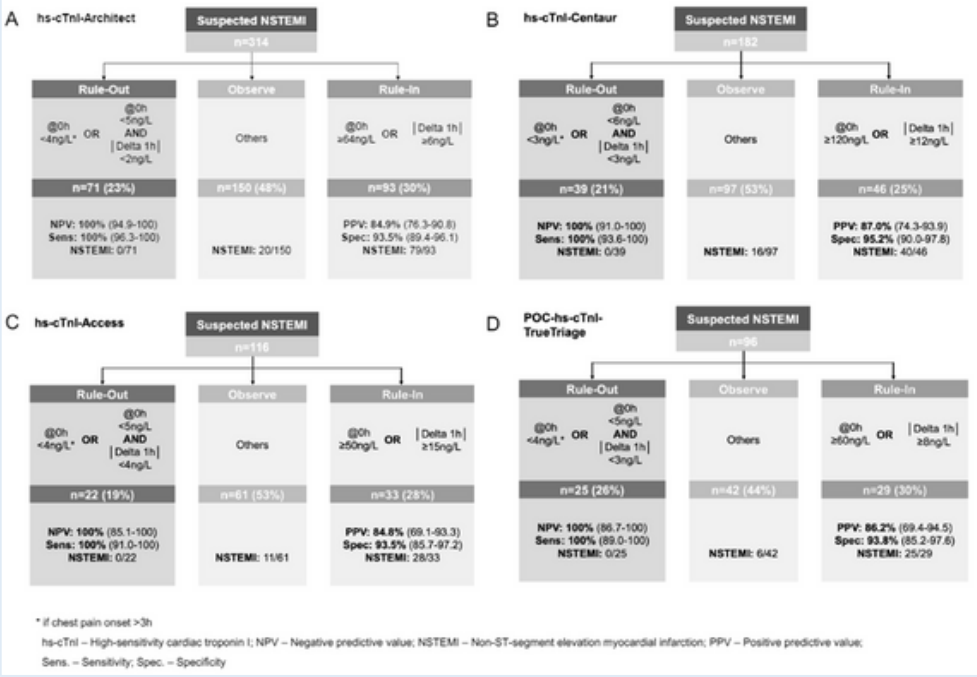
Conclusion: Diagnostic accuracy of hs-cTnI and efficacy of the ESC 0/1h-hs-cTnI-algorithms are lower in patients with prior CABG, but sensitivity/specificity remain very high.

Figure 1. Diagnostic accuracy of the four different high-sensitivity cardiac troponin I assays.



AUC – Area under the curve; CABG – Coronary artery bypass grafting

Figure 2. Diagnostic performance of the 0/1h-algorithms using four different high-sensitivity cardiac troponin I assays in patients with prior CABG.



* if chest pain onset >3h

hs-cTnI – High-sensitivity cardiac troponin I; NPV – Negative predictive value; NSTEMI – Non-ST-segment elevation myocardial infarction; PPV – Positive predictive value; Sens. – Sensitivity; Spec. – Specificity

Conflict of interest to declare? No

O13

Digital interprofessional communication with families in a cardiac surgery unit during the COVID-19 pandemia

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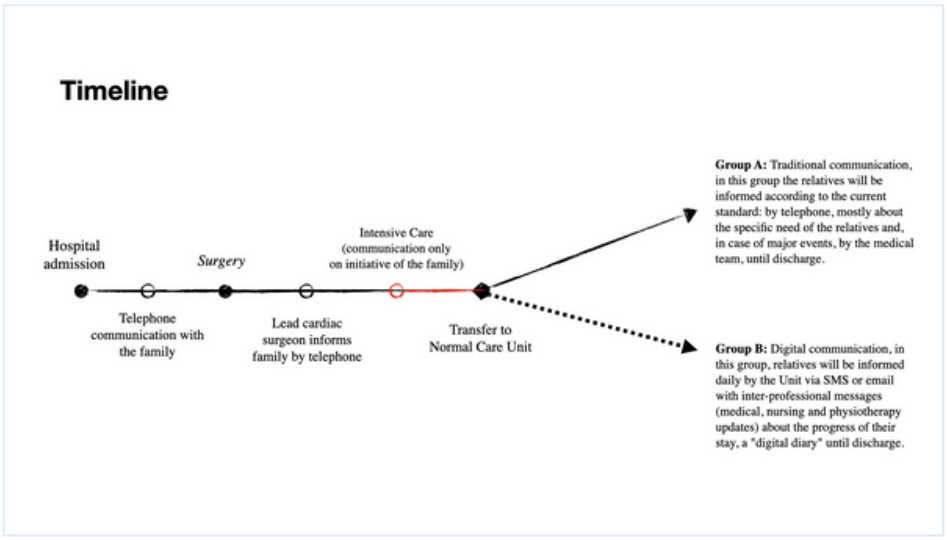
Background: The COVID-19 pandemic entailed cutting off any access to hospitals, denying patients daily visits from their relatives and friends. The standard communication between medical staff and relatives also suffered, with a perceived negative impact on overall care. We developed an electronic communication solution to achieve a daily digital communication with patients' families.

Methods: The communication software allowed families to receive daily updates by SMS, on patients' post-operative clinical state. Appreciation and performance of this inter-professional (medical, nursing and physiotherapy) communication was evaluated through a prospective randomized study. Two groups were compared (group D, 32 patients "Digital" receiving daily SMS and group S, 16 patients "Standard" without SMS), assessing satisfaction through dedicated surveys under COVID-19 restrictions. Moreover, outgoing vs incoming telephone flow between patients and their relatives (phone calls and SMS, for the two groups) were analyzed at different timeframes of the post-operative stay.

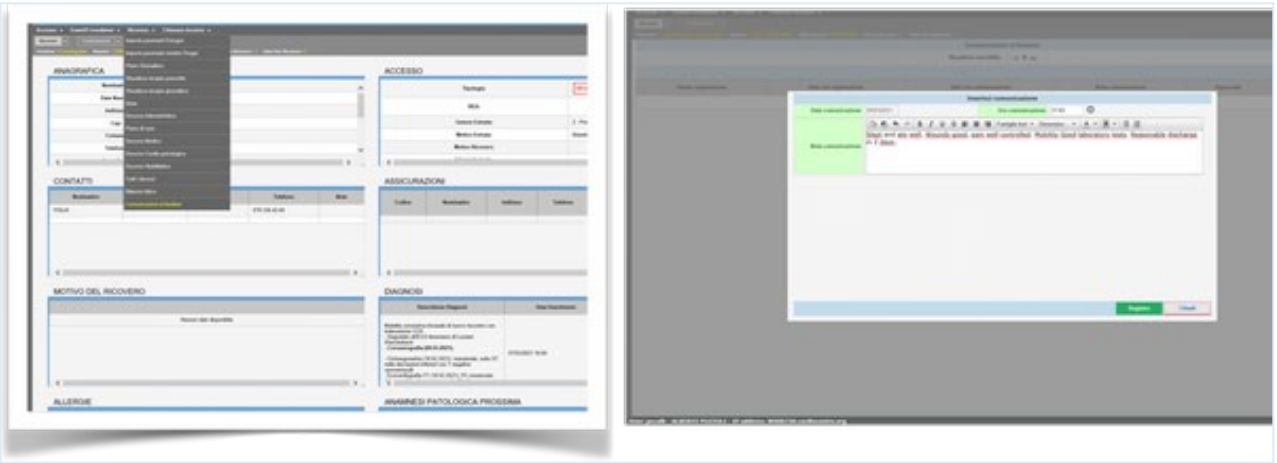
Results: Mean age of the population was 66 ± 7 years for both groups. The digital communication service was successfully adopted in group D in all cases, sending overall 155 communications (4.84 per patient). Calls received from relatives were 13 in group D vs 22 in group S (0.4 vs 1.4 calls per patient, p=0.002). Patients' outgoing vs incoming traffic flow was equal in the two groups for every timeframe (first two post-op days vs the rest), independently from digital communication. Comparing satisfaction of communication (from 1 to 7), level of information and understandability resulted 6.7 in group D vs 5.6 in group S (p=0.004). Appreciation of digital communication was highest during the first three post-operative days.

Conclusion: The restrictions caused by the COVID-19 pandemic generated simple and highly effective digital solutions for interprofessional communication from our cardiac surgery unit. Offering this digital service, which complements rather than replaces the classic communication method, significantly enhances overall satisfaction of patients and families.

Conflict of interest to declare? No



Randomized Study Protocol



Software for Digital Communication

RAPID FIRE ABSTRACT SESSION: BASIC SCIENCE

O15

Liraglutide lowers endothelial vascular cell adhesion molecule 1 in murine atherosclerosis independent of glucose levels

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Introduction: Clinical studies have shown a reduction in cardiovascular outcomes with liraglutide (a glucagon like peptide (GLP)-1 receptor agonist), but the exact mechanism is not understood. Vascular cell adhesion molecule (VCAM)-1 is involved in the pathogenesis of atherosclerosis. Our aim was to determine the effect of liraglutide on the endothelial surface expression of VCAM-1 and vascular inflammation in a mouse model of atherosclerosis.

Methods: Apolipoprotein E knockout mice were injected subcutaneously once daily with liraglutide or vehicle. Contrast enhanced ultrasound molecular imaging (CEUMI) using microbubble (MB)s targeted to VCAM-1 (MB_{VCAM-1}) and control MBs (MB_{Ctr}) was performed at baseline, 4, 8 and 12 weeks, and values were expressed as MB_{VCAM-1}/ MB_{Ctr} ratios. The mice were euthanized at 8 or 12 weeks and blood was collected for measurement of lipids, cytokines, glucose and glycated hemoglobin (HbA1c). Aortic tissue was removed for histology and immunohistology.

Results: CEUMI showed a 3-fold increase in endothelial surface VCAM-1 signal at 4, 8 and 12 weeks in vehicle treated animals, whereas in the liraglutide treated animals the signal ratio remained around 1 throughout the study ($p<0.001$ for liraglutide vs. vehicle treated animals at 4, 8 and 12 weeks). In liraglutide treated animals, plasma triglyceride, TNF-α, IL-1β and MCP-1 levels were significantly reduced by 44%, 63%, 55% and 43% respectively; LDL-cholesterol was not influenced. Plasma glucose and blood HbA1c levels were not affected by liraglutide treatment. Plaque lesion area and luminal VCAM-1 expression were reduced by liraglutide treatment at the aortic root (29 and 36 % respectively) and at the ascending aorta (71 and 32 % respectively).

Conclusion: Liraglutide treatment reduces endothelial VCAM-1 expression in a murine model of atherosclerosis independent of glucose levels. Combined with the reduction in cytokine levels this suggests that liraglutide acts on vascular inflammation through a mechanism that needs to be explored further.

Conflict of interest to declare? No

O16

IGF1R is a key-regulator of neonatal cardiac regeneration

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In contrast to other adult tissues myocardium cannot be sufficiently regenerated following significant myocardial infarction (MI). Efficient cardiac regeneration was demonstrated in neonatal mouse myocardial injury models. Similar observations were reported in other neonatal mammals including newborn human babies suffering from neonatal MI. The mechanisms of neonatal mammalian cardiac regeneration remain unclear. Here we show the crucial role of IGF1R which was unraveled in a time-course transcriptome analysis of neonatal mouse hearts.

IGF1R was specifically knocked-down (KD) in cardiomyocytes of wildtype postnatal day one (P1) mice using adeno-associated virus (rAAV9) delivered shRNAmirs. KD of Renilla served as control (REN-CTRL). $10x5^{13}$ viral genomes per kg bodyweight were injected intrathoracally.

Three batches of rAAV9 with different shRNAmirs were used for the IGF1R-KD groups. Viral transduction was confirmed by bioluminescence imaging on luciferase containing rAAV9 copies and by immunofluorescence staining of rAAV9 delivered GFP reporter. KD efficiency was confirmed in vitro using a retrovirus system and in vivo.

On P2 mice underwent either left anterior descending artery (LAD) ligation for induction of MI or SHAM surgery. Cardiac function was subsequently assessed by echocardiography 1 day post injury (dpi) and 21 dpi. Thereafter, hearts were harvested and left ventricular fibrosis was analyzed histologically.

LAD ligation resulted in significant MI in both, IGF1R-KD and REN-CTRL, LAD groups as proven by a markedly reduced ejection fraction (EF) 1 dpi. Importantly, 21 dpi both, IGF1R-KD and REN-CTRL, SHAM groups displayed normal functional cardiac parameters proving no effect on neonatal cardiac growth and development of only KD of IGF1R without LAD ligation. In contrast, LAD ligation IGF1R-KD mice presented significantly reduced EF 21dpi compared to the other 3 groups. Histological analysis revealed significant residual fibrosis in the IGF1R-KD LAD hearts compared to the other 3 groups.

Whereas IGF1R-KD or control rAAV9 does not alter physiological cardiac development, KD of IGF1R markedly impairs neonatal cardiac regeneration in neonatal mice after MI suggesting a crucial role in neonatal cardiac regeneration.

Conflict of interest to declare? No

O17

Lifelong dietary n3 fatty acid prevents aging-related diastolic and vascular dysfunction

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Introduction: The prevalence of left ventricular (LV) diastolic and vascular dysfunction increases as age advances and eventually proceeds to heart failure with preserved ejection fraction (HFpEF). There are no accepted effective therapies for the treatment of HFpEF in the aging, so a preventive strategy is an urgent need. We and others have reported previously the beneficial effects of omega-3 fatty acid ALA on cardiovascular disorders in animal models and human translational studies.

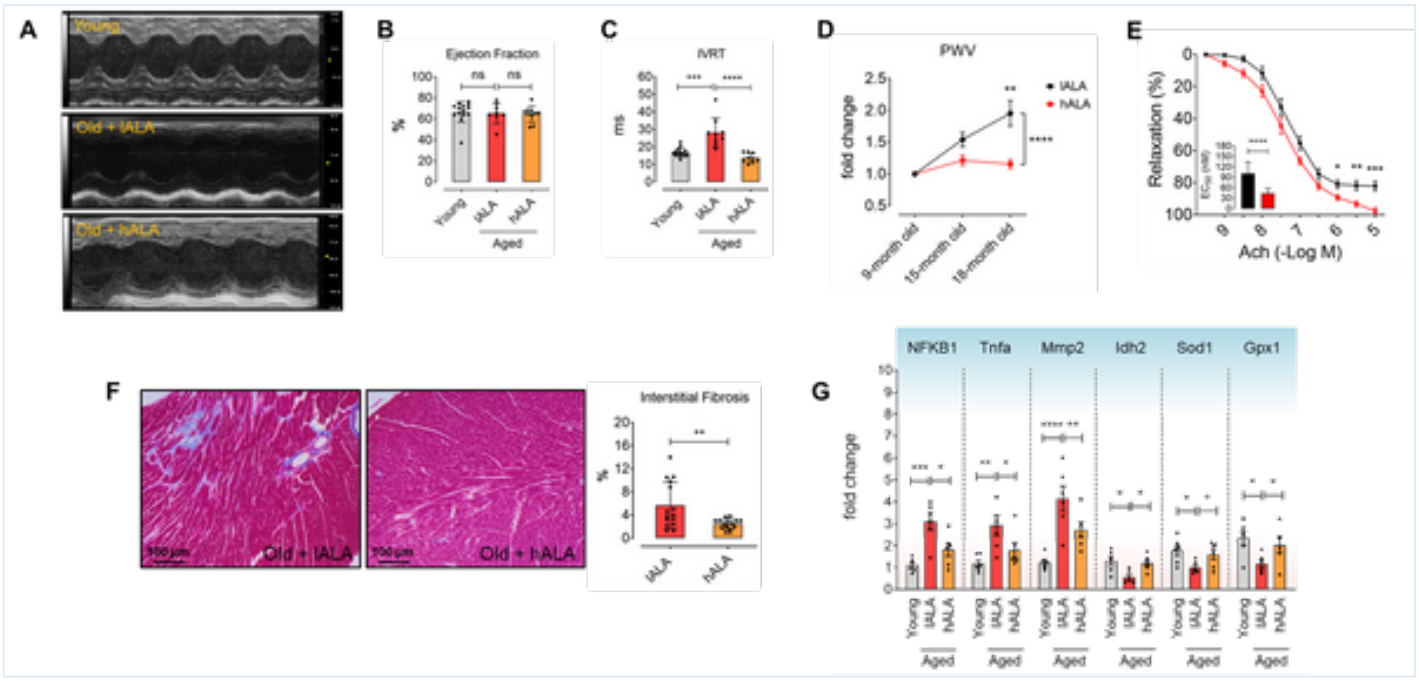
Here, we test the hypotheses (*A*) that lifelong dietary ALA prevents LV diastolic dysfunction and vascular aging in the murine model, and (*B*) that it regulates redox and inflammatory responses as well as extracellular matrix (ECM) homeostasis.

Methods and results: 6-months-old (young) wild-type C57BL/6J mice were fed a low (lALA) or high ALA (hALA) diet for 12 months. Here, we show that aged (18 months) mice on lALA recapitulate major hallmarks of HFpEF, including LV diastolic dysfunction with normal ejection fraction, impaired vascular function, cardiac fibrosis, arterial stiffening and inflammation, as well as elevated B-type natriuretic peptide (BNP). Lifelong ALA supplementation upregulates the mitochondrial tricarboxylic acid enzyme Idh2 and the reducing enzymes SOD1 and Gpx1, whereas it counteracts the NF-κB-regulated inflammatory process and suppresses ECM remodeling and fibrosis biomarkers MMP-2/TGF-β in both the heart and aorta from aged mice. These beneficial mechanisms lead to the prevention of LV diastolic dysfunction, impaired vasorelaxation and the reduction in cardiac fibrosis and arterial stiffening.

Conclusions: We provide evidence and mechanisms on how lifelong ALA supplementation is a successful strategy to prevent the development of diastolic dysfunction and vascular aging.

Key Words: Omega-3 fatty acid; α-linolenic acid (ALA); Aging; Heart failure with preserved ejection fraction (HFpEF)

Conflict of interest to declare? No



O18

A large-scale MicroRNA functional high-throughput screening identifies members of the MiR-515 family as potent inducers of human IPSC-cardiomyocyte proliferation

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Introduction: Ischemic cardiomyopathy, driven by loss of cardiomyocytes and inadequate proliferative response, persists to be a major global health problem. Experimental studies have shown that miRNAs may be used as a therapeutic option to reinduce adult cardiomyocyte proliferation. This study thought to evaluate proliferative potential in human cardiomyocytes after overexpression and inhibition of 2019 microRNAs (miRNAs).

Methods: To identify miRNAs that regulate cardiomyocyte proliferation, we performed functional high-throughput screenings in human iPSC-derived cardiomyocytes (hiPSC-CM) after transient hypoxia. Herein, 2019 miRNA-mimics for overexpression and 2019 anti-miRs for inhibition were individually transfected to examine EdU-incorporation in hiPSC-CM. MiR-515 family members that induced the highest EdU-uptake, were further assessed by immunostaining and molecular methods for markers indicative of early and late mitosis. In addition, RNA-Sequencing in hiPSC-CM after overexpression of MiR-515 family members was performed to examine differential gene expression and miRNA-modulated pathways involved in cardiomyocyte proliferation.

Results: Whereas miR-inhibitors failed to enhance EdU-uptake, overexpression of 28 miRNAs substantially induced proliferative activity in hiPSC-CMs, with an overrepresentation of miRNAs belonging to the primate-specific microRNA cluster on chromosome 19 (C19MC) and adjacent miR-371-373 family. Importantly, two members of the miR-515 family increase markers of early and late mitosis, indicative of cell division, and substantially alter signaling pathways and transcription factors relevant for cardiomyocyte proliferation.

Conclusion: Collectively, these results support a critical role of specific miR-515 family members for induction of proliferation in human cardiomyocytes under hypoxic conditions and therefore represent a potential novel therapeutic option in ischemic cardiomyopathy.

Conflict of interest: Drs. Jakob, Renikunta and Landmesser are listed as co-inventors on a pending patent held by Charité – University Medicine Berlin that relates to the miRNAs described in this abstract.

O19

Pharmacological blockade of histone methyltransferase SETD7 restores angiogenic response in experimental diabetes

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Introduction: Peripheral artery disease (PAD) is highly prevalent in patients with diabetes and associated with a high rate of limb amputation and poor prognosis. Surgical and catheter-based revascularization have failed to improve outcome in diabetic patients with PAD. Hence, a need exists to develop new treatment strategies able to promote blood vessel growth in the ischemic limb of diabetic patients. Mono-methylation of histone 3 at lysine 4 (H3K4me1) - a specific epigenetic signature induced by the methyltransferase SETD7 - favours a chromatin active and open state thus enabling the gene transcription.

Purpose: To investigate whether SETD7-dependent epigenetic changes modulate post-ischemic vascularization in experimental diabetes.

Methods: Primary human aortic endothelial cells (HAECs) were used as an in vitro model, and exposed to normal glucose (NG, 5 mM) or high glucose (HG, 25 mM) concentrations for 48 hours. T1D mice (streptozotocin-induced diabetes) were orally treated with SETD7-selective inhibitor called (*R*)-PFI-2 and with the vehicle for 21 days and followed by induction of hindlimb ischemia. Gastrocnemius muscle samples from patients with and without T2D were employed to translate our experimental findings.

Results: RNA-seq in HG-treated HAECs revealed a profound upregulation of the methyltransferase SETD7, an enzyme involved in mono-methylation of lysine 4 at histone 3 (H3K4me1). SETD7 upregulation in HG-treated HAECs was associated with an increase of H3K4-monomethylation levels as well as with impaired endothelial cell migration and tube formation. Of interest, both gene silencing (SETD7-siRNA) and pharmacological blockade of SETD7 by *(R*)-PFI-2 rescued hyperglycemia-induced impairment of angiogenic properties in HAECs. RNA-seq in HG-treated HAECs with and without SETD7 depletion unveiled an array of differentially expressed genes, which were mainly involved in blood vessel growth and angiogenic response. Among dysregulated genes, Chromatin immunoprecipitation (ChIP) assays showed that SETD7 specifically mono-methylates H3K4m1 in the proximity of Semaphorin-3G (SEMA3G) promoter, thus regulating its expression. Treatment of T1D mice with (*R*)-PFI-2 improved blood flow reperfusion at 14 days as compared to vehicle-treated animals. Finally, SETD7/SEMA3G axis was upregulated in muscle specimens from T2D patients.

Conclusion: Targeting SETD7 represents a novel epigenetic-based therapy to boost neovascularization in diabetic patients with PAD.

Conflict of interest to declare? No

MAIN SESSION WG PM&ELECTROPHYSIOLOGY: GUIDELINES INTO PRACTICE "2021 ESC GUIDELINES ON CARDIAC PACING AND CRT"

O20

Comparison of the accuracy of contact force measurement in four commercially available force-sensing ablation catheters

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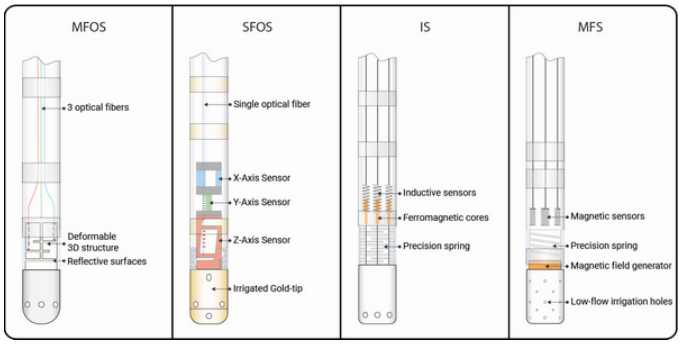
Background: Contact force-sensing catheters are widely used for ablation of cardiac arrhythmias. They allow precise quantification of catheter-to-tissue contact, which is an important determinant of lesion size and durability. Moreover, contact force information reduces the risk for cardiac perforation and is used for estimation of lesion size. However, the accuracy of contact force sensors across different manufacturers has not been validated independently.

Objective: To compare the accuracy and reproducibility of different force sensing catheters used in cardiac electrophysiology procedures.

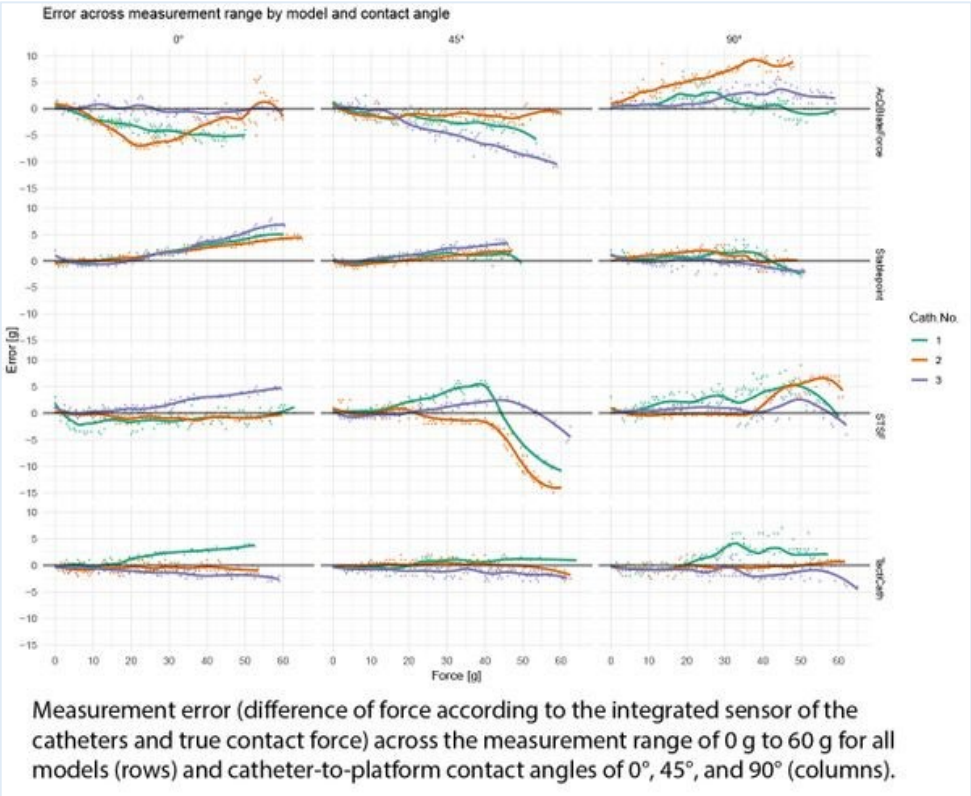
Methods: A force measurement setup was constructed allowing for accurate measurement of forces applied to a platform with a catheter. We studied four different catheter models, equipped with the following, unique force-measurement technologies (figure 1): 1) multiple-fiber optical sensor (MFOS, Tacticath Quartz, Abbott); 2) single-fiber optical sensor (SFOS, AcQBlate Force, Acutus/Biotronik); 3) inductive sensor (IS, Stablepoint, Boston Scientific); and 4) magnetic field sensors (MFS, Smarttouch SF, Biosense Webster). For each model, we assessed three catheters. Repeated measurements within the force range of 0g to 60g and at electrode-tissue contact angles of 0°, 45°, and 90° were performed and validated against the force measurement unit of our measurement setup.



Results: For each catheter, at least 500 measurements at different contact forces were performed. Correlation of measured-force to real-force was $\rho_{Spearman}$=0.99 for MFOS, $\rho_{Spearman}$=0.98 for SFOS, $\rho_{Spearman}$=0.99 for IS, and $\rho_{Spearman}$=0.98 for MFS. MFS and SFOS showed a higher variance for high forces and increased intra-catheter variability compared to MFOS and IS. IS overestimated higher contact force at 0° and 30°. MFS and SFOS underestimated contact force for higher forces at 30° and 45° (figure 2). Within a clinical range of 5g to 40g, the catheters reached the following root-mean-square-error, independent of contact angle: MFOS 0.88g ±0.68g, SFOS 2.15g ±1.74g, IS 0.88g ±0.72g, and MFS 1.13g ±1.01g.

Conclusion: Measured contact by force-sensing catheters correlates well with true exerted electrode-tissue force. Despite an excellent overall correlation, some technologies may be prone to significant errors at higher forces (>10g under-/overestimation of true contact force) with potential clinical consequences related to increased risk of perforation or less effective lesions.

Conflict of interest to declare? No



Measurement error (difference of force according to the integrated sensor of the catheters and true contact force) across the measurement range of 0 g to 60 g for all models (rows) and catheter-to-platform contact angles of 0°, 45°, and 90° (columns).

MAIN SESSION WG HEARTFAILURE / WG IMAGING: GUIDELINES INTO PRACTICE SESSION "2021 ESC GUIDELINE ON HEART FAILURE"

O21

Myocardial energetics and myocardial blood flow across the spectrum of light chain amyloidosis

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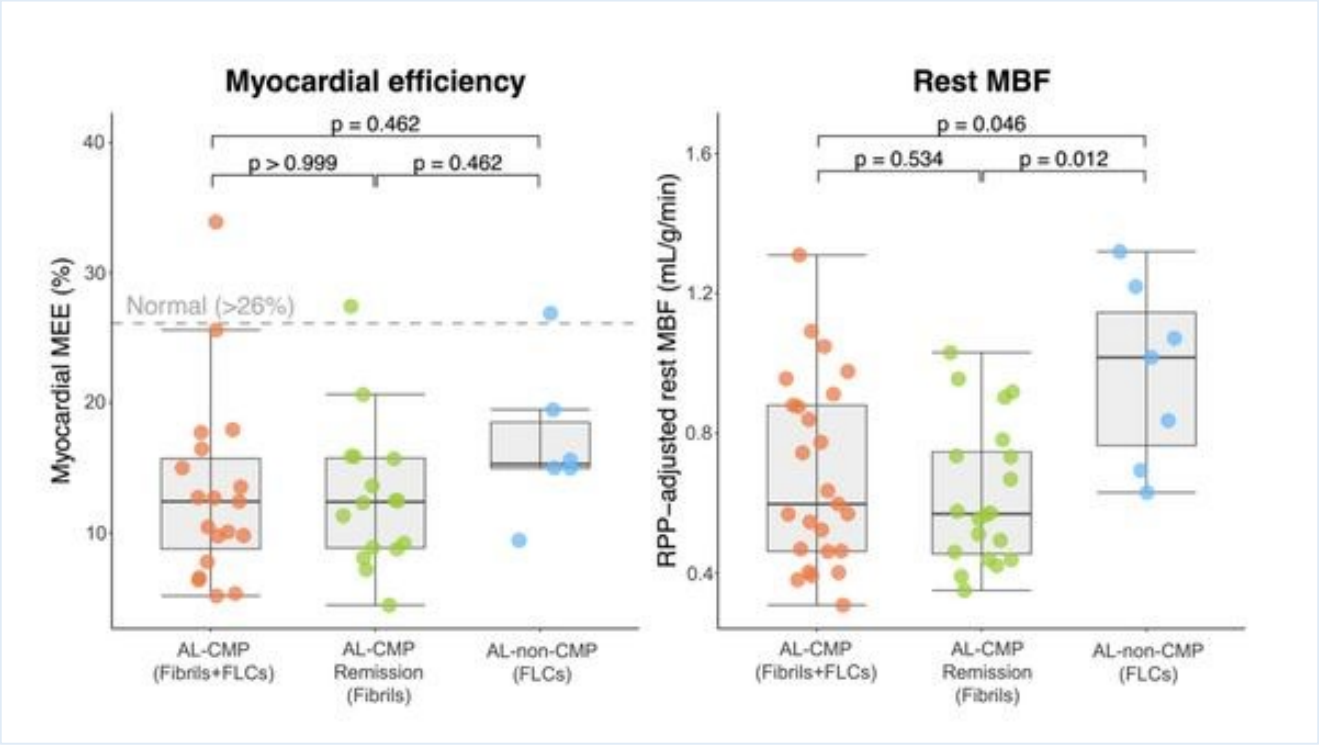
Introduction: The contributions of cardiac amyloid fibrils and light chain toxicity to the pathogenesis of myocardial dysfunction in light chain (AL) cardiac amyloidosis are poorly understood. The aim of the present study is to evaluate the effects of circulating, amyloidogenic immunoglobulin free light chains (FLCs) and myocardial AL amyloid fibrils (Fibrils) on myocardial mechanical external efficiency (MEE) and myocardial blood flow (MBF) in patients with AL amyloidosis.

Methods: This prospective, longitudinal study enrolled 61 biopsy-proven AL amyloidosis patients with recently diagnosed AL amyloidosis with [AL-CMP (Fibrils+FLCs), n=30] or without cardiomyopathy [AL-non-CMP (FLCs), n=9], and AL cardiomyopathy with hematological remission [AL-CMP Remission (Fibrils), n=22]. All subjects underwent ^{11}C-acetate positron-emission tomography (PET); myocardial oxygen consumption (MVO_2) and MBF were assessed from the clearance (k2) and inflow rate constant (k1) in 41 and 52 patients, respectively. MEE was calculated as (stroke volume*heart rate*mean arterial blood pressure*1.33*10^{-4})/(myocardial mass*MVO_2*20)*100 using stroke volume and myocardial mass from MRI. MBF was adjusted by rate-pressure-product (RPP).

Results: The mean age of the cohort was 62±7 years, and 51% were females. Between AL-CMP, AL-CMP Remission and AL-non-CMP, heart rate (83±11, 70±10, and 76±14/min; p=0.005), stroke volume (67±18, 76±13, and 85±20 mL; p=0.012), and indexed LV mass (80±28, 74±20, and 53±7 g/m^2, p=0.003) were different. MEE was lower than the previously established normal limits and did not differ among study groups (AL-CMP, 13±7%; AL-CMP Remission, 13±7%; AL-non-CMP, 17±7%; p=0.273; **Figure**). In contrast, RPP-adjusted MBF was lower in patients with fibrils (AL-CMP, 0.60 mL/min/g [0.46-0.90]; AL-CMP remission, 0.57 mL/min/g [0.44-0.77]; AL-non-CMP, 1.02 mL/min/g [0.69-1.22]; p=0.023; **Figure**).

Conclusion: Myocardial MEE is equally impaired in AL amyloidosis patients with FLCs but no cardiac fibrils, as in patients with cardiac fibrils. By contrast, MBF is reduced primarily in patients with cardiac fibrils. These findings suggest that FLCs reduce MEE, while fibrils reduce both MEE and MBF.

Conflict of interest to declare? No



MAIN SESSION WG PCI / WG IMAGING / SSCS: GUIDELINES INTO PRACTICE SESSION "2021 ESC GUIDELINES ON VALVULAR HEART DISEASE"

O22

Association of left ventricular myocardial work with all-cause mortality after transcatheter aortic valve implantation

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[1]*University Heart Center Zurich, Zurich, Switzerland*

Introduction: Echocardiography is an important modality for peri-interventional assessment of patients undergoing transcatheter aortic valve implantation (TAVI). Left ventricular (LV) global longitudinal strain measures ventricular deformation at end-systole, while myocardial work parameters determine LV deformation throughout the cardiac cycle and correct for afterload. This study aims at evaluating LV deformation by myocardial work efficiency (GWE) and index (GWI) in early post-TAVI echocardiography and explore its association with all-cause mortality.

Methods: We analyzed 144 patients with severe aortic stenosis and an echocardiography study within two weeks after TAVI. All echocardiographic analyses were performed using GE EchoPac v2.6. Follow-up data was obtained from medical records until September 2021. All-cause mortality was the primary endpoint.

Results: During a median follow-up duration of 625 [IQR: 511.0 – 769.8] days, 25 (17.5%) patients died. No significant differences in the baseline characteristics were found between non-survivors and survivors. GWE (Figure 1-A) and GWI (Figure 1-B) were significantly lower among non-survivors than survivors. Both myocardial work parameters differentiated non-survivors from survivors with a cut-off value of -85% for GWE and 990 mmHg% for MWI (Figure 2; both p<0.001).

Conclusions: In this study, GWE and GWI were lower among non-survivors than survivors and were associated with an increased risk of all-cause mortality after TAVI.

Figure 1

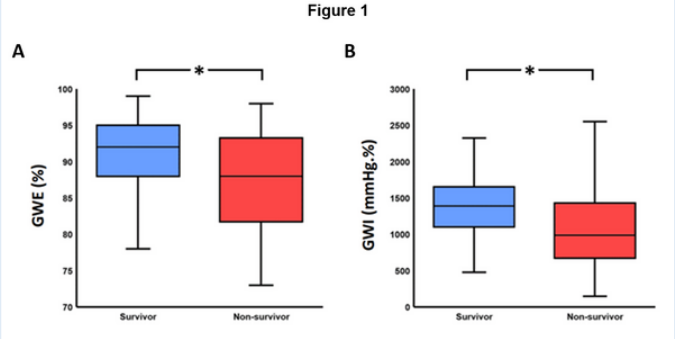
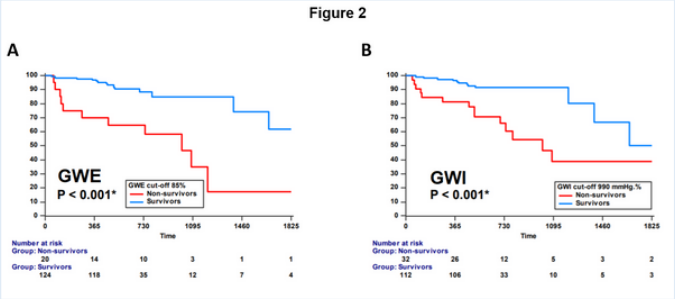


Figure 2



Conflict of interest to declare? No

RAPID FIRE ABSTRACT SESSION: VALVULAR HEART DISEASE

O23

Right and left ventricular strain for outcome prediction in severe aortic stenosis

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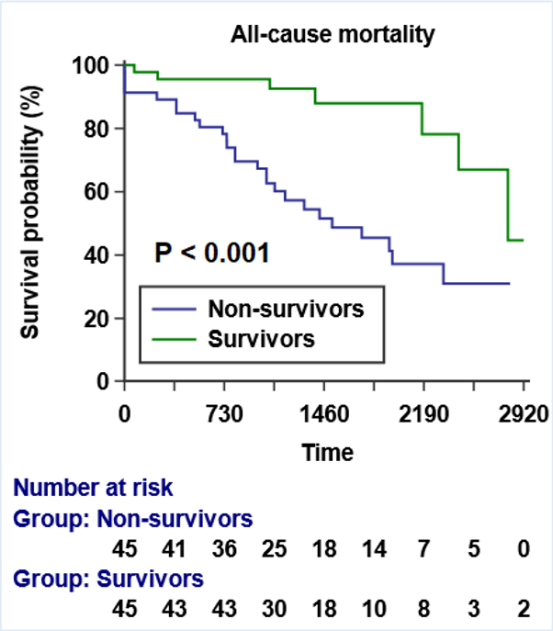
Introduction: Speckle-tracking echocardiography plays and increasingly important role in the evaluation of aortic stenosis (AS). Global longitudinal strain (GLS) contributes to outcome prediction in various cardiovascular diseases. Left (LV) and right ventricular (RV) GLS have been studied separately in AS patients undergoing trans-catheter aortic valve implantation (TAVI). We aim to study if combining LV and RV GLS improves their association with all-cause mortality post-TAVI.

Methods: A total of 91 patients undergoing TAVI for severe AS were included. LV GLS and RV GLS were determined by speckle tracking echocardiography within three months pre-TAVI. During post-TAVI follow-up, all-cause mortality was defined as primary endpoint. Combined ventricular strain was defined as the sum of LV+RV GLS.

Results: RV GLS was significantly impaired among non-survivors (N=57, median -13.93, p=0.001) compared to survivors (-17.19, p=0.001), while LV GLS was not (-11.53 versus -10.42, p=0.25). Survivors exhibited a lower combined ventricular strain compared to non-survivors (p=0.008).

A cut-off value of pre-TAVI RV GLS above -16.62% differentiated survivors from non-survivors with good sensitivity and specificity (sens. 77%, spec. 65%, AUC 71%, p<0.001). This cut-off value was used for Kaplan-Meier survival analysis, which revealed a significant difference between survivors and non-survivors (p<0.001) (Fig. 1). LV GLS and left ventricular ejection fraction (LVEF) did not differentiate significantly between survivors and non-survivors. RV GLS was associated with an increased risk of all-cause mortality (HR 1.10, p=0.017), also when adjusted to LV GLS (HR 1.10, p=0.028), while LV GLS alone was not (HR 1.04, p=0.39). Similar to RV GLS, combined ventricular strain revealed an association with all-cause mortality (HR 1.05, p=0.038).

Figure 1:



Conclusion: In this study, right ventricular strain as well as combined left and right ventricular strain was associated with all-cause mortality post-TAVI, while LV GLS and LVEF were not.

Conflict of interest to declare? No

O24

Pre-interventional pulmonary hypertension predicts mortality in patients with aortic stenosis after transcatheter aortic valve replacement. A definition update

D. Adamopoulos[1], S. Pagoulatou[2], G. Rovas[2], V. Bikia[2], H. Müller[1], G. Giannakopoulos[1], S. Mauler-Wittwer[1], M.-J. Licker[3], N. Stergiopulos[2], F. Lador[4], S. Noble[1]

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Introduction: Pulmonary hypertension (PH), traditionally defined as a mean pulmonary artery pressure (PAP) ≥ 25 mmHg, is associated with poor outcomes in patients undergoing a transcatheter aortic valve replacement (TAVR) for severe aortic stenosis (AS). Recently, a novel definition for PH has been proposed, placing the cut-off value of mean PAP at 20 mmHg. In light of the novel definition, the question on whether PH still preserves its prognostic significance has not been thoroughly studied.

Methods: The study population consisted of 380 patients with AS (mean age 83±6 years, 44% males), who underwent a right heart catheterization before TAVR. The cohort was divided according to the presence of PH (n=174, 45.7%) or not. Patients with PH were further divided into the following groups: 1) Pre-capillary PH ([Pre-capPH], pulmonary artery wedge pressure ≤ 15 mmHg [PAWP] and pulmonary vascular resistance [PVR] ≥ 3 Wood Units [WU], n=46, 12.1%); 2) Isolated post capillary PH ([IpcPH], PAWP > 15 mmHg and PVR < 3 WU, n=78, 20.5%); 3) Combined pre and post capillary PH ([CpcPH], PAWP > 15 mmHg and PVR ≥ 3 WU, n=82, 21.6%). Primary endpoint was all-cause mortality at 1 year.

Results: A total of 246 patients (64.7%) exhibited mean PAP > 20 mmHg. Overall, the presence of PH was associated with higher 1-year mortality rates (hazard ratio [HR] 2.8, 95% CI:1.4-5.8, p=0.004). Compared to patients with no PH, Pre-CapPH and CpcPH (but not IpcPH) were related to higher 1-year mortality (HR 2.7, 95% CI:1.0-7.2, p=0.041 and HR 3.9, 95% CI:1.8-8.5, p=0.001 respectively). This remained significant even after the adjustment for baseline comorbidities (PH: adjusted HR 2.5, 95% CI:1.2-5.3, p=0.013; Pre-capPH: adjusted HR 2.8, 95% CI:1.1-7.4, p=0.037; CpcPH: adjusted HR 3.7, 95% CI:1.6-8.6, p=0.003).

Conclusions: Pre-interventional PH, even at PAP mean values as low as 20 mmHg, is linked with poor outcomes in patients undergoing TAVR for severe AS. Patients with a pre-capillary PH component are characterized by extensive cardiac damage associated with an even worse prognosis.

Conflict of interest to declare? No

O25

Interventional treatment of severe tricuspid regurgitation using a novel heterotopic bicaval valve: first use of the TricValve® in Switzerland

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Introduction: Severe tricuspid regurgitation is associated with high morbidity and mortality. Given the increasing numbers of patients at high perioperative risk, interventional treatment of tricuspid regurgitation is a clinical need. Current catheter-based concepts include edge-to-edge repair, direct annuloplasty, and heterotopic bicaval valves. While the use of edge-to-edge repair and direct annuloplasty may be limited by anatomical restrictions, an interventional approach using heterotopic bicaval valves is an option in even challenging situations. We report the first two cases

of a novel catheter-based heterotopic bicaval valve implanted in Switzerland. The TricValve® (P+F products and features, Vienna, Austria) system consists of two self-expanding valves designed for implantation in the superior and inferior vena cava (Fig.).

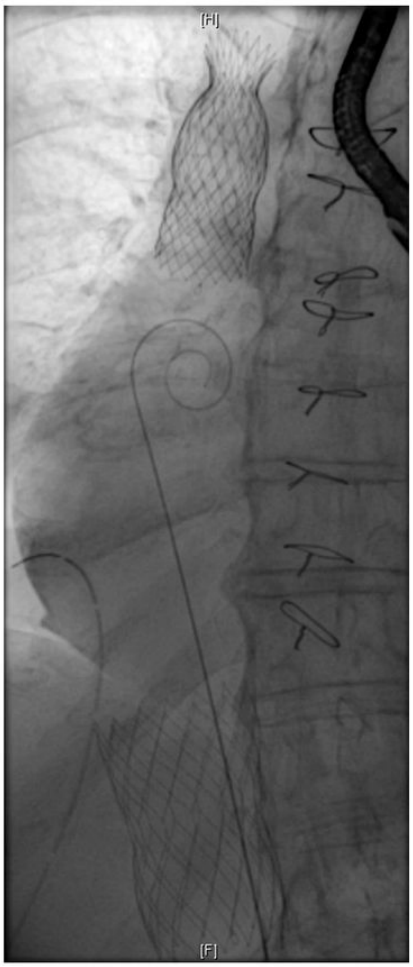

Fig. Bicaval valve implantation using the TricValve® system. The system is composed of two oversized self-expanding valves with three leaflets of bovine pericardium. While the valve in the inferior vena cava protrudes into the right atrium avoiding obstruction of the hepatic veins, the superior vena cava valve is funnel-shaped, with a skirt covering the entire base of the valve to prevent paravalvular leakage.

Methods: Patients with isolated severe tricuspid regurgitation and elevated risk for surgery were screened for different catheter-based techniques to treat the underlying disease. After transthoracic and transesophageal echocardiography, right-heart catheterization, coronary angiography and ECG-triggered computed tomography, 2 patients (female, 83 years, and male, 84 years) with severe secondary tricuspid regurgitation due to annular dilatation and a wide coaptation gap, non-severe postcapillary pulmonary hypertension, and right-heart failure were discussed in the Heart Team and selected for heterotopic bicaval valve implantation. Other interventional methods were not possible due to anatomic restrictions.

Results: Both patients underwent the intervention in general anesthesia under fluoroscopic and echocardiographic guidance. Via a right-sided venous femoral approach, both interventions were performed without complications. Postinterventional transthoracic echocardiography showed a persistant severe tricuspid regurgitation, however no backflow in the inferior vena cava and the jugular veins. Right ventricular function and pulmonary pressures were unchanged. Both patients could be discharged after 8 and 10 days, respectively.

Conclusion: Heterotopic bicaval valve implantation using the TricValve® is a safe and feasible procedure in selected patients with severe tricuspid regurgitation and right heart failure.

Conflict of interest to declare? No

O26

Arterial wave reflection and aortic valve stenosis: diagnostic challenges and clinical implications

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Introduction: Arterial wave reflection is an important component of the left ventricular afterload, affecting both pressure and flow to the aorta. The aim of the present study was to evaluate the impact of wave reflection on transvalvular pressure gradients (TPG), a key parameter for the evaluation of aortic valve stenosis (AS), as well as its prognostic significance in patients with AS undergoing a transcatheter aortic valve replacement (TAVR).

Methods: The study population consisted of 351 patients with AS (mean age 84±6 years, 43% males) who underwent a complete hemodynamic evaluation before the (TAVR). The baseline assessment included right and left heart catheterization, transthoracic echocardiography (TTE), and a thorough evaluation of the left ventricular afterload by means of wave separation analysis. The cohort was divided into quartiles according to the transit time of the backward pressure wave (BWTT). Primary endpoint was all-cause mortality at 1 year.

Results: Early arrival of the backward pressure wave was related to lower cardiac output (Q1: 3.7±0.9 lt/min vs Q4: 4.4±1.0 lt/min, p<0.001) and higher aortic systolic blood pressure (SBP, Q1: 132±26 mmHg vs Q4: 117±26 mmHg, p<0.001). TPG was significantly related to the BWTT, patients in the early arrival group exhibiting the lowest TPG (mean TPG, Q1: 37.6±12.7 mmHg vs Q4: 44.8±14.7 mmHg, p=0.005) for the same aortic valve area (AVA) (Q1: 0.58±0.35 cm^2 vs 0.61±0.22 cm2, p=0.303). In multivariate analysis, BWTT remained an independent predictor of mean TPG (beta 0.40±0.23, p=0.006). Moreover, the prevalence of low-flow, low-gradient AS with preserved ejection fraction was higher in patients with the earlier arterial reflection arrival (Q1: 33.3% vs Q4: 14.9%, p=0.033). Finally, patients with early arrival of the reflected wave (Q1) exhibited higher all-cause mortality at 1 year after the TAVR (unadjusted HR: 2.33, 95% CI: 1.17-4.65, p=0.016).

Conclusions: Early reflected wave arrival to the aortic root is associated with poor prognosis and significant aortic hemodynamic alterations in patients undergoing a TAVR for AS. This is related to a significant decrease in TPG for a given AVA, leading to a possible underestimation of the AS severity.

Conflict of interest to declare? No

O27

Single-center experience with transapical mitral valve replacement using the Tendyne™ prosthesis

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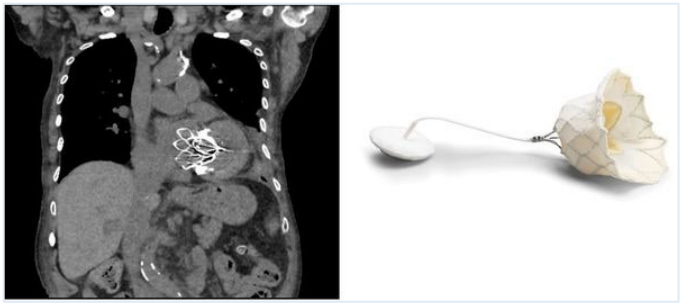
Introduction: Change in patients` demographics and development of percutaneous approaches for cardiac pathologies generate an increasing appeal for interventional cardiac therapy. The Tendyne™ (Abbott Vascular, Santa Clara, CA, USA) prosthesis is a novel transapical mitral valve replace-

ment (TMVR) system for patients suffering from mitral valve regurgitation. We report our experience with the first 9 implantations at our institution.



Methods: We included consecutive patients undergoing Tendyne™ implantation. After thorough Heart Team assessment, patients were operated in the hybrid operating room in close collaboration of cardiac surgeons, cardiologists and anesthetists.

Table 1: Preoperative patient characteristics ($n = 9$)

Age, median (m) [IQR]	78 [71 to 82]
Male Gender, n (%)	5 (56)
Mitral regurgitation Grade IV, n (%)	9 (100)
STS-Score, m [IQR]	4.29 [3.5 to 11.4]
Euroscore II, m [IQR]	6.62 [3.44 to 9.6]
LVEF in %, m [IQR]	34 [30 to 50.5]
LVEDD in mm, m [IQR]	58 [51 to 64]

Numbers presented as median, m, and interquartile range, or number (n) with %

Results: Since November 2020, Tendyne™ prosthesis implantation was successfully performed in 9 patients (see Table 1). Mean operation time was 135.8 ± 33.5 min. In one patient, prosthesis retrieval was necessary due to left ventricular outflow tract (LVOT) obstruction. So far, six patients (75%) had follow-up echocardiography at least 3 months postoperatively. Two patients showed mild paravalvular leakage. In all other patients, excellent prosthesis function was observed. Median [IQR] LVEF and LVEDD of the patients were 33.5 [24 to 51] and 62 [51 to 73], respectively. At follow-up dyspnea according to the New York Heart Association classification improved in 2 patients from NYHA III to NYHA II.

Conclusion: To our knowledge, this is so far the largest cohort using the Tendyne™ prosthesis in Switzerland. Though it is a novel technology, it shows to be a safe and feasible alternative for high-risk patients not amenable for surgery or transcatheter edge-to-edge repair. It is of utmost interest, that retrieval of Tendyne™ prosthesis had no detrimental effect on the native valve function. Patient selection, careful preoperative and bailout planning is key to obtain convincing results. With this technique, the Heart Team approach leaves mere decision making but reaches the next level of joint treatment of patients.

Conflict of interest to declare? No

O28

Excellent outcome in minimally invasive non-resection mitral valve repair in degenerative valve disease mid term results

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Introduction: The aim was to assess the early and midterm outcomes of minimal invasive non resection approach in patients with moderate to severe degenerative mitral valve regurgitation.

Methods: A retrospective analysis was performed on 156 consecutive patients who underwent a minimally invasive mitral valve repair between 2017 and 2021. All patients underwent minimal invasive approach. Mitral valve repair was repaired by a non-resection technique using neochord loop implantation and ring annuloplasty. Clinical as well echocardiogram follow up was conducted.

Results: The mean age was 64 ± 10 years and 66% were males. Minimally invasive mitral valve repair was performed in all 156 patients. The mean preoperative ejection fraction was 60.0 ± 10, the median LogEuroScore was 3.0 (range(IQR) 2.1-5.1) and 23% of patients had atrial fibrillation. A mean of 1.9± 1.0 neochord were used, ring size implanted was 36±2.8 mm. There was no in hospital mortality, stroke was registered in one (0.64%) an perioperative myocardial infarction in two cases (1.3%). Median follow up was 1.8 years (IQR 1 to 3 years) and was completed in 93.6% cases. The mortality rate was 0.71 (95%CI 0.18-2.86), rate of re-operation for recurrent mitral valve regurgitation was 3.22(95%CI 1.67 to 6.18) and stroke rate during was 1.56(95%CI 0.50 to4.85) per 100 patient years. At the latest echocardiography the recurrent mitral valve regurgitation +2> was registered in 6 cases, where one patient had severe valve regurgitation.

Conclusion: Minimally invasive mitral valve repair using a non-resection technique can be performed for severe degenerative mitral regurgitation with a low complication rate, excellent durability and very good mid-term results.

Conflict of interest to declare? No

RAPID FIRE ABSTRACT SESSION: PREVENTION, REHABILITATION AND SPORTS CARDIOLOGY

O29

Three-year experience of ECG screening in young athletes during a popular pedestrian race in Switzerland

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Introduction: Resting electrocardiogram (ECG) based screening is recommended by most sports societies for the prevention of sudden cardiac death (SCD) in young athletes. A recent Swiss proposal recommended to start ECG screening at the age of 15 years based on experts' opinion, but this remains debated. As part of a Swiss multicentre prospective ECG screening study (Swiss PAED), we started in 2018 to perform ECG screening during "The Escalade race", gathering >10'000 children and adolescents participants each year. Our aim is to report ECG findings of 3 consecutive years (2018, 2019 and 2021).

Method: Voluntary paediatric and adolescent athletes, aged 8 to 17 years, performing ≥6 hours of training/week in a squad, without known heart disease, were included. Demographics, anthropometrics, sport type, medical history, blood pressure, heart rate, cardiac auscultation, and 12-lead resting ECG were performed before or at least one hour after the race. ECGs were analysed according to the 2017 international recommendations for athletes, and classified as normal, borderline, or abnormal findings, and further investigations performed when appropriate.

Results: A total of 249 paediatric athletes (138 males, mean age 12.2 years ±2.6 SD) were recruited. Normal variants were found in 223 (89.6%) athletes, of which the most frequent was sinus arrhythmia in 47.4% of all athletes. Borderline findings were detected in 17 (6.8%) athletes, of which, the most frequent was right atrial enlargement in 4% of all athletes. Abnormal findings were found in 6 (2.4%) athletes (table 1).

Abnormal findings	Sex	Age (years)	Physical exam	Follow-up
Pathologic Q waves	Male	8	Normal	Normal transthoracic echocardiogram.
Pathologic Q waves	Female	10	Normal	Normal transthoracic echocardiogram.
Ventricular pre-excitation	Female	11	Normal	Confirmed accessory pathway. Normal transthoracic echocardiogram. Normal exercise test and 24h-Holter. Conservative management.
Atrial tachyarrhythmia	Female	11	Normal	Normal transthoracic echocardiogram. Normal 24-h Holter.
Two borderline findings: right axis deviation, right atrial enlargement	Male	11	Normal	Normal transthoracic echocardiogram.
ST segment depression in V3/V4	Female	13	Normal	Investigations pending.

Conclusion: ECG-based screening in 249 paediatric athletes during a popular race found abnormal ECG findings in 6 athletes (2.4%), comparable to prior data. A potential SCD cause was confirmed in only one athlete so far. Current ECG interpretation criteria seem appropriate in this population. Longitudinal follow-up of athletes should be performed to improve screening performances.

Conflict of interest to declare? No

O30

Prevalence and epidemiology of coronary sclerosis in young adults

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Introduction: Particularly in younger individuals, coronary atherosclerosis is associated with an increased risk for cardiovascular events. The aim of this study was to assess the prevalence and amount of coronary atherosclerosis in a population of young adults and to correlate these findings with underlying traditional cardiovascular risk factors.

Method: In this retrospective cohort study we assessed 4895 consecutive coronary computed tomography angiography (CCTA) scans and included 222 young adults, aged 20-45 years (± 6.72); 75% males, that underwent CCTA to investigate unspecific clinical findings or for pre-surgery assessment. Only 50% of the patients were symptomatic.

Results: Coronary atherosclerosis is a common finding in this cohort of young adults, and in 61 patients (27.5%) coronary atherosclerosis was detected (<20% up to 100% grade of stenosis). Proximal left anterior descending artery and proximal right coronary artery were the most common sites for atherosclerosis. The most frequent underlying cardiovascular risk factors were smoking (55%) and obesity (52%), while hemodynamically relevant stenoses were most commonly found in patients with diabetes, hypercholesterinemia or a positive family history. The relative risk for the presence of coronary atherosclerosis was highest for male gender (2.46), obese individuals (1.88) and diabetics (1.69).

Conclusion: Coronary atherosclerosis was surprisingly frequent in this cohort of young individuals. Early detection of coronary atherosclerosis may help to improve the awareness for risk factor management in cardiovascular prevention and to guide individual therapy to reduce adverse outcomes. An underlying selection-bias in primary preventive CCTA studies is unavoidable, as mass screenings with CCTA in healthy probands are not feasible. However, in our cohort, only 50% of the patients were symptomatic.

Risk factor	Relative risk
Male gender	2.46
Overweight	1.88
Diabetes	1.69
Sedentary lifestyle	1.65
Positive family history	1.56
Smoking	1.53
Diagnosis of arterial hypertension	1.52
LDL > 4.1mmol/l	1.43
HDL < 1.0mmol/l	1.40
Current arterial hypertension	1.27
Stress	0.93

Table 1: Relative risk (RR) to develop coronary atherosclerosis related to every cardiovascular risk factor.

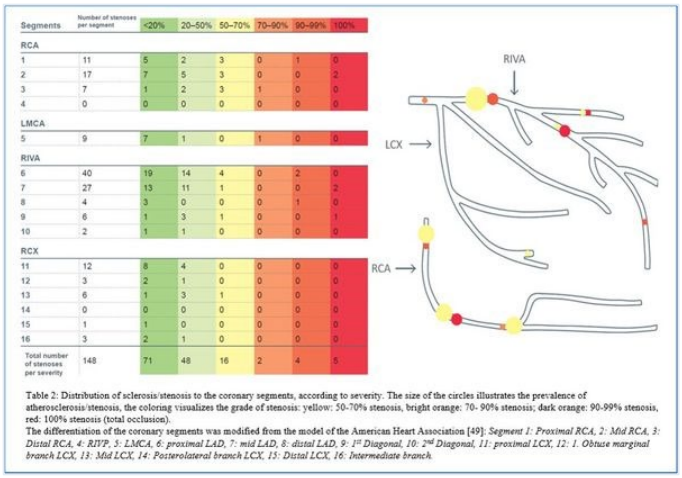

Table 2: Distribution of sclerosis/stenosis to the coronary segments, according to severity. The size of the circles illustrates the prevalence of atherosclerosis/stenosis, the coloring visualizes the grade of stenosis: yellow: 50-70% stenosis, bright orange: 70- 90% stenosis; dark orange: 90-99% stenosis, red: 100% stenosis (total occlusion).
The differentiation of the coronary segments was modified from the model of the American Heart Association [49]: *Segment 1: Proximal RCA, 2: Mid RCA, 3: Distal RCA, 4: RIVP, 5: LMCA, 6: proximal LAD, 7: mid LAD, 8: distal LAD, 9: 1st Diagonal, 10: 2nd Diagonal, 11: proximal LCX, 12: 1. Obtuse marginal branch LCX, 13: Mid LCX, 14: Posterolateral branch LCX, 15: Distal LCX, 16: Intermediate branch.*

Conflict of interest to declare? No

O31

Optimized treatment of refractory hypercholesterolemia in patients with atherosclerotic cardiovascular disease or heterozygous familial hypercholesterolemia with alirocumab (OPTIMIZE)

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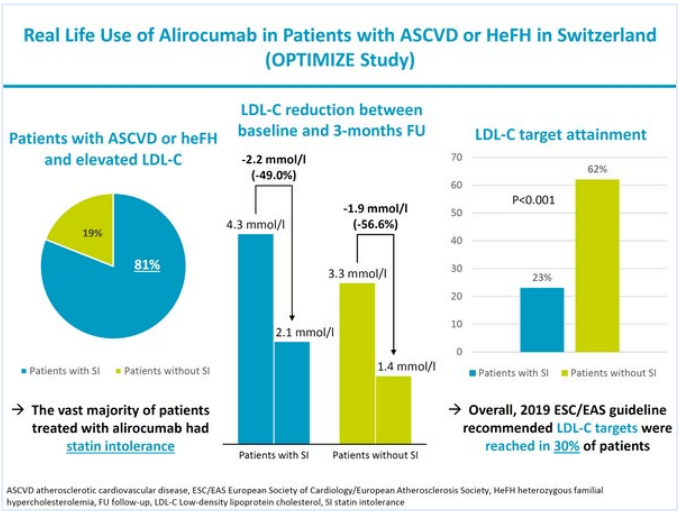
Introduction: Low-density lipoprotein cholesterol (LDL-C) is a major risk factor for atherosclerotic cardiovascular disease (ASCVD). In confirmatory trials, proprotein convertase subtilisin/kexin type 9 inhibitor alirocumab substantially lowered LDL-C and reduced cardiovascular morbidity and mortality. However, the real-life use of alirocumab in Switzerland has not yet been studied.

Methods: In this prospective nation-wide cohort study, we aimed to investigate the patient profile and real-life efficacy and safety of alirocumab in 207 patients with ASCVD or heterozygous familial hypercholesterolemia and increased LDL-C despite maximally tolerated statin therapy. LDL-C was measured at baseline and after 3-months follow-up, and LDL-C targets attainment was assessed using the 2019 European Society of Cardiology (ESC) / European Atherosclerosis Society (EAS) Guidelines on the Management of Dyslipidemias.

Results: Overall, mean age was 63±11 years, 138 (67%) were men, and 168 (81%) had statin intolerance (SI). Patients with SI had a higher baseline LDL-C (4.3±1.4 vs. 3.3±1.4 mmol/l; p<0.001) and less frequently ASCVD (71% vs. 95%; p=0.002). After 3 months of treatment with alirocumab, LDL-C was reduced from 4.1±1.5 to 2.0±1.2 mmol/l (50.5%; p<0.001). Mean absolute and relative reductions in LDL-C were similar in patients with versus without SI (2.2±1.2 vs. 1.9±1.3 mmol/l; p=0.24 and 49.0 vs. 56.6%; p=0.11, respectively). The 2019 ESC/EAS guidelines-recommended targets for LDL-C were reached in 30% (95%CI 24-37%) patients; they were achieved in 23% (95%CI 16-30%) patients with and 62% (95%CI 46-79%) without SI (p<0.001). In total, adverse events were recorded in 25 (12%) patients, with no new safety signals.

Conclusions: In real-life setting, alirocumab was predominantly used in patients with SI suggesting that the great majority of patients with insufficient LDL-C control do not benefit from this therapeutic option in Switzerland. LDL-C lowering was potent and similar in patients with and without SI, replicating the favourable efficacy-safety profile of alirocumab from randomized trials.



Conflict of interest: IS received speaker fee and research support by Sanofi-Aventis (Suisse) SA, Vernier, Switzerland as well as travel and personal fees by Amgen, Astra Zeneca, Daiichi Sankyo, Menarini, MSD, Recordati, and Servier. TB received speaker fees and research support by Sanofi-Aventis as well as speaker or travel fees by Servier, Daichii, MSD, and Novartis. SB, TF, and DS are employees of Sanofi-Aventis (Suisse) SA, Vernier, Switzerland. GE received fees from Amgen, Boehringer, MSD, Novartis, Recordati, Sanofi, and Servier. No other conflict of interest was reported from the authors regarding the content of this manuscript. The study was supported by Sanofi-Aventis (Suisse) SA, Vernier, Switzerland. Data collection, data management, and analyses were conducted by an independent clinical research organization

O32

Cardiac rehabilitation delivery and outcomes in Switzerland 2010-2019

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Introduction: Cardiac rehabilitation (CR) is a multidisciplinary, exercise-based intervention that it is strongly recommended by current guidelines to improve symptoms, quality of life and to reduce cardiovascular adverse outcomes, mainly in patients with coronary artery disease and heart failure. CR data on a Swiss national base have not been reported so far.

Methods: As part of the Swiss working group for cardiovascular rehabilitation, prevention and sports cardiology (SCPRS) quality standards, all Swiss CR centres have to provide a yearly report on an online questionnaire regarding their activity. We report the data from 2010 to 2019. Annual data were transferred as medians or means of all individual patients' data from each centre.

Results: The total number of CR participants ranged from 11596 to 14909 with a proportion of outpatients increasing progressively from 43% in 2010 to 56% in 2019. Mean age ± standard deviation (SD) was 60 ±1 and 68 ±1 years, and women percentage was 21% in outpatient and 32% in inpatient programmes. The most common CR indication was acute coronary syndrome (51%) in outpatient programmes and all types of cardiovascular surgery (60%) in inpatient programmes. Mean improvement of

functional capacity, from 2013 to 2019, was 38% (±SD 3.6%) in inpatient programmes using the six-minute walk test and 21% (±SD 2.2%) in outpatient programmes using a cycle-ergometer maximal exercise test. Quality of life mainly assessed with the 12-item Short Form Survey (SF-12) in outpatient CR improved by 13% (± SD 4.5%) and all subdomains of MacNew Heart questionnaire also significantly improved in inpatient CR.

Conclusion: CR has continuously gained importance in Switzerland over the last decade, even if still underutilised. Individual CR patient data should be collected in the future to improve outcome assessment and quality standards of CR centres.

Conflict of interest to declare? No

O33

Sex- and age- related differences of HRQOL change in Cardiac Rehabilitation

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Introduction: Health-related quality of life (HRQOL) has emerged as a valid and disease-specific outcome measure in cardiac patients. Cardiac rehabilitation (CR), a core component of secondary pervention, not only improves cardiovascular outcomes, but also HRQOL. Unfortunately, CR is still underutilized, especially among women. Aim of this study was to highlight age- and sex-specific effects of CR on HRQOL.

Method: A sample of 8286 patients (mean age 69.2 ± 11.47 years; men 67.8 ±11.29, women 72.2 ± 11.25) was analyzed. Patients were prospectively asessed from 2012 to 2018 in six Swiss CR clinics. HRQOL was measured at CR entry and discharge using the MacNew Heart Disease questionnaire. In multivariate analyses, sex- and age- specific changes in HRQOL during CR were estimated, adjusting for clinical characteristics.

Results: Women scored lower in any subdomain of HRQOL on admission to CR (social $M = 5.05$ ($SD = 1.3$); emotional $M = 5.06 \pm 1.17$; physical $M = 4.36 \pm 1.72$), compared to men (social $M = 5.2 \pm 1.23$); emotional $M = 5.35 \pm 1.1$; physical $M = 4.43 \pm 1.76$). Women showed greater improvement of social (F 10.98, $p < 0.001$), emotional ($F = 17.73$, $p < 0.001$) and physical HRQOL ($F = 9.47$, $p = 0.002$). Age was associated with changes in emotional ($F = 10.6$, $p = 0.001$), but not in social ($F = 2.41$, $p = 0.121$) and physical HRQOL ($F = 3.63$, $p = 0.057$).

Conclusion: Women report poorer HRQOL in all subdomains at CR entry compared to men, but in turn particularly benefit from CR in this regard. Our results indicate that sex- and age-specific needs of cardiac patients should be considered during CR.

Conflict of interest to declare? No

RAPID FIRE ABSTRACT SESSION: CLINICAL CASE REPORTS

O34

Two answers to one tachycardia - an unusual reentrant mechanism

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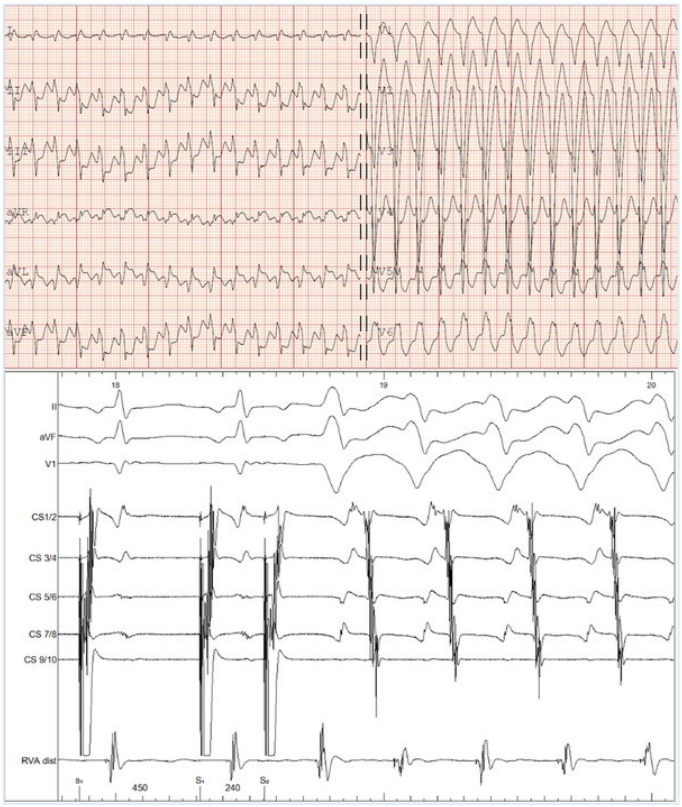
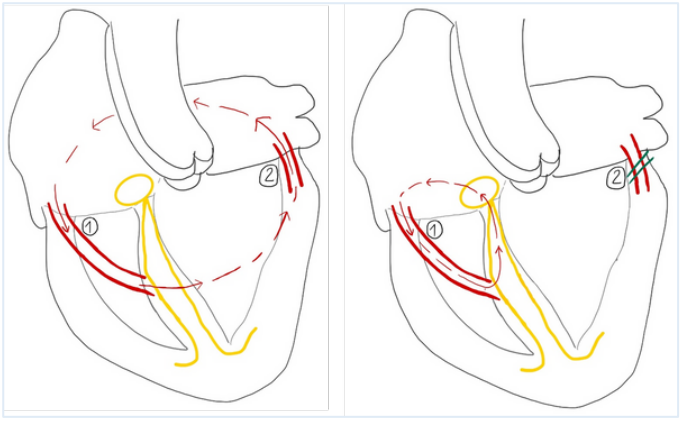
Introduction: A 34-year-old, male patient with paroxysmal broad complex tachycardia (Graph 1 upper panel) was evaluated. His 12-lead-ECG during sinus rhythm looked normal and echocardiography demonstrated a structurally normal heart.

Electrophysiologic findings: During electrophysiologic study, the clinical tachycardia was repetitively induced with a programmed atrial extrastimulus of 240ms coupled to a driving cycle length of 450ms. The initiation was consistently associated with a PR-prolongation followed by a single QRS complex with LBBB-morphology differing from subsequent QRS-morphology during tachycardia (Graph 1 lower panel).



Graph 1: Upper panel 12-lead ECG of the tachycardia. **Lower panel** Stimulation from CS 9/10 with initiation of the tachycardia. II, aVF, V1: Surface leads. CS: decapolar coronary sinus catheter. RVA: quadripolar right ventricular catheter.

Application of Adenosine resulted in complete antegrade block. These findings were compatible with a right sided, antegrade conducting and decremental atrio-fascicular pathway (Mahaim bundle). During tachycardia however, atrial activation was eccentric with a long VA interval and sometimes changed to a simultaneous distal and proximal activation pattern on the coronary sinus catheter. Right ventricular stimulation on the other hand resulted in concentric and decremental, retrograde atrial activation. 3D-activation mapping during tachycardia showed VA fusion at the lateral mitral annulus compatible with a left lateral accessory pathway (AP) (Graph 2 left). Following successful RF-ablation of this retrograde limb, recurrent tachycardia with the same LBBB-morphology using normal AV node for retrograde conduction was induced (Graph 2 right). Consecutively, the earliest right ventricular activation during atrial pacing was mapped and RF-ablation at the posterolateral tricuspid annulus was performed, resulting in non-inducibility.



Graph 2: The reentrant circuit initially (left) and after RF-ablation of the left lateral AP (right). 1 Atriofascicular pathway 2 left lateral AP

Discussion: Our case describes a highly unusual mechanism for reentrant tachycardia using two separate APs. The antegrade limb fulfilled the characteristics of a Mahaim fibre. A concealed left lateral accessory pathway served as the retrograde limb. Possibly due to slower conduction property compared to retrograde AV nodal conduction and larger distance from pacing site, the latter was not apparent during right ventricular pacing.

Conflict of interest to declare? No

O35

Ruptured sinus of valsalva aneurysms: a rare but not uncommon cardiac defect

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Introduction: Ruptured sinus of Valsalva aneurysms (RSoVA) are rare and not well understood cardiac defects. Its heterogeneous clinical presentation may lead to diagnostic and therapeutic delay.

Methods: We report a series of six adult patients (age 29-54 years, 3 females, 3 males) with RSoVA treated in our centre between 2015 and 2021. Baseline characteristics, clinical presentation, treatment strategy, complications and outcomes were analysed.

Results: As summarised in ***table 1***, 2/3 of our patients had pre-existing congenital heart disease and one patient with Down syndrome had a positive family history of aortic dissection. Symptoms at presentation ranged from cardiogenic shock in half of the patients to mild chest discomfort. Their onset varied between one and thirty days. In all but one patient, the rupture was located in the non-coronary sinus (NCS), four of which resulted in a left-to-right shunt into the right atrium (RA) (***figure 1***) and in one into the left atrium (LA). One patient presented with a perforation between the right-coronary sinus (RCS) and the right ventricle (RV). Acute percutaneous treatment was attempted in one patient only. However, despite initial haemodynamic improvement, surgery became inevitable due to persistent haemolysis. Surgery was the first-line treatment in the other five cases. Reconstruction of the ruptured sinus was achieved in four patients and two patients required aortic valve replacement. Extracorporeal life support (va-ECMO) was needed on to occasions due to persistent postoperative cardiogenic shock. Significant postoperative complications included bleeding, complete heart block and long-term dialysis. All patients could be discharged into rehabilitation after 11-69 days.

Conclusions: On average, one case of RSoVA is referred and treated every year in our institution. General awareness of this important, albeit rare,

cause of cardiogenic shock needs to be raised as timely diagnosis can be life-saving and prevent significant life-long sequelae.

Patient (age / gender)	Pre-existing cardiac diagnosis / comorbidities	Clinical presentation (symptom onset)	Site of rupture and shunt	Treatment (timing after diagnosis)	Clinical Course
1 (46 y / m)	Down syndrome Positive family history of aortic dissection	Cardiogenic shock (4 d)	NCS Shunt into RA	Interventional treatment with Amplatzer 14 mm Muscular VSD Occluder (day 1) Extraction of the occluder, RSoVA patch repair, aortic valve repair (day 8)	• Improved haemodynamic situation after partial interventional RSoVA closure but significant haemolysis • Moderate aortic regurgitation • Discharged after 29 d
2 (34 y / f)	Bicuspid aortic valve, repaired coarctation of the aorta (CoA)	Cardiogenic shock (1 d)	NCS Shunt into RA	RSoVA patch repair, aortic valve and tricuspid valve repair (day 1)	• va-ECMO for 8 d • Permanent haemodialysis • Discharged after 29 d • Kidney transplantation after 2 y
3 (54 y / f)	Bicuspid aortic valve, repaired ventricular septal defect (VSD)	Cardiogenic shock (unclear, >30 d)	NCS Shunt into LA	RSoVA patch repair, AVR (bioprosthesis), replacement of the ascending aorta (day 1)	• va-ECMO for 9 d • Severe bleeding complications • Multiple thrombosis • Transient vvHDF • Severe critical illness polyneuropathy • Persistent pulmonary hypertension • Discharged after 68 d
4 (32 y / f)	None	Chest pain, breathlessness (10 d)	NCS Shunt into RA	RSoVA repair with direct closure (day 4)	• Uneventful clinical course • Discharged after 12 d
5 (32 y / m)	Bicuspid aortic valve, repaired CoA	Reduced exercise capacity, abdominal bloating (30 d)	NCS Shunt into RA	RSoVA patch repair, AVR (mechanical prosthesis), aortic root reduction plasty (day 1)	• Surgical revision due to bleeding complications • Complete AV block requiring permanent pacemaker • Discharged after 11 d
6 (29 y / m)	Perimembranous VSD	Chest discomfort (4 d)	RCS Shunt into RV	RSoVA patch repair, direct VSD closure (day 10)	• Perioperative myocardial ischaemia • Small residual shunt into the RV • Postcardiotomy syndrome • Discharged after 12 d

Table 1. Patient characteristics of six patients with ruptured sinus of Valsalva aneurysms (RSoVA). *Abbreviations*: **AVR** aortic valve replacement, **cvvHDF** continuous veno-venous haemodiafiltration

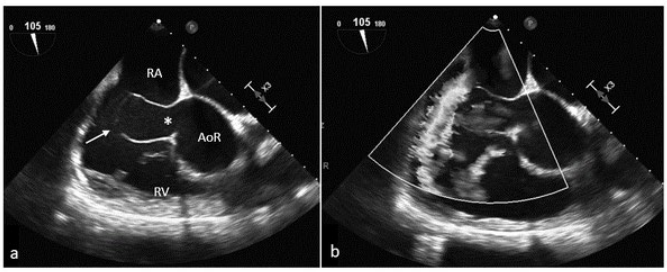

Figure 1. Transoesophageal echocardiogram: (a) Sinus of Valsalva aneurysm (*) originating from the NCS of the aortic root (AoR) with rupture (arrow) into the right atrium (RA). (b) Colour Doppler with left-to-right shunt from the AoR into the RA.

Conflict of interest to declare? No

O36

Moth-eaten like impact of automated titanium fasteners on aortic valve bioprosthesis: a word of caution

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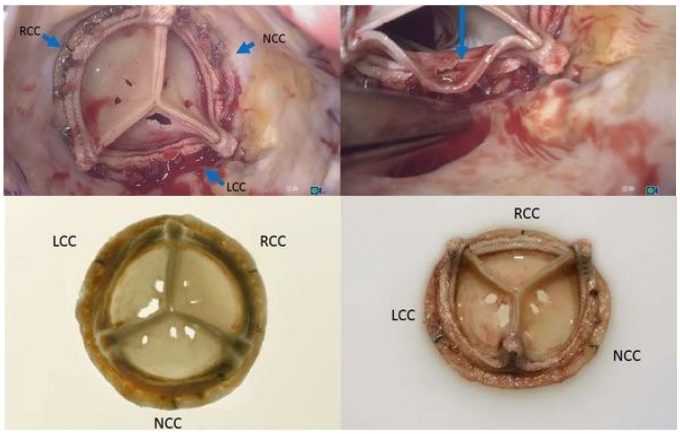
Introduction: Within the last decade COR-KNOT® has facilitated valve surgery and has also been shown to be a valuable alternative to knot-pushers in minimally invasive surgery. Recent case reports have shown onset of COR-KNOT® induced aortic valve regurgitation eight months after surgery with the primary suspicion of paravalvular leakage.

Methods: We present the case of a 78 years old male patient undergoing redo aortic valve replacement for aortic valve insufficiency. In 2018 the patient underwent his third biological aortic valve replacement (25mm, Inspiris Resilia™, Edwards Lifesciences LLC, Irvine, USA) with COR-KNOT® (LSI Solutions, Victor, NY, USA) due to valve degeneration. In 2021, the patient was diagnosed with severe aortic regurgitation and admitted to our hospital for his fourth surgery.

Results: Intraoperatively, seven perforations of all three valve leaflets have been observed, which were obviously induced by the rigid metallic fasteners. Redo isolated aortic valve replacement (29mm, Perimount Magna Ease, Edwards Lifesciences LLC, Irvine, USA) was performed with conventionally knotted, pledget enforced braided threads. Postoperative course was uneventful.



Conclusion: This report shows that COR-KNOT® induced defects do not appear immediately after surgery but within the first four postoperative months. Since degenerated aortic bioprostheses are mostly replaced by valve-in-valve strategy, the true incidence of this serious complication might be underestimated. COR-KNOT® should be used with caution in biological aortic valve replacement and patients should undergo close postoperative follow-ups.

Conflict of interest to declare? No

O37

False negative DPD scintigraphy in Val30Met hereditary TTR amyloidosis

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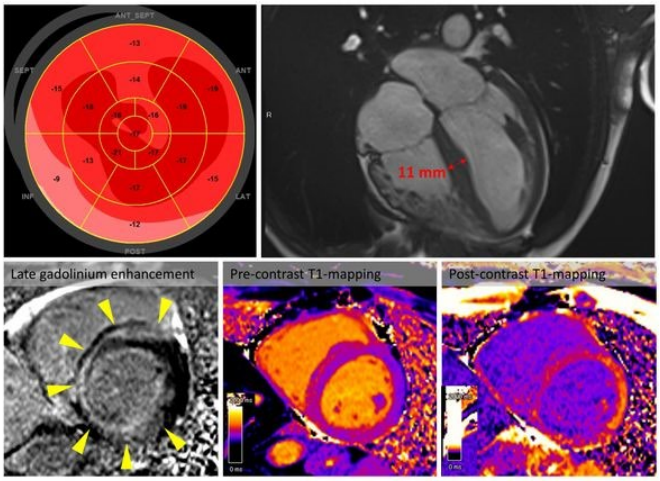
Introduction: Scientific societies strongly recommend the use of DPD-scintigraphy combined with exclusion of monoclonal gammopathy for the non-biopsy diagnosis of TTR cardiac amyloidosis (CA).

Case: We report the case of a 40-years old male, known for a familial Val30Met mutation of the TTR gene. The mild neurologic involvement did not qualify for patisiran treatment. He was hospitalized for an unexplained syncope; at admission, the patient was stable with a heart rate of 63/min. ECG was in sinus rhythm with 1st degree AV block (PR 360 msec) and a complete LBBB (QRS 160 ms). Left ventricle was non-hypertrophied by echocardiography (wall thickness 11 mm), with an EF of 55% and a GLS of -14.6%. On CMR, EF was 48% with no regional wall motion abnormalities but diffuse sub-endocardial to mid-wall late gadolinium enhancement was detected in 7/17 myocardial segments. By relaxometry, T1-relaxation time was mildly increased (1059-1081 ms) with significant expansion of the extracellular volume (37-40%, N<28%). To confirm diagnosis of CA, DPD-scintigraphy was performed but surprisingly showed no uptake (Perugini 0). Due to a high clinical suspicion, cardiac biopsy was performed and eventually confirmed TTR CA.

Discussion: ATTRwt and the majority of ATTRh deposits are usually a combination of the full-length and truncated TTR protein (type A); however, deposits associated with Val30Met ATTRh and few other mutations are characterized by full-length deposits only (type B). DPD tracers are known to have low affinity for type B deposits, which can explain the false-negative results of scintigraphy in the present case.

Conclusion: While DPD scintigraphy is the first-line method for the diagnosis of older patients with suspected ATTRwt CA, it has limitations to confirm CA in young patients with ATTRh, especially with Val30Met mutation, which is the most prevalent ATTRh mutation in Switzerland. CMR has a crucial diagnostic role in those patients.



Conflict of interest to declare? No

O38

Severe Postural Tachycardia Syndrome (POTS) in a patient after COVID-19 vaccination with mRNA-1273 (Moderna®)

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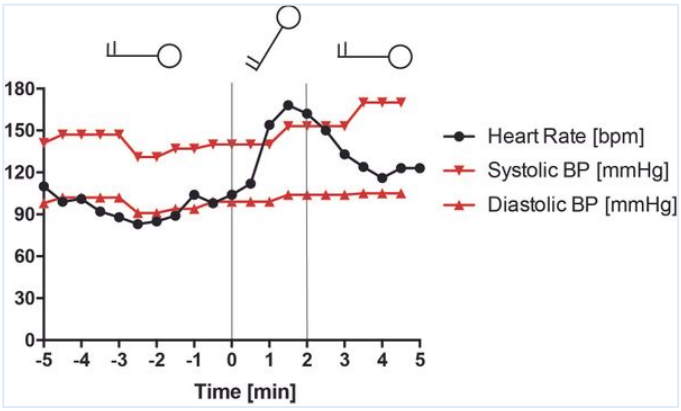
Introduction: Postural tachycardia syndrome (POTS) is a clinical syndrome characterized by orthostatic intolerance due to orthostatic tachycardia and the absence of severe hypotension, and has been described after SARS-CoV-2 infection among others.

Method: A 54-year-old female patient presented with orthostatic intolerance few days after the first COVID-19 vaccination with mRNA-1273 (Moderna®). Except for dietary controlled celiac disease, the patient was healthy and did not take any regular medication. Due to symptom severity, the self-employed physiotherapist was unable to work for 9 months when she presented at our clinic.

Results: Tilt table testing revealed severe orthostatic symptoms including syncope and headache and was accompanied by a significant increase in heart rate from ~95bpm to 168bpm (77%) in sinus rhythm without orthostatic hypotension after head-up tilt to 70 degrees, findings consistent with POTS (Figure 1). Potential other causes such as anemia, thyroid dysfunction, adrenal insufficiency and pheochromocytoma were ruled out. In addition, anti-nuclear antibodies and anti-neutrophil cytoplasmatic antibodies were negative and did not suggest (auto)-immune disease besides celiac disease. Echocardiography and cardiac stress MRI excluded heart failure, structural heart disease, myocarditis and myocardial ischemia. 48-h 12-lead-Holter ECG did not detect supraventricular or ventricular tachycardia other than sinus tachycardia and genomic analysis covering a large channelopathy panel did not identify pathogenic/likely pathogenic/variants of uncertain significance. Brain MRI imaging found no cerebral brain lesions and clinical neurologic examination was non suggestive for peripheral polyneuropathy. Due to headache in upright position, cerebrospinal fluid hypotension was ruled out by lumbar puncture. Finally, serologic analysis showed adequate immune response to COVID-19 vaccination (IgG S1 index 25.8 and IgG RBD index 36.4) without signs of previous SARS-CoV-2 infection (IgM and IgG NP index negative).

Conclusion: To our knowledge, this is the first case world-wide reporting severe POTS most likely triggered by COVID-19 vaccination with mRNA1273 (Moderna®) since no other causes could be detected.



Conflict of interest to declare? No

O39

First-in-man mitral valve replacement and coronary artery bypass grafting using a single minimally invasive access

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Introduction: The Development of new strategies to treat cardiac pathologies in high risk patients has become essential due to the aging population and the advent of percutaneous approaches. Coronary revascularization using minimally invasive direct coronary artery bypass grafting (MIDCABG) is an established technique. Transapical mitral valve replacement (TMVR) using the Tendyne™ is, on the other hand, at an early stage of development. To the best of our knowledge, it has never been attempted to combine these two techniques to treat mitral valve regurgitation and coronary artery disease (CAD) in a single procedure.

Methods: We present the case of a 78-years old woman suffering from CAD and secondary severe mitral valve regurgitation (MR) due to left ventricular and annular distention. The interdisciplinary heart-team recommended a simultaneous hybrid procedure consisting of a minimally invasive direct coronary artery bypass grafting (MIDCABG) with subsequent transapical mitral valve replacement (TMVR) using the Tendyne™ (Abbott Vascular, Santa Clara, CA, USA) prosthesis via the same small anterolateral thoracotomy.

Results: The operation was performed in close collaboration with our cardiologists in the hybrid theatre. Intra- and postoperative course was uneventful. Pre-discharge transthoracic echocardiography on postoperative day 8 revealed an immaculate function of the implanted valve without para- or transvalvular insufficiency, a mean gradient of 2mmHg, no left ventricular outflow tract (LVOT) obstruction and an improved ejection fraction of 50%.

Conclusion: The combination of MIDCABG revascularization with concomitant transapical TMVR is feasible and enables a further step towards minimal invasive therapy. It shows, that the modern heart-team approach exceeds mere decision making but expands towards a hybrid patient treatment.

Conflict of interest to declare? No

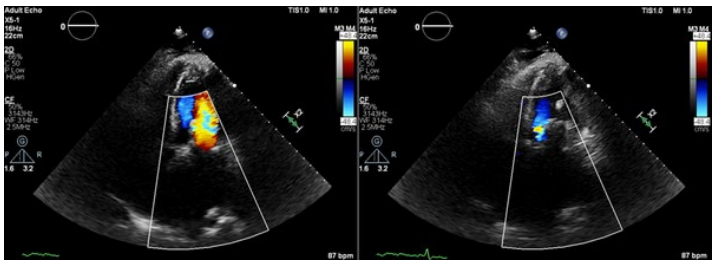

Figure 1 Neo-LVOT simulation after Tendyne™ prosthesis implantation using ECG triggered computer tomography.

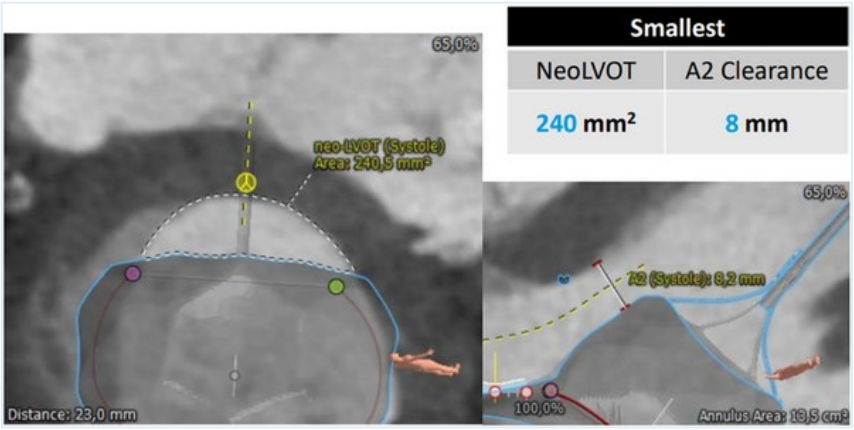

Figure 2 postoperative TTE showing immaculate prosthesis function and no LVOT obstruction

RAPID FIRE ABSTRACT SESSION: RHYTHM DISORDERS 1

O40

Pulsed-field ablation for the treatment of left atrial reentry tachycardia

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[1]*Bern Inselspital, Cardiology, Bern, Switzerland*

Background: A multipolar pulsed field ablation (PFA) catheter was recently introduced for pulmonary vein isolation and combines the benefits of high procedural efficacy and safety. It may also be used to treat left atrial (LA) reentry tachycardia.

Purpose: To describe our initial experience using a multipolar PFA catheter for the treatment of LA reentry tachycardia.

Methods: We included all patients with LA reentry tachycardia treated with a multipolar PFA catheter at our institution. Using 3D electro-anatomical mapping (3D-EAM), we identified the tachycardia mechanism and applied linear lesions either at the left atrial roof, mitral isthmus or on the anterior wall, as appropriate. Positioning of the PFA catheter was verified by integration into 3D-EAM. Applications were performed using 2.0kV with the catheter in basket or flower configuration, depending on ablation site. Bidirectional block across linear lesions was verified using standard criteria. Additional focal radiofrequency ablation (RFA) was used to achieve bidirectional block if necessary.

Results: We targeted 21 LA reentry tachycardia with a multipolar PFA catheter in 17 patients (median age 70 (62-75) years; 7 females). The tachycardia mechanism was identified as roof-dependent in four, peri-mitral in ten and anterior scar-related in seven cases. PFA lesion sets consisted of 15 posterior wall isolations (i.e. roof lines), five mitral isthmus lines (MIL) and eleven anterior lines. Three roof-dependent, six peri-mitral, and four anterior scar-related tachycardias were successfully terminated by PFA (76%). Additional RFA was necessary for three MIL, two anterior lines and no roof line. Eventually, we achieved bidirectional block across all lines. PFA triggered, vagal-mediated and reversible AV block was observed in one case. Otherwise, there were no acute procedural complications.

Conclusion: Linear lesion sets are feasible and safe using a multipolar PFA catheter. Posterior wall isolation by PFA for the treatment of roof-dependent LA reentry tachycardia is highly efficient while anterior lines and MIL remain challenging and may need complementary RFA or a PFA catheter designed for focal or linear ablations.

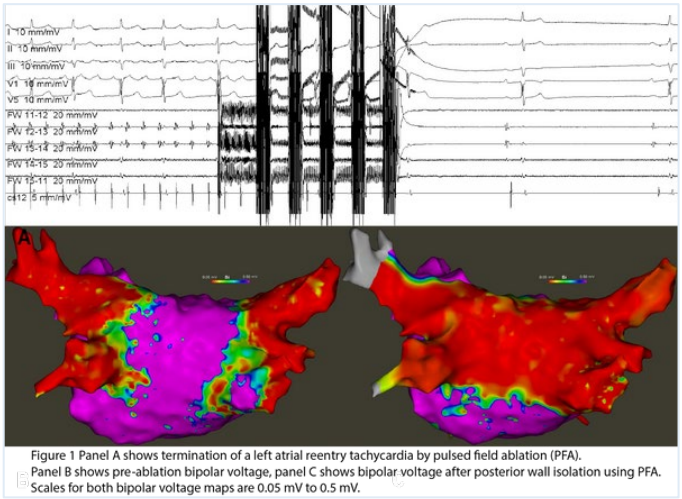

Figure 1 Panel A shows termination of a left atrial reentry tachycardia by pulsed field ablation (PFA). Panel B shows pre-ablation bipolar voltage, panel C shows bipolar voltage after posterior wall isolation using PFA. Scales for both bipolar voltage maps are 0.05 mV to 0.5 mV.

Conflict of interest to declare? No

O41

Validation of a multipolar pulsed field ablation catheter for endpoint assessment in pulmonary vein isolation procedures

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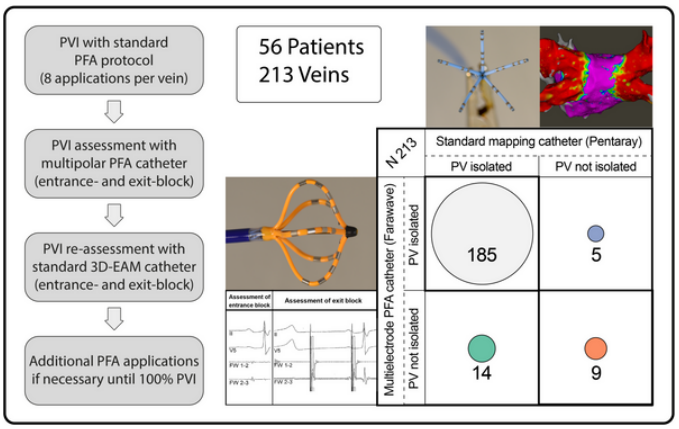
Introduction: Pulsed field ablation (PFA) for pulmonary vein isolation (PVI) using single-shot devices combines the benefits of high procedural efficacy and safety. A newly available multipolar PFA catheter allows real-time recording of pulmonary vein (PV) signals during PVI. We aim to validate the performance of a multipolar PFA catheter compared to a standard pentaspline 3D-mapping catheter for endpoint assessment of PVI.

Methods: Patients undergoing first PVI using PFA with the standard ablation protocol (8 applications per PV) were studied. Entrance- and exit-block (10V/2ms) were assessed using the PFA catheter. Subsequently, a high-density bipolar voltage 3D electro-anatomical map (3D-EAM) was constructed using a standard pentaspline 3D-mapping catheter. Additional PFA applications were delivered only after confirmation of residual PV-connection by 3D-EAM.

Results: In 56 patients, 213 PVs were targeted for ablation. Acute PVI was achieved in 100% of PVs: in 199/213 (93%) PVs with the standard ablation protocol alone and in the remaining 14 PVs after additional PFA applications. Accuracy of PV assessment with the PFA catheter after the standard ablation protocol was 91% (194/213 veins). In 5/213 (2.3%) PVs, the PFA catheter incorrectly indicated PV-isolation. In 14/213 (6.6%) the PFA catheter incorrectly indicated residual PV-conduction due to high-output pace-capture. When the output was reduced to 5V/1ms, pace-capture was reduced to 0.9% (2/213).

Conclusion: A novel multipolar PFA catheter allows reliable endpoint assessment for PVI. Due to its design, far-field sensing and high-output pace-capture can occur, which may require adjustment of standard pacing outputs for verification of exit-block.



Conflict of interest to declare? No

O42

Programmed ventricular stimulation for risk stratification in patients with myocardial scarring and an ejection fraction above or equal to 40%

A. Soris[1], C. Herrera-Siklody[1], M. Lebloa[1], G. Domenichini[1], C. Teres[1], A. Porretta[1], C. Haddad[1], E. Pruvot[1], P. Pascale[1]

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Introduction: Sudden cardiac death (SCD) is one of the leading causes of death, particularly among patients with myocardial scars. Implantable cardioverter defibrillators (ICD) are recommended in patients with a left ventricular ejection fraction (LVEF) ≤ 35%. Another recognised indication is the induction of sustained ventricular tachycardia (VT) or ventricular fibrillation (VF) during programmed ventricular stimulation (PVS) in post-myocardial infarction patients with non-sustained VT and a LVEF between 35% and 40%. However, no recommendation exists to guide the use of prophylactic ICD implantation in patients with less altered LVEF, even though they represent the majority of SCDs. We aimed to evaluate the prognostic value of PVS in patients with myocardial scars and a relatively preserved LVEF (≥ 40%).

Methods: Patients with evidence of a chronic myocardial scar and a LVEF ≥ 40%, who underwent PVS at two hospital centers were considered for inclusion. Ischemic and non-ischemic myocardial scars were included. The primary endpoint was the occurrence of a Major Arrhythmic Event (MAE), namely SCD, clinical VT/ventricular fibrillation, or appropriate ICD therapy.

Results: 134 patients were included (mean age 62.4 ± 12.5 years, LVEF 54.7 ± 8.6 %). Indication for PVS was mostly non-sustained VT and/or syncope (84%). Post-myocardial infarction patients represented about half of the cases (53%). Inducibility during PVS was observed in 17 patients (13%). There was a nonsignificant trend towards higher inducibility rates in ischemic versus nonischemic scars (17% and 8%, respectively; p-value = 0.1). Of these patients, 15 received an ICD (88%). Over a mean follow-up of 49 (±42) months, a MAE occurred in 7 patients (41.2%) with positive PVS, versus 4 patients (3.4%) with negative PVS. MAE-free survival at 10 years was 91% and 43% in PVS-negative and PVS-positive patients, respectively (p-value < 0.001). One SCD occurred in a PVS-positive patient who denied prophylactic ICD implantation. Inducibility during PVS provided a 64% sensitivity and a 97% negative predictive value (PV) to predict the occurrence of MAE (specificity 92%, positive PV 41%).

Conclusion: PVS is a useful tool to discriminate patients with myocardial scars and LVEF ≥ 40% at increased arrhythmic risk. Effective utilisation of ICD may be anticipated in case of positive PVS, while non-inducible patients are at lower MAE risk.

Conflict of interest to declare? No

O43

Clinical validation of five direct-to-consumer smartwatches to detect atrial fibrillation in a Real-World Cohort of Patients: BASEL Wearable Study

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[1]*University Hospital Basel, Department of Cardiology, Basel, Switzerland*

Introduction: Atrial fibrillation (AF) is the most common cardiac arrhythmia with an estimated lifetime risk of one in four. Multiple smartwatches capable to "screen" AF are presently available. The sensitivity and specificity for the detection of AF may differ between the available smartwatches, but this has not yet been adequately investigated.

Methods: We enrolled patients presenting to a cardiology service at a tertiary referral center in a prospective, observational study. The aim of this study was to assess and compare the accuracy of five smartwatches in identifying AF compared to a physician-interpreted 12-lead ECG in a real world cohort.

Results: We prospectively enrolled 163 patients (32.9% female, mean age 64.7 years). AF was present in 47 patients (30.3%) at time of recording. We included 155 patients with 4 or more individual recordings for further analysis. Sensitivity and specificity for the detection of AF was similar between smartwatches: 90% and 95% for the Apple Watch 6, 97% and 96% for the AliveCor Kardia Mobile, 86% and 100% for the Fitbit Sense, 97% and 91% for the Samsung Galaxy Watch 3 and 91% and 95% for the Withings Scanwatch, respectively (Figure1). The rate of inconclusive tracings, meaning the algorithm was not able to determine the heart rhythm, was 17%, 26%, 21%, 20% and 24%. Among inconclusive individual tracings from all devices, 63 tracings (40%) were due to high or low heart rate and 50 tracings (31%) due to motion artifacts. Inconclusive recordings were interpreted by blinded cardiologists to determine if these tracings are still clinically useful. By manual review the rhythm could be determined in 98.8% of 741 total individual recorded single-lead ECGs.

Conclusion: We found a high diagnostic accuracy among all assessed smartwatches. We report differences in the amount of inconclusive tracings. In a clinical setting manual review of tracings is required in about one fourth of cases for all assessed smartwatches. This clinical validation study may help to better advice patients and physicians in the usage and validity of single-lead ECG-devices for everyday use.

Figure 1: Comparison of analyzed devices with picture of used device and electrocardiogram as shown on saved PDF, produced by manufacturers app.

Conflict of interest to declare? No

Manufacturer	Apple	Withings	Samsung	AliveCor	Fitbit
Version	Watch 6	Scan Watch	Galaxy Watch 3	Kardia Mobile	Sense
Price *1	449	303	265	147	244
Battery capacity *1	18h *2	720h *2	45h *2	90h/2y *3	144h *2
Limit of HR interpretation *4	50-150 bpm	No information	50-120 bpm	50-100 bpm	50-120 bpm
Sensitivity (95% CI)	90% (76%-97%)	91% (75%-98%)	97% (86%-100%)	97% (87%-100%)	86% (70%-95%)
Specificity (95% CI)	95% (88%-99%)	95% (88%-99%)	91% (82%-96%)	96% (89%-99%)	100% (96%-100%)
Preferred Choice *5	53	38	20	11	23

*1: Recommended retail price on 12.11.21, no discounts or special offers were deducted, price includes tax / all prices in CHF
*2: time with GPS disabled
*3: 90h net operating time, under regular use up to 2 years
*4: information obtained from manufacturers website
*5: of 155 analyzed patients, 10 patients were not able to decide between the available devices

bpm: beats per minute; CHF: Swiss Franc; CI: confidence interval; h: hour; HR: heart rate

O44

Recurrences after stereotactic arrhythmia radioablation for refractory ventricular tachycardia

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[1]CHUV, Cardiology, Lausanne, Switzerland, [2]CHUV, Radio-oncology, Lausanne, Switzerland

Introduction: Stereotactic arrhythmia radioablation (STAR) has been recently introduced for the management of ventricular tachycardia (VT) refractory to antiarrhythmic drugs (AADs) and catheter ablation (CA). VT recurrences have been reported after STAR but the mechanisms remain poorly known. We analyzed recurrences in our patients (pts) after STAR for refractory VT.

Methods: From 09.2017 to 01.2020, 12 pts (66±8y, LVEF 40±14%) suffering from refractory VT were enrolled. The underlying cardiopathy was ischemic in 3, inflammatory in 3 and idiopathic in 6 pts. Nine out of 12 pts had a history of at least 1 electrical storm. Before STAR, an invasive electro-anatomical mapping (Carto3) of the VT substrate (VT-sub) was performed. A mean dose of 22±2Gy was delivered to the VT-sub using the Cyberknife® system.

Results: The ablation volume was 24±7cc and involved the basal interventricular septum (IVS) in 10 pts. During the first 6 months after STAR, VT burden decreased by 95% (mean value, from 930 to 46 VT/semester). After a median follow-up of 14±10 months, 10/12 (83%) developed a recurrence as a sustained VT and underwent a redo CA. VT recurrence was located at the border zone (BZ) of the treated VT-sub in 6 cases, involved both the BZ and a larger substrate in 2 cases, and occurred remote from the VT-sub in 2 cases (see Table). The dose delivered at sites of VT recurrence was 9.9±8.6 Gy with a large heterogeneity ranging from 0.11 to 28.37 Gy, for some patients due to dose constraints near critical structures. Importantly no pts developed an AV block after STAR.

Conclusion: STAR appears to be an efficient tool for the management of IVS refractory VT, leading to a strong VT burden reduction and no AV block. Recurrences were nevertheless common, often at the border zone of the irradiated volume.

	Treated segments (AHA)	Treated volume (cc)	Recurrence location (AHA)	Received dose (mean, Gy)	Minimal dose (Gy)	Maximal dose (Gy)
1	2,3		20		No recurrence	
2	1,2,3	22	2	20.77	11.58	28.37
3	3,4	35	2	4.09	0.5	19.79
4	1,2	19	2,8	12.83	5.28	21.53
5	14,17	28	14	3,47	0.64	16.05
6	2,3,4		33		No recurrence	
7	1,2,7	23	3,4,5,6,8,9,10,11	0.91	0.11	15.36
8	1	14	6	19.05	9.06	24.39
9	3,4,9	26	2,3,12	24.01	18.44	26.16
10	2,8	18	RVOT	6.33	1.71	14.31
11	1,2	18	3	0.66	0.23	1.47
12	1,2,3	36	2	7.64	2.91	16.9

Conflict of interest to declare? No

O45

Genotype-phenotype correlation in hypertrophic cardiomyopathy: moving towards precision medicine?

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[1]Centre Hospitalier Universitaire Vaudois (CHUV), Service de Cardiologie, Lausanne, Switzerland

Background: In hypertrophic cardiomyopathy (HCM), mutations encoding myosin 7 (*MYH7)* and cardiac myosin-binding protein C (*MYBPC3)* are responsible for 80% of patients with a confirmed genetic aetiology. However, the complex model of inheritance, encompassing genetic modifiers and environmental causes, still hampers genotype-phenotype correlation.

Purpose: We present a series of patients diagnosed with HCM at our center. We describe the clinical presentation and outcome, according to specific genotype.

Methods: We report a series of 65 patients (42 ± 17 years) with clinical HCM. The cardiac assessment included, among others, echocardiography and cardiac stress test (CST). 28 patients (43%) underwent a genetic test: a genetic variant was detected in 23 of them (82%) including 11 *MYBPC3* (48%), 10 *MYH7* (43%), 1 *MYL3* (4%) and 1 *TNNI3* (4%) variants. We divided patients into two groups: the *MYH7* group (10/23) and the non-*MYH7* one (13/23). No pathogenic variant was detected among the 5 remaining patients (18%).

Results: Despite similar left ventricle outflow tract pressure gradient (LVOTPG) at rest, *MYH7* patients had a higher LVOTPG during Valsalva manoeuvre (12 [9-80] vs 7 [7-8] mmHg, p=0.03) and a trend *(*p =0.08) towards a greater left atrium diameter (44 ±2 vs 39 ±2 mm). At CST, *MYH7* patients had lower peak systolic blood pressure (149 ±10 vs 185 ±8 mmHg, p=0.01). *MYH7* patients underwent more often septal myectomy (70% vs 55%,p =0.02) and showed a trend (p =0.07) towards more frequent heart failure/transplantation (30% vs 0%) as compared to non-MYH7 patients.

Conclusions: Our study suggests a more severe phenotype with worse prognosis in *MYH7* patients compared to other CMH genotypes, as suggested by greater LVOTPG during Valsalva manoeuvre, greater left atrial enlargement, abnormal exercise pressure response and by a more frequent occurrence of septal myectomy and of heart failure/transplantation.

Conflict of interest to declare? No

RAPID FIRE ABSTRACT SESSION: RHYTHM DISORDERS 2

O46

Pulsed field ablation of atrial fibrillation: recurrence rate after first pulmonary vein isolation and first insights into durability at redo procedures

T. Kueffer[1], J. Seiler[1], A. Madaffari[1], A. Mühl[1], R. Stettler[1], B. Asatryan[1], A. Haeberlin[1], F. Noti[1], H. Servatius[1], H. Tanner[1], S.H Baldinger[1], L. Roten[1], T. Reichlin[1]

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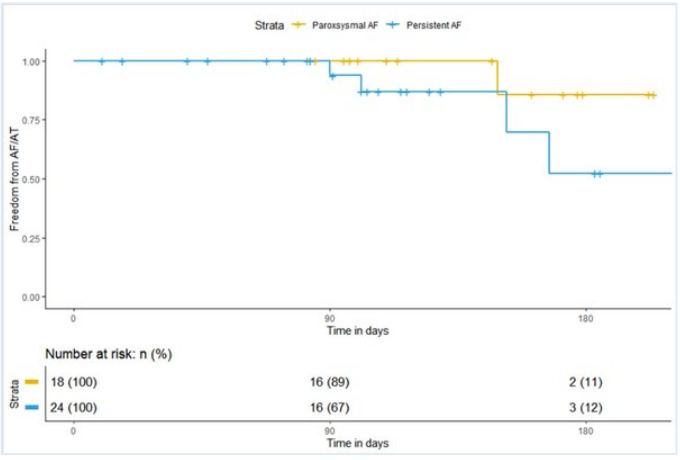
Introduction: Pulsed field ablation (PFA) is newly available for pulmonary vein isolation (PVI) and combines the benefits of high procedural efficacy and safety. Independent data on the recurrence-rate of atrial fibrillation (AF) after PVI and on PVI durability during redo procedures are scarce. We report data on the recurrence rate of AF after first PVI using PFA and first insights into findings of PVI durability during redo procedures.

Methods: Consecutive AF patients undergoing a first PFA PVI at our center between May 2021 and August 2021 were included. PVI was verified by 3D-electroanatomical mapping (3D-EAM), and additional PFA lesions were applied when necessary until all PV were isolated. Seven-day Holter ECGs were performed at 3 and 6 months after ablation. After a blanking period of 3 months, episodes of AF/AT lasting more than 30 seconds were considered as AF-recurrence.

Results: Forty-one patients (median age 69 (interquartile range 62-73) years, 24% female, 56% persistent AF) underwent first PVI by PFA. All PVs were successfully isolated using a multipolar PFA catheter. Median total procedure time including 3D-EAM was 104 (85-121) min. Total fluoroscopy time and dose were 26 (19-30) min and 671 (323-1248) Gym^2. Acute complications occurred in 1 (2.4%) patient (cardiac tamponade requiring drainage). Early recurrence of AF during the blanking period occurred in 3 (7.3%) patients. Median follow-up time was 107 (91-152) days. Recurrence of AF after the blanking period was detected in 5 (12%) patients, 1 (6%) in paroxysmal AF, and 4 (17%) in persistent AF patients, respectively. Redo procedures in 3 (7.3%) patients with AF recurrence confirmed durable isolation of 12/12 (100%) pulmonary veins and showed no evidence of PFA lesion regression.

Conclusion: AF recurrence rates after PVI by PFA are low. Durable isolation of 12/12 pulmonary veins (100%) and no evidence of PFA lesion regression was observed at redo procedures in patients with AF recurrence.



Conflict of interest to declare? No

O47

An automatic single beat algorithm to discriminate farfield from nearfield bipolar voltage electrograms in the pulmonary veins

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Introduction: Confirmation of pulmonary vein (PV) isolation (PVI) during ablation of atrial fibrillation can be challenging due to superimposition of nearfield (NF) PV and farfield (FF) atrial bipolar voltage electrograms (BVE).

Purpose: To develop an automatic algorithm allowing to discriminate PV nearfield (PV-NF) from atrial farfield (atrial-FF) BVE from a circular mapping catheter during cryoballoon (CB) PVI based on a single-heartbeat analysis.

Methods: BVEs from a decapolar inner-lumen diagnostic catheter (Achieve, Medtronic) during CB PVI were manually classified as PV-NF, atrial-FF and combined FF-NF signal based on the disappearance of the PV signal during isolation (Figure, upper row). BVE power spectra were computed using the fast Fourier transform (FFT) and automatic classification of PV-NF, atrial-FF and combined FF-NF signals was performed using the power in different frequency bands (Figure, lower row). Support vector machine classifier was used to identify PV-NF BVE for the two classes PV-NF+ (PV-NF only and combined FF-NF) and PV-NF- (atrial-FF only). Validation of the approach was performed by comparison of a subset of 80 random samples classified by five experienced electrophysiologists.

Results: The 355 BVEs examples from 57 patients were balanced between the two classes PV-NF+ and PV-NF-. Overall balanced accuracy including BVE from all PVs was 82.7% (95% CI: 80.3% to 85.1%). Analysis on individual PVs showed an accuracy of 96.6%, 85.2%, 80.8%, and 76.9% for the right inferior, right superior, left inferior and left superior PV, respectively. Validation of the algorithm showed a comparable accuracy, sensitivity and specificity in PV-NF detection between the automatic algorithm and the experienced electrophysiologists (82.8%, 89.2%, and 76.3%, compared to 85.2%, 91.9%, and 78.5%, respectively).

Conclusion: A reliable automatic based classification algorithm to identify PV-NF BVE could be developed based on a single-beat analysis. Real-time applications as well as using other electrode configurations may improve local signal interpretation.

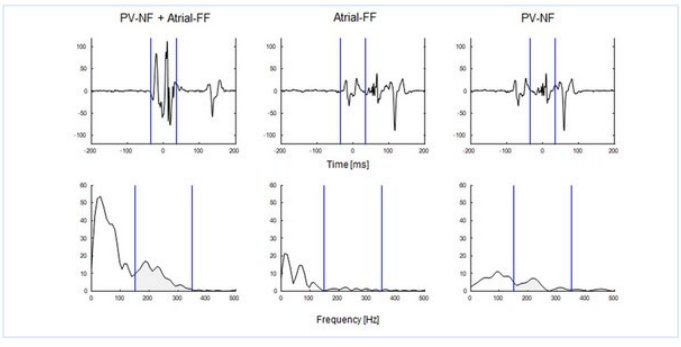

Figure: Time domain (upper row) and corresponding frequency domain representation (lower row) of representative signals of the three classes from the same patient between two blue vertical lines. With a local PV-NF, high-frequencies are visible, as illustrated between the blue vertical lines highlighting the 150 to 350 Hz frequency band in the left and right lower plot.

Conflict of interest to declare? No

O48

First experience of arrhythmogenic substrate characterization using wideband LGE CMR in ICD-patients undergoing catheter ablation for scar-related ventricular tachycardia

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Background: Advanced cardiac imaging allows for pre-procedural ventricular substrate assessment and may facilitate catheter ablation for scar-related ventricular tachycardia (VT). Late gadolinium enhancement (LGE) in cardiac magnetic resonance (CMR) is the reference standard for myocardial scar characterization. However, the majority of patients undergoing VT ablation present with an implanted cardioverter defibrillator (ICD). The quality of LGE imaging in these patients is limited by off-resonance artefacts of the ICD (Figure 1A). We sougtht to report our first experience with novel wideband (WB)-LGE sequences, developped for eliminating these artefacts (Figure 1B).

Methods: 2D WB-LGE CMR was performed on a 1.5-T scanner (MAGNETOM Aera; Siemens Healthcare). 3D scar reconstructions were generated using the ADAS 3D software Version: 2.8.1 (Galgo Medical D.L. Barcelona, Spain & Circle Cardiovascular Imaging Inc. Calgary, Canada). Scars were characterized as hyperenhanced areas and divided into scar core zone (CZ) and border zone (BZ), using 60±5% and 40±5% of the maximum intensity as thresholds, respectively. Border zone channels (BZC) were defined as continuous corridors of BZ surrounded by CZ or CZ and an anatomical barrier (i.e. mitral annulus) connecting two areas of healthy tissue (Figure 2).

Results: Pre-procedural 2D WB-LGE CMR have been performed in 28 ICD-patients (median age: 69 years [IQR: 60-76 years], 4% women, median LVEF: 35% [IQR: 30-44%]). Twenty patients had ischemic heart disease, 6 had non-ischemic cardiomyopathy, and two had arrhythmogenic right ventricular (RV) cardiomyopathy (ARVC). No complications related to the CMR occurred. Imaging quality was sufficient for scar analysis in all patients. Analysis with the ADAS software was not possible due to technical issues despite good quality in 4 (14%) patients. As the ADAS software is not dedicated for RV scar analysis, the two patients with ARVC were not analyzed. The remaining 22 patients presented with left ventricular (LV) scar. Median total scar mass (CZ and BZ) was 65g (IQR: 38-92g) corresponding to 38% (IQR 33% - 45%) of the total LV mass. BZCs - representing potential ablation targets - could be identified in all these patients.

Conclusions: WB-LGE CMR in ICD patients is feasible and safe and allows for comprehensive scar assessment in ICD-patients. More data on the association of WB-LGE-CMR with electro-anatomic mapping and the influence on outcome of VT ablation is needed.

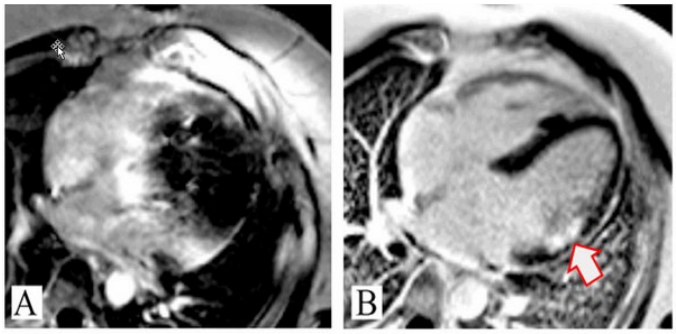

Figure 1: Panel A shows a conventional LGE-MRI. Artefacts from the ICD obscure large parts of the ventricles. In comparison, panel B shows wideband LGE-MRI. Attenuation of ICD artefacts allow for precise interpretation of the myocardium with subendocardial scar in the lateral midventricular segment of the left ventricle (arrow).

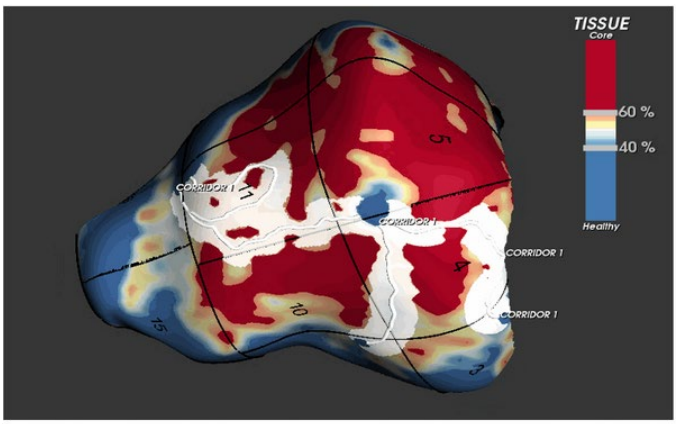

Figure 2: ADAS reconstructed 2D WB-LGE CMR image. Scar core zone (CZ) is shown in red, borderzone (BZ) in orange/yellow. Border zone channels (BZC) are depicted in white.

Conflict of interest to declare? No

O49

External validation study of the 2014 European Society of Cardiology Guidelines in relation to 2020 ACC/AHA Guidelines on Sudden Cardiac Death Prevention in Hypertrophic Cardiomyopathy

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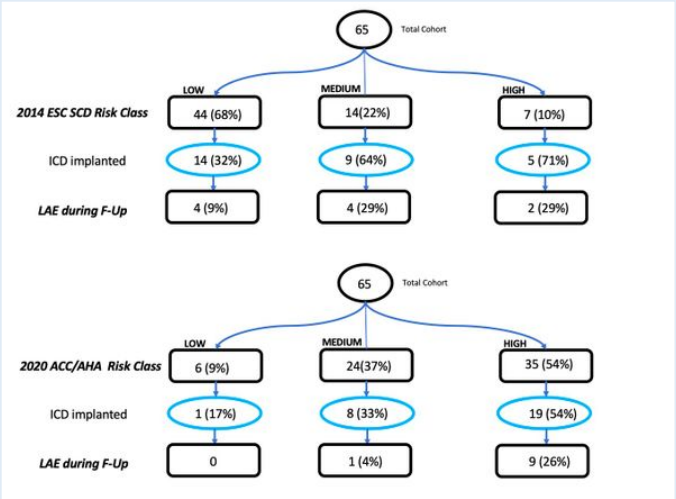
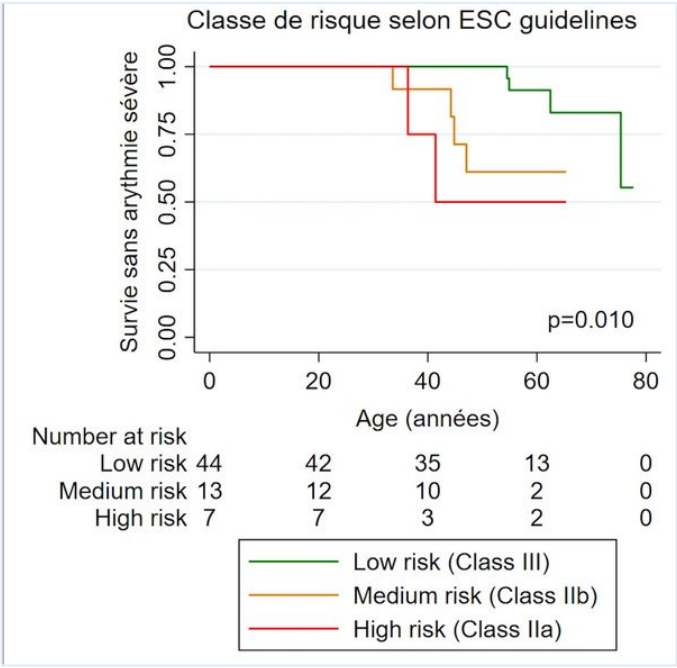
Introduction: Strategies for reliable selection of high-risk hypertrophic cardiomyopathy (HCM) patients for prevention of sudden cardiac death (SCD) with implantable cardioverter-defibrillators (ICDs) are still debated. We therefore assessed the performance of SCD risk strategies (2014 ESC SCD 5-year risk score and 2020 ACC/AHA risk factor strategy) in predicting lethal arrhythmic events (LAE) among a cohort of HCM patients.

Methods: Sixty-five patients (42±17 years) with a diagnosis of HCM were enrolled from 1990 to 2021. Patients were managed according to the best available treatment strategy for HCM in the different clinical eras.

Results: Of the 65 patients, 28(43%) received an ICD (23 in primary, 5 in secondary prevention). During 15 years (15 [6,21], range 1-33 years, 1014 patients/year), a total of 10 LAE were observed (0.98%/year). According to ESC SCD risk score and ACC/AHA risk-factors patients were respectively categorized as: 7(10%) and 35(54%) at high-risk, 14(22%) and 24(37%) at intermediate to high-risk, 44(68%) and 6(9%) at low-risk. Four (2.8%) patients experiencing SCD events were misclassified as low-risk by the ESC SCD Risk score, whereas none by the ACC/AHA model. Of the 7 patients categorized as high-risk by the ESC SCD Risk Score, 2(29%) experienced a LAE, whereas of the 35 patients at high-risk by the ACC/AHA, 9(26%) suffered a LAE. No difference in the AUC was shown between the two models (0.72; 95% CI 0.60–0.83, 0.66; 95% CI 0.49–0.84, p =0.55).

Conclusions: In this HCM cohort followed up over an extended period of more than 15 years, incidence of LAE was low (0.98%/year). Although 2020 ACC/AHA stratification did not show a higher accuracy to predict arrhythmia than ESC 2014 SCD risk score, it had a much higher sensitivity and would result in a IIa or IIb indication for an ICD implantation in up to 83% of our HCM patients.





Conflict of interest to declare? No

O50

Incidence and burden of atrial fibrillation in cryptogenic stroke patients implanted with a cardiac monitor: a multicenter Swiss study

J. Bartkowiak[1], E. Hennings[2], T. Meinel[3], B. Steinhauer[1], U. Fischer[4], M. Kühne[2], T. Reichlin[1], L. Roten[1]

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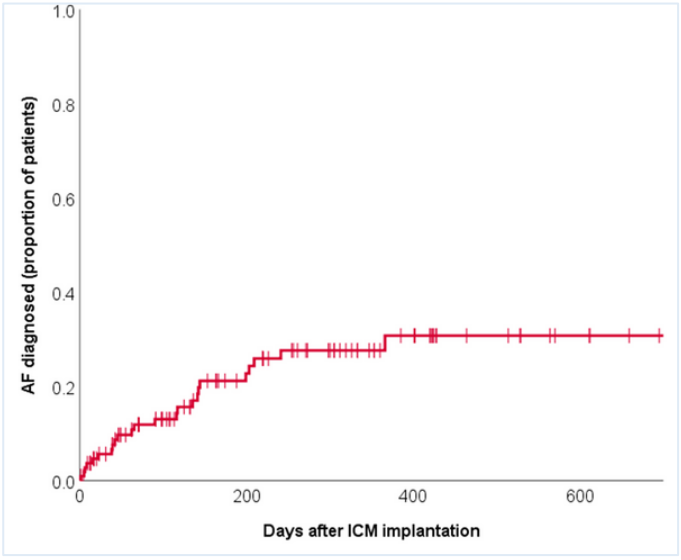
Introduction: Implantable cardiac monitors (ICM) are increasingly used for atrial fibrillation (AF) screening after ischemic stroke.

Methods: This multicenter, prospective study included patients with a cryptogenic, ischemic stroke and at least one of the following predictors of incident AF: age >65 years, NT-proBNP >400 pg/mL, left atrial diameter >44 mm, frequent atrial ectopy, or involvement of multiple cerebrovascular territories compatible with an embolic source. Patients with AF detected by in-hospital telemetry (first 24-48 hours after the ischemic stroke), or by one 7-day Holter ECG at discharge, were excluded. The primary endpoint of the study was any AF episode lasting >2 minutes detected by remote monitoring of the implanted ICM.

Results: Of 111 patients implanted with an ICM, 73 (66%) were male and mean age at implant was 66±13 years. No adverse events occurred during implantation. Two ICMs (2%) were explanted prematurely because of discomfort at implant site or patient wish after 102 and 508 days, respectively. After a median follow-up of 257±193 days, AF was detected in 24 patients (22%) overall. Twelve months after implantation, AF was diagnosed in 28% of patients (Figure). The first AF episode detected by the ICM lasted longer than 24 hours in four patients (17%). Median percentage of time spent in AF was 0.2% (IQR 0, 1%). Longest AF episodes recorded by the ICM exceeded 24 hours in 4 patients, 6 hours in 11 (46%), one hour in 15 (63%), and 6 minutes in 19 (79%).

Conclusions: In selected patients with cryptogenic ischemic stroke, AF was detected by an ICM in 28% of patients after 12 months. AF burden, however, was low and only a minority of patients had episodes lasting longer than 24 hours. The minimal AF burden warranting initiation of anticoagulation therapy remains to be defined.



Conflict of interest to declare? No

O51

Clinical validation of a novel smartwatch for automated detection of atrial fibrillation

M.J. Lischer[1,2], P. Badertscher[1,2], S. Knecht[1,2], C. Isenegger[1,2], J. Du Fay de Lavallaz[1,2], F. Spies[1,2], B. Schär[1,2], S. Osswald[2,1], M. Kühne[1,2], C. Sticherling[1,2]

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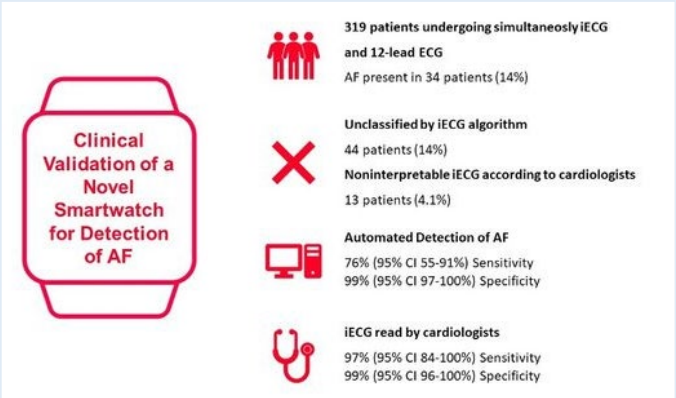
Introduction: The Withings Scanwatch is a novel smartwatch able to record an intelligent (i)ECG with automated detection of AF. While the iECG function from three major manufacturers have been extensively investigated, there is a paucity of data regarding the performance of the iECG function of the Withings Scanwatch.

Methods: We performed a prospective, observational study enrolling consecutive patients presenting to the Basel Heart Center at the University Hospital Basel. The aim was to assess the diagnostic performance of the iECG function of the Withings Scanwatch to detect AF compared to a simultaneously acquired cardiologist-interpreted 12-lead ECG.All iECG rhythm strips and 12-lead ECGs were anonymized and distributed to two blinded cardiologists who independently interpreted each tracing and assigned a diagnosis of sinus rhythm, AF or unclassified.

Results: iECGs and 12-lead ECGs were simultaneously recorded in 319 patients (67 yo (IQR 54-76), 48% female). Using the automated algorithm, rhythm was deemed inconclusive in 44 patients (14%). Overall, AF was present in 34 patients (11%). Among the tracings where the algorithm provided a diagnosis, it correctly identified AF with 76% (95%CI 55-91%) sensitivity, 99% (95%CI 97-100%) specificity, and a Kappa (K) coefficient

of 0.72 when compared with cardiologist-interpreted 12-lead ECGs (Figure). Among patients in sinus rhythm, 3 were labeled AF (false-positive). From the 44 unclassified recordings, blinded cardiologists were able to correctly diagnose AF with 100% (95%CI 59-100%) sensitivity, 93% (95%CI 77-99%) specificity, and a K coefficient of 0.49. A total of 13 iECG recordings (4.1%) were determined to be noninterpretable by the cardiologists. Of the remaining 306 patients with simultaneous recordings, cardiologist interpretation of the iECG tracings demonstrated 97% (95%CI 84-100%) sensitivity, 99% (95%CI 96-100%) specificity and a K coefficient of 0.75.

Conclusion: Automatic rhythm classification was inferior to manual interpretation of iECGs. We found a lower sensitivity for the detection of AF using the Withings iECG function compared to data published on other devices. Cardiologist-iECG interpretation, however, was highly reliable with a diagnostic accuracy of 98% (95%CI 96-100%). Clinical interpretation of iECG readings by a cardiologist is therefore strongly encouraged.



Conflict of interest to declare? No

O52

Evolution of tricuspid valve regurgitation after implantation of a leadless pacemaker – a single center experience, systematic review and meta-analysis

A. Haeberlin[1], J. Bartkowiak[1], N. Brugger[1], H. Tanner[1], E. Wan[2], S.H. Baldinger[1], J. Seiler[1], A. Madaffari[1], G. Thalmann[1], H. Servatius[1], L. Roten[1], F. Noti[1], T. Reichlin[1]

[1]Bern University Hospital, University of Bern, Dept. of Cardiology, Bern, Switzerland, [2]Columbia University, Vagelos College of Physicians and Surgeons, Div. of Cardiology, Dept. of Medicine, New York, United States

Introduction: Conventional pacemaker leads may interfere with the tricuspid valve leaflets, tendinous chords and papillary muscles, resulting in significant tricuspid valve regurgitation (TR). Leadless pacemakers (LLPMs) theoretically cause less mechanical interference with the tricuspid valve apparatus. However, data on TR after LLPM implantation are sparse and conflicting. Our goal was to investigate the prevalence of significant TR before and after LLPM implantation.

Methods: Patients who received a leadless LLPM (Micra™ TPS, Medtronic, US) between 05/2016 and 05/2021 at our center were included in this observational study if they had at least a pre- and postinterventional echocardiogram (TTE). The evolution of TR severity was assessed. Following a systematic literature review on TR evolution after implantation of a LLPM, data were pooled in a random-effects meta-analysis.

Results: We included 69 patients (median age 78 years [interquartile range (IQR) 72-84 years], 26% women). Follow-up duration between baseline and follow-up TTE was 11.4 months (IQR 3.5-20.1 months). At follow-up, overall TR severity was not different compared to baseline (p=0.49). Six patients (9%) had new significant TR during follow-up after LLPM implantation, whereas TR severity improved in seven patients (10%, Fig. 1). In the systematic review, we identified seven additional articles that investigated the prevalence of significant TR after LLPM implantation. The meta-analysis based on 297 patients failed to show a difference in significant TR before and after LLPM implantation (risk ratio 1.22, 95%-CI 0.97-1.53, p=0.11; results for subgroups are shown in Fig. 2).

Conclusion: To date, there is no substantial evidence for an increase in the prevalence of significant LLPM-induced TR after implantation.

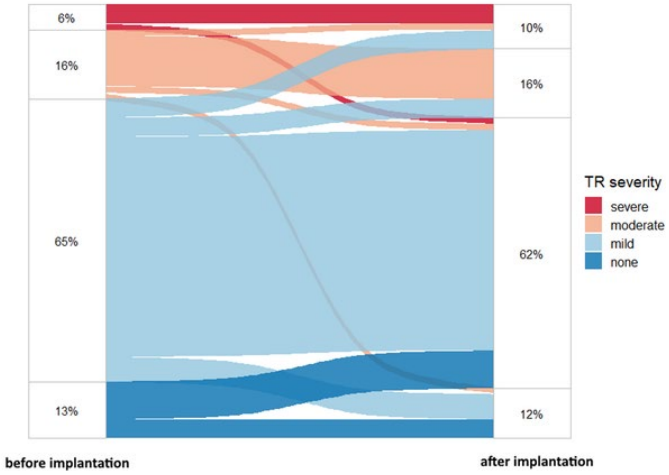


Fig. 1: Alluvial diagram of TR severity before and after LLPM implantation. At baseline, nine patients had no TR, 45 patients had mild TR, 11 patients had moderate TR, and four patients had severe TR. During follow-up, eight patients had no TR, 43 patients had mild TR, 11 patients had moderate TR, and seven patients had severe TR.

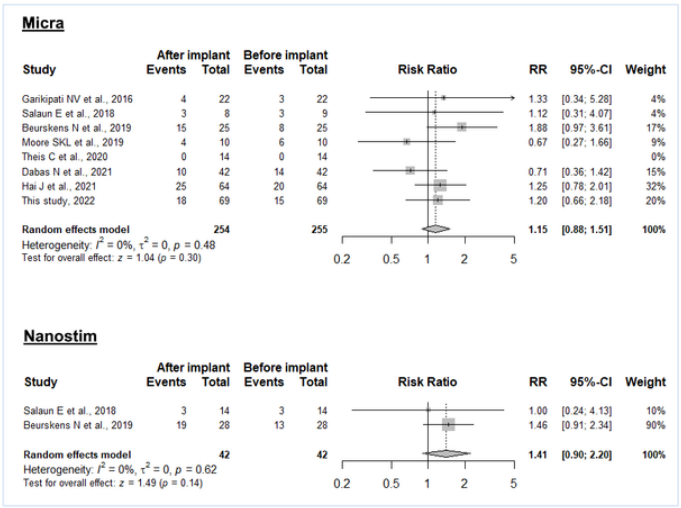


Fig. 2: Meta-analysis of tricuspid valve regurgitation of moderate or severe degree (labelled as "event") before and after implantation of a LLPM (top panel: Micra™ TPS; bottom panel: Nanostim™). Horizontal lines represent 95% confidence intervals. Abbreviations: CI – confidence interval; RR – risk ratio.

Conflict of interest: None of the authors has received any compensation for this study. Dr. Haeberlin has received travel/educational grants from Medtronic and Philips/Spectranetics. He is consultant/advisor for DiNAQOR and Biotronik and Co-founder/head of Act-Inno. Dr. Tanner has received travel grants from Abbott and an educational grant from Biosense-Webster. Dr. Baldinger has received travel grants from Microport. Dr. Seiler's spouse is an employee of Boston Scientific. Dr. Roten has received speaker honoraria from Abbott and consulting honoraria from Medtronic. Dr. Noti has received travel/educational grants from Medtronic and Abbott, Boston Scientific and Philips/Spectranetics and speaker honoraria from Medtronic and Abbott. Dr. Reichlin has received consulting fees/speaker honoraria/travel support from Abbott, Astra Zeneca, Brahms, Bayer, Biosense-Webster, Biotronik, Boston-Scientific, Daiichi Sankyo, Medtronic, Pfizer-BMS and Roche.

MAIN SESSION AGLA / SCPRS: GUIDELINES INTO PRACTICE SESSION "2021 ESC GUIDELINES ON CVD PREVENTION"

O53

20-year trends in the prevalence of cardiovascular risk factors and outcomes among young adults (<50 years old) hospitalised with acute coronary syndromes in Switzerland

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Introduction: Coronary artery disease is traditionally considered a pathology that affects older individuals. However, the prevalence of cardiovascular risk factors is on the rise in young adults. We evaluated the 20-year trend in the prevalence of cardiovascular risk factors and outcomes among young adults hospitalised with acute coronary syndromes (ACS) in Switzerland.

Method: Data from the Acute Myocardial Infarction in Switzerland (AMIS) registry for the period 01.01.2000-31.12.2019 were analysed. Young patients were defined as those <50 years old. The primary and secondary endpoints were in-hospital mortality and cardiogenic shock, respectively.

Results: Among 58'028 patients, 7'073 (14.1%) were aged <50 years (median age 45.6 years IQR 42.0-48.0). Compared with patients ≥50 years (median age 68.8 years IQR 60.0-77.7), young adults had lower rates of hypertension (35.9% vs. 65.7% p<0.001), diabetes (10.1% vs. 22.2%, p<0.001) and dyslipidaemia (57.3% vs. 62.2%, p<0.001), but were more likely to be obese (BMI >30 kg/m^2) (21.7% vs. 17.4%, p<0.001) and active smokers (71.4% vs. 33.9%, p<0.001). Young adults exhibited lower levels of cardiogenic shock (3.3% vs. 4%, p<0.001) and in-hospital mortality (1.8% vs. 5.9%, p<0.001).

Temporal linear-by-linear association revealed a significant increase in hypertension (from 32% [2000-2004] to 42% [2015-2019], p-for-trend <0.001) and obesity (from 21% [2000-2004] to 27% [2015-2019], p-for-trend <0.001) among young adults. Conversely, there was a significant decrease in active smoking (from 73% [2000-2004] to 68% [2015-2019] p=0.02). No significant changes in the prevalence of diabetes (p-for-trend 0.32) or dyslipidemia (p-for-trend 0.67) occurred. Although in-hospital mortality remained stable (2.1% [2000-2004] vs. 2.1% [2015-2019] p=0.86), there was a significant increase in cardiogenic shock (1.7% [2000-2004] to 5.4% [2015-2019], p<0.001) (**Figure**).

Conclusions: These data suggest an increase in the prevalence of hypertension and obesity in young ACS patients in Switzerland, suggesting a need for improved public health initiatives targeting cardiovascular risk factors in young adults.

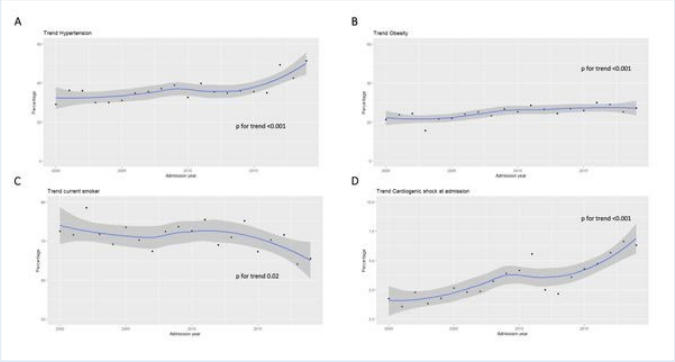

Figure. Twenty-year trends in the prevalence of (A) hypertension, (B) obesity, (C) active smoking, and (D) cardiogenic shock among young adults presenting with acute coronary syndromes in Switzerland.

Conflict of interest to declare? No

CONGENITAL FRIDAY: WHAT HAPPENED TO OUR CHALLENGING CASES?

O54

Swiss Evaluation Registry for Pediatric Infective Endocarditis (SERPIE)

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Introduction: Infective endocarditis (IE) in pediatric patients is a rare but severe cardiac disease and aetiology and treatment are rare. The aim of this study was to analyse the epidemiology of paediatric IE in Switzerland.

Method: Retrospective nationwide multicenter data analysis regarding frequency, microbiological spectrum, diagnostics, predisposing risk factors, clinical course, complications, therapy and outcome of cases of pediatric IE in children (<18 years) between 2011 and 2020 that were treated or had a follow-up at one of the four main pediatric cardiac centres in Switzerland (Zurich, Bern, Lausanne, Geneva).

Results: 69 patients were treated for definite (40;58%) or possible IE (29;42%). 42 (61%) were male. Diagnosis was made at median 6.39 years (0.81-12.60) with 19 patients (28%) during the first year of life. 58 children (84%) had congenital heart defects (CHD), 46% of them (32/58) were cyanotic. 42 (61%) were recommended for antibiotic prophylaxis. IE was located on pulmonary (29;42%), mitral (10;14%), tricuspid (8;12%) and aortic valve (6;9%), and rarely on ventricular septal defect (VSD;4;6%) and atrial septal defect (ASD;1;1%). In 12 patients (17%) localisation was unknown. 48 patients (70%) had postoperative IE, with prosthetic material involved in 33 (33/48; 69%). Prosthetic material associated endocarditis affected the right ventricular to pulmonary artery conduit (28/48;58%; Contegra (21), Melody (5), Homograft (1), Shelhigh-Conduit (1)), prosthetic material in VSD position (4/48; 8%; Patch (3), Amplatzer-Device (1)) and an Amplatzer-Device in ASD position (1/48;2%). Causative organisms were staphylococci spp. (26;38%) including Staphylococcus aureus (18;26%), streptococci spp. (13;19%), enterococci spp. (8;12%), HACEK (6;9%), culture negative IE (5;7%) and other pathogens (10;14%). 35 patients (51%) suffered from severe complications including heart failure (16;23%), sepsis (17;25%) and embolism (19;28%; lung (11), brain (9), spleen (3), kidney (2), extremities (2), retina (1)). Cardiac surgery was performed in 32 patients (46%), with 63% surgical interventions (20/32) performed early (≤28days after diagnosis). 5 patients (7%) died.

Conclusions: IE in childhood remains a severe disease relevant mortality, that is associated with a high rate of complication. CHD acts as a risk factor for IE, in particular the high number of cases associated with prosthetic pulmonary valve needs further evaluation and therapeutic alternatives.

Conflict of interest to declare? No

RAPID FIRE ABSTRACT SESSION: CONGENITAL AND PEDIATRIC CARDIOLOGY

O55

Arrhythmia burden, rhythm interventions and outcome in a large Swiss multicenter population of d-TGA patients with atrial switch

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Introduction: Patients with dextro-transposition of the great arteries (d-TGA) and atrial switch face a high life-time risk of arrhythmias. The purpose of this study was to describe the incidence of arrhythmias, associated cardiac interventions and outcome in a large Swiss population of patients with d-TGA and atrial switch.

Methods: In this multicenter analysis we included all consecutive patients with d-TGA and atrial switch treated at three Swiss tertiary care hospitals. The primary outcome was survival free from left ventricular assist device (LVAD), heart transplantation (HTx) and death. The secondary outcome was survival free from ventricular tachycardia, ventricular fibrillation and sudden cardiac death.

Results: We identified 207 patients (34% females; median age at last follow-up 35 years) with d-TGA and atrial switch. Arrhythmias occurred in 97 patients (47%) at a median age of 22 years. A pacemaker or an implantable cardioverter/defibrillator was implanted in 39 (19%) and 13 (6%) patients, respectively, and 33 (16%) underwent a total of 51 ablation procedures to target 60 intra-atrial reentry tachycardias, 4 AV nodal reentry tachycardias and one atrial fibrillation (Figure 1). The primary outcome occurred in 21 patients (10%) and the secondary outcome in 18 (9%) (Figure 2). Primary and secondary outcomes were more common in patients with concomitant ventricular septum defect (VSD) than in those without (hazard ratio [HR] 3.06; 95% confidence interval [CI] 1.29-7.27, p=0.011; and HR 3.62; 95% CI 1.43-9.18, p=0.007, respectively).

Conclusions: At a median age of 35 years, arrhythmias occur in almost half of patients with d-TGA and atrial switch and associated rhythm interventions are frequent. One in ten patients does not survive free from LVAD and HTx and outcome is worse in patients with concomitant VSD.

Figure 1.

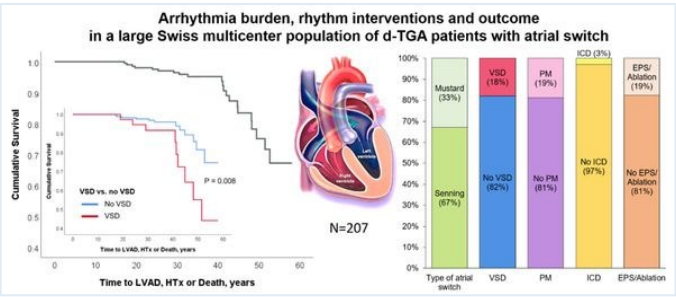
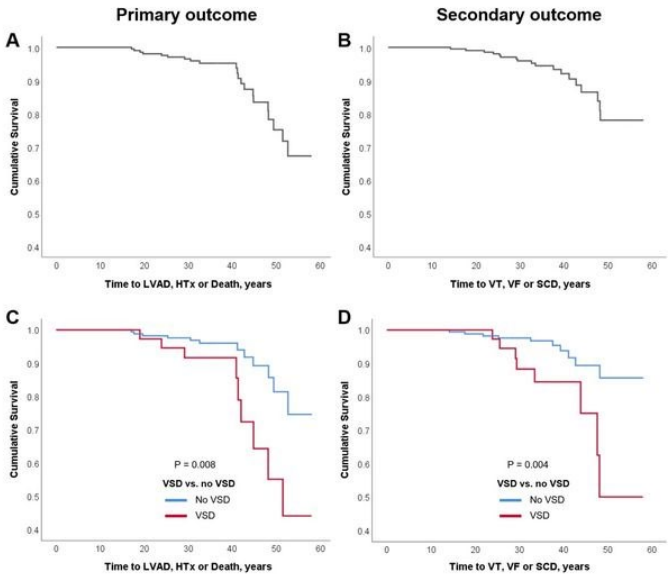


Figure 2.



Conflict of interest to declare? No

O56

Perioperative brain structure is altered in patients with cerebral desaturation during neonatal congenital heart surgery

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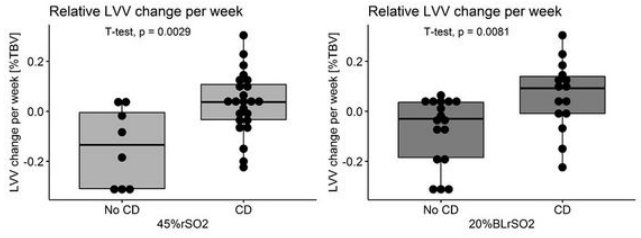
Introduction: Controversy exists about the significance of intraoperative cerebral desaturation measured by near-infrared spectroscopy (NIRS) to predict neurodevelopment in neonates with severe congenital heart disease (CHD). The aim of this study was to compare brain structure changes and neurodevelopmental outcome in patients with severe CHD with and without intraoperative cerebral desaturation.

Methods: Neonates requiring congenital heart surgery were enrolled in a prospective cohort study. NIRS data of their first cardiac surgery was collected. Pre- and postoperative cerebral magnetic resonance imaging (MRI) results and Bayley-III scores at one year were compared between patients with and without cerebral desaturation, defined by two NIRS thresholds: regional cerebral oxygen saturation (rSO_2) of 45% (*45%rSO_2*) and rSO_2 below 20% of baseline value (*20%BLrSO_2*).

Results: Thirty-two patients (72% male) with d-transposition of the great arteries (n=24, 75%) and other complex types of CHD (n=8, 25%) were analyzed. NIRS data of their first cardiac surgery performed at mean 14.4 (SD 5.8) days of life were collected. Brain volumes and intracranial lesions were analyzed in pre- and postoperative MRI scans performed within a range of mean 19.3 (SD 7.1) days. Perioperative relative lateral ventricle volume change was increased in patients with versus without intraoperative cerebral desaturation (p=0.003 for *45%rSO_2*, p=0.008 for *20%BLrSO_2*). For *45%rSO_2,* the effect of cerebral desaturation remained significant af-

ter adjusting for age at postoperative scan, time between scans, and cardiac diagnosis (p=0.019). New intracranial lesions occurred predominantly in cerebral desaturation groups (6 of 6 patients for *45%rSO$_2$*, 5 of 6 patients for *20%BLrSO$_2$*). Neurodevelopmental outcome at one year was not associated with intraoperative cerebral desaturation.

Conclusion: This study demonstrates the clinical relevance of NIRS monitoring during congenital heart surgery. The occurrence of intraoperative cerebral desaturation is associated with perioperative lateral ventricle volume change and new intracranial lesions.



CD: cerebral desaturation; LVV: lateral ventricle volume; TBV: total brain volume

Conflict of interest to declare? No

O57

Physical activity in single ventricle patients – between somatic predictors and quality of life

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Background and aim: Fontan patients tend to a sedentary lifestyle with low physical activity (PA) levels and their objective exercise capacity is reduced. This study investigates PA of Fontan patients, and its relationship to exercise capacity, heart rates, cardiac function at cardiovascular magnetic resonance (CMR), biomarkers, health-related quality of life (HRQoL), and sleep quality.

Methods: CMR, exercise testing, 24h-ECG, and blood samples were prospectively performed in 38 Fontan patients, females (40%), and 18 (47%) with a single left ventricle. Time interval from Fontan operation was in median (IQR) 10 (8-15) years, age 13 (11-16). PA was assessed by accelerometer during 7 consecutive days of regular school/work. Moderate intensity PA was defined as >2296 counts/minute and vigorous PA as >4012 counts/minute. Patients with moderate-to-vigorous PA (MVPA) below 60minutes per day were categorized as inactive as recommended by the WHO. Parameters of exercise capacity included maximal oxygen uptake, maximum work rate, and maximal heart rate. HRQoL was self-assessed using the KIDSCREEN-27 and SF-36 according to patients' age; sleep quality with the Pediatric Sleep Questionnaire (PSQ) and Pittsburgh Sleep Quality Index (PSQI).

Results: Daily MVPA was in median (IQR) 40 (28-57) minutes and 7/38 (18%) patients reached the recommended 60minutes/day of MVPA. Daily minutes of MVPA did not correlate with gender, age, single ventricle morphology, time interval from Fontan surgery, mean heart rate, ventricular volumes, and ejection fraction at CMR, cardiac biomarkers, or exercise capacity. Physical well-being (r=0.33, p=0.04), autonomy (r=0.39, p=0.03), and social support & peers (r=0.43, p=0.009) assessed using the KIDSCREEN-27 tool correlated with daily minutes of MVPA. On the SF-36 tool, both physical (r=0.57, p=0.03) and mental (r=0.54, p=0.04) component summaries correlated with daily minutes of MVPA. PSQI global sleeping score (r=0.7, p=0.007), and PSQ scales for snoring (r=0.49, p=0.05) and daily sleepiness (r=0.32, p=0.05) correlated with daily minutes of MVPA.

Conclusion: Only 18% of the patients meet the recommendation for daily MVPA. Measures of exercise capacity, cardiac function or chronotropic competence are not correlated to daily physical activity. In contrast Quality of life and sleep quality seems to benefit from regular physical activity.

Conflict of interest to declare? No

O58

Prenatal detection rate of major congenital heart disease in Switzerland

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Introduction: Detection of major congenital heart disease (MCHD) is an important aim of second trimester screening for improving parental counseling and perinatal treatment. Prenatal detection rate of MCHD in Switzerland is unknown. We sought to analyse the prenatal detection rate and outcome of MHCD of the referral region of the largest pediatric heart centre in Switzerland.

Methods: Definition of MCHD was defined as any structural cardiac malformation diagnosed in the first 6 months of life and requiring invasive therapy, i.e. cardiac surgery and/or catheter-guided intervention. The cases were retrospectively identified by reviewing all echocardiographic reports performed at the age <6 months between 2012 and2017 in our institution. All cases were cross-checked with the fetal echocardiographic database, if diagnosis was already done prenatally. In addition, all fetal cases expected to be delivered in the same period were matched to the identified cases. Survival rate were considered to an age of 6 months.

Results: A total of 643 patients with MCHD were identified. Overall prenatal detection rate was 26.5% (n=170). Distribution of cases (n, % of total; % of prenatal detection) was large ventricular septal defect (VSD) (n=108, 17%;*10%*), coarctation (n=86, 13%;*21%*), single ventricle(n=62, 10%;*60%*), atrioventricular septal defect (n=58, 9%; *33%*), d-transposition of the great arteries (TGA) (n=48, 7%;*23%*); tetralogy of Fallot (n=47, 7%;*19%*), pulmonary arterial stenosis(n=43, 7%;*9%*), double outlet right ventricle (n=35, 5%;*31%*), aortic stenosis (n=27, 4%;*19%*), pulmonary atresia (PA) with VSD (n=25, 4%;*36%*), total pulmonary venous return(n=15, 2%;*13%*), PA/intact ventricular septum (n=9, 1%;*56%*), common arterial trunk (n=6, 1%;*50%*), Ebstein's anomaly (n=6, 1%;*83%*), congenitally corrected TGA (n=6, 1%;*50%)* and others (n=62, 10%;26%). In summary, detection rate in single ventricle was relatively high. Detection rate in critical heart lesions such as coarctation and d-TGA remains below 25%.

Conclusion: Prenatal diagnosis of MCHD for distinct cardiac lesions remains low. Efforts to improve detection rate for critical lesions such as d-TGA and aortic coarctation are crucially required.

Conflict of interest to declare? No

O59

Percutaneous interventions in adults with unrepaired cyanotic heart defects: prepare for post-interventional heart failure!

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Introduction: Adults with unrepaired cyanotic heart defects are among the most complex patients in adult congenital heart disease. Exercise tolerance is often severely limited due to restricted pulmonary blood flow and hence low systemic oxygen saturations. Interventions to improve pulmonary blood flow may increase oxygen saturation and exercise tolerance but little is known about the outcome of such interventions in adult life.

Methods: Herein we report a series of 4 adults (age 26-45 years, 3 females, 1 male) with complex unrepaired congenital heart defects who underwent percutaneous interventions to improve pulmonary blood flow by

means of stenting of stenotic Blalock-Taussig-Shunts (n = 3) or a native hypoplastic persistent arterial duct to the left lung (n = 1). We report the impact of the interventions on ambulatory systemic oxygen saturations, NT-proBNP-levels and clinical outcomes.

Results: Table 1 summarizes heart defects and impact of interventional procedures on systemic oxygen-saturations, NT-proBNP-levels and clinical outcome. After the procedure, all patients experienced an increase in oxygen-saturation (3-13%) and a marked increase in NT-proBNP-levels with overt clinical heart failure in 3/4 patients. All patients required diuretic therapy to manage fluid overload (illustrated in figure 1, representing patient 1). All but 1 patient had a clinical benefit from the procedure but all required long-term diuretic treatment.

Conclusion: In adults with unrepaired cyanotic heart defects, interventional stenting of previous surgical Blalock-Taussig-Shunts may improve pulmonary blood flow and systemic oxygen-saturations. However, all adults with cyanotic heart defects have diastolic ventricular dysfunction and may struggle to tolerate the increased volume load by these procedures. Careful multi-disciplinary pre-interventional assessment and post-interventional follow-up with early administration of diuretics to manage fluid retention is important.

Conflict of interest to declare? No

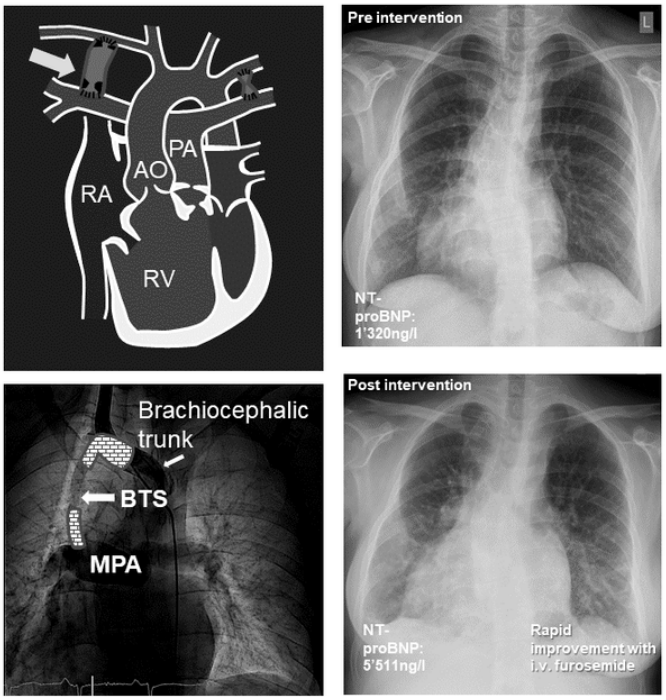

Figure 1

Table 1

	Congenital heart defect	Age	SpO2 pre intervention	SpO2 post intervention	NT-proBNP pre intervention	NT-proBNP post intervention	Clinical course
1	Complex single ventricle, pulmonary stenosis, Blalock-Taussig-Shunts at age 3 and 7 years.	32, female	71 %	84 %	1320 ng/l	5511 ng/l	• Stenting of BT-shunt • Required hospital admission for decompensated heart failure. Improved on diuretic therapy, improved functional class.
2	Criss-Cross heart, pulmonary atresia, non-confluent pulmonary arteries. Hypoplastic PDA to left lung. Classic right Blalock-Taussig shunt at age 3 years.	45, female	78 %	82 %	434 ng/l	1780 ng/l	• Stenting of PDA • Required diuretic therapy to manage fluid retention, moderately improved exercise capacity.
3	Left atrial isomerism, complex single ventricle physiology, severe pulmonary stenosis. Modified left Blalock-Taussig-Shunt at age 8 years.	32, female	82 %	85 %	276 ng/l	1521 ng/l	• Stenting of BT-Shunt • Required high doses of diuretics to manage fluid retention. Slightly improve saturations, no clinical benefit.
4	Double inlet left ventricle, pulmonary atresia. Modified Blalock-Taussig-Shunts at age 2 days and 2 years, central shunt age 14 years.	26, male	75 %	84 %	1702 ng/l	3376 ng/l	• Stenting central shunt • Admitted for optimization of cardiac function (ACE-inhibitor, B-Blocker) prior to intervention. Pre-emptive low-dose diuretics post-stenting. • Excellent subjective response.

POSTER WALK: BASIC SCIENCE

P01

Rimeporide, a first in class Na/H exchanger-1 inhibitor, ameliorates right ventricular dysfunction and pulmonary arterial hypertension in a Sugen/Hypoxia model

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Background: Pulmonary arterial hypertension (PAH) is characterized by pulmonary vasoconstriction and vascular remodeling leading to right ventricular (RV) failure. Although RV function is the major prognostic factor in PAH, no RV-specific therapies exist. The Na^+/H^+ exchanger type 1 (NHE1) regulates the intra- and extracellular pH balance mainly through the 1:1 exchange of intracellular H^+ with extracellular Na^+. Increased NHE-1 activity is involved in several diseases, including hypoxic PAH. Inhibition of NHE-1 activity attenuates pulmonary vascular remodeling in rodents exposed to hypoxia but its potential direct contribution in RV remodeling remains unclear.

Aim: To investigate the cardio-pulmonary protective effects of Rimeporide, a first in class NHE-1 inhibitor, in rats with PAH and RV dysfunction.

Methods: PAH was induced in adult Sprague-Dawley rats with a single injection of SU5416 (20 mg/kg) followed by 3 weeks of hypoxia (10% O_2; Sugen/Hypoxia model: SuHx) and then return to normoxia. Control rats were injected with equal volume of vehicle. At week 5 post-injection, control and SuHx rats were treated with rimeporide (100 mg/Kg daily in drinking water, n=10/group) or placebo (n=11/group) for 3 weeks. RV phenotype was monitored by echocardiography and hemodynamic analysis. Lung and heart were collected for histological and protein expression analysis, such as NHE-1 and hypoxia-inducible factor-1

(HIF-1a).

Results: As reported in Table I, SuHx caused severe PAH and RV dysfunction. RV dysfunction in SuHx rats was accompanied by an increase in RV hypertrophy and RV fibrosis and PA remodeling (increase in the arteriolar wall thickness and fibrosis). A marked increase in macrophages was found in lung and RV tissues but not in LV. Moreover, Western blot analysis showed that RV protein levels of NHE-1 and HIF-1a were higher in SuHx rats than Normoxia rats (2-fold and 4-fold increase, respectively). Treatment with Rimeporide reversed SuHx-induced PAH as well as RV dysfunction and blunted pulmonary and RV inflammation, RV NHE-1 and HIF-1a expression.

Conclusion: Our results indicate that NHE-1 and HIF-1a levels are increased in RV tissues from SuHx-induced PAH rats. Rimeporide, through NHE-1 inhibition, might be a potential new target for treatment of RV dysfunction and PAH.

Conflict of interest to declare? No

Table: Effects of Rimeporide on cardio-pulmonary function.

Definition of abbreviations: PAT/ET= pulmonary acceleration time/ejection time; VTI= velocity time integral; mPAP= mean pulmonary arterial pressure; RVFWTd= RV free wall thickness at diastole; RVIDd= RV internal diameter at diastole; RVEF= RV ejection fraction; RV+dp/dt= RV dp/dt maximum; RV-dp/dt= RV dp/dt minimum; RV and LV CSA= RV and LV cross-sectional area.

* vs Normoxia and Normoxia + Rimeporide rats
# vs SuHx rats.

Parameters	Normoxia		Normoxia + Rimeporide		SuHx		SuHx + Rimeporide		P ANOVA One-way
Echocardiography									
PAT/ET, ratio	0.36 ±0.02	11	0.35±0.02	10	0.18±0.01*	11	0.24±0.01*#	10	<0.0001
VTI, mm	51.2±1.66	11	52.7±1.21	10	35.0±1.75*	11	42.2±2.25*#	10	<0.0001
mPAP, mmHg	19.9±1.85	11	22.2±2.11	10	39.4±2.23*	11	32.4±1.45*#	10	<0.0001
RV FWT d, mm	1.05±0.05	11	1.10±0.03	10	2.17±0.05*	11	1.77±0.12*#	10	<0.0001
RV ID d, mm	2.41±0.10	11	2.24±0.07	10	3.54±0.02*	11	3.01±0.12*#	10	<0.0001
RV EF, %	93.1±1.33	11	88.2±2.63	10	54.2±3.45*	11	77.9±1.30*#	10	<0.0001
Hemodynamics									
RV end-systolic pressure, mmHg	21.9±0.10	9	20.9±1.01	9	56.5±3.61*	7	43.3±3.51*#	9	<0.0001
LV end-diastolic pressure, mmHg	98.7±3.39	11	104.3±5.19	10	94.0±4.90	9	103.0±3.30	10	NS
RV end-diastolic pressure, mmHg	1.40±0.22	9	1.09±0.20	9	2.82±0.16*	7	1.84±0.31#	9	<0.0001
RV +dp/dt, mmHg/s	1039±110	9	956±53	9	1838±79*	7	1864±141*	9	<0.0001
RV -dp/dt, mmHg/s	-607±52	9	-681±48	9	-1319±79*	7	-1353±97*	9	<0.0001
RV Tau, ms	20.3±0.99	9	19.6±0.97	9	24.5±1.42*	7	19.0±0.93*#	9	<0.001
RV remodeling									
Body weight, g	487.1±14.7	11	481.1±9.1	10	444.1±12.6	11	455.0±13.7	10	NS
RV/LV+Septum, ratio	0.25±0.02	5	0.26±0.01	4	0.67±0.09*	4	0.53±0.04*#	4	<0.0001
RV CSA, mm2	335.8±16.9	6	340.4±22.2	6	1062.3±54.0*	7	827.2±79.30*#	6	<0.0001
LV CSA, mm2	385.2±33.1	6	420.2±24.7	6	421.8±29.3	7	419.3±32.4	6	NS
RV collagen, %	5.46±0.68	6	5.52±0.59	6	22.25±1.88*	7	14.88±1.59*#	6	<0.0001
LV collagen, %	4.56±0.46	6	5.15±0.76	6	7.81±0.53*	7	4.77±0.45*#	6	<0.001

P02

Methylation of the Hippo effector YAP by the methyltransferase SETD7 drives myocardial ischemic injury: a translational study

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Introduction: Methylation of non-histone proteins is emerging as a central regulatory mechanism in health and disease. The methyltransferase SETD7 has shown to methylate and alter the function of a variety of proteins in vitro, however its function in the heart is poorly understood. The present study investigates the role of SETD7 in myocardial ischemic injury.

Methods: Experiments were performed in neonatal rat ventricular myocytes (NRVMs), SETD7 knockout mice (SETD7-/-) undergoing myocardial ischemia-reperfusion (I/R) injury, left ventricular (LV) myocardial samples from patients with ischemic cardiomyopathy (ICM) and peripheral blood mononuclear cells (PBMCs) from patients with ST-elevation MI (STEMI).

Results: We show that SETD7 is activated upon energy deprivation in cultured NRVMs and methylates the Hippo pathway effector YAP, leading to its cytosolic retention and impaired transcription of antioxidant genes manganese superoxide dismutase (MnSOD) and catalase (CAT). Such impairment of antioxidant defense was associated with mitochondrial reactive oxygen species (mtROS), organelle swelling and apoptosis. Selective pharmacological inhibition of SETD7 by (R)-PFI-2 restored YAP nuclear localization thus preventing mtROS, mitochondrial damage and apoptosis in NRVMs. In mice, genetic deletion of SETD7 attenuated myocardial I/R injury, mtROS and LV dysfunction by restoring YAP-dependent transcription of MnSOD and CAT. Moreover, in cardiomyocytes isolated from I/R mice and ICM patients (R)-PFI-2 prevented mtROS accumulation while improving Ca2+-activated tension. Finally, SETD7 was upregulated in PBMCs from STEMI patients and negatively correlated with MnSOD and CAT.

Conclusions: We show a methylation-dependent checkpoint regulating oxidative stress during myocardial ischemia. SETD7 inhibition may represent a valid therapeutic strategy in this setting.

Conflict of interest to declare? No

P03

Arterial thrombosis in Hutchinson Gilford Progeria syndrome

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Introduction: Arterial thrombosis is the most common event underlying major adverse cardiovascular (CV) events. Being associated with advanced age, arterial thrombosis involves the interplay between the vascular endothelium, platelets, and the coagulation cascade and results in cessation of blood supply to the territories downstream of the thrombus. Hutchinson-Gilford Progeria Syndrome (HGPS) is a rare genetic disorder whereby accelerated aging is caused by defects in the nuclear A-type lamin gene, leading to defective protein splicing and the accumulation of progerin. This genetic disease leads to a shortened lifespan, mostly associated to myocardial infarction, and ischemic stroke. Declined vascular function and compliance have been reported as common CV characteristics of HGPS patients. Nevertheless, the effect of the specific A-type lamin gene mutation on coagulation and thrombus formation has not been investigated previously.

Methods: 28 to 30 week-old transgenic heterozygous LmnaG609G knock-in (HGPS) mice and the corresponding wild-type (WT) littermate controls were exposed to photochemically-induced carotid artery endothelial injury to trigger thrombosis. Vascular and circulating levels of tissue factor (TF) and plasminogen activator inhibitor (PAI)-1 were measured using enzyme-linked immunosorbent assay (ELISA). TF activity assay was also performed on carotid artery homogenates of WT and HGPS animals.

Results: Compared to WT, HGPS mice displayed accelerated thrombus formation as underlined by shortened time to occlusion. Despite this finding suggesting increased activation of the extrinsic coagulation cascade, no significant differences were found in TF expression and activity in carotid artery lysates. In addition, circulating and vascular expression of the fibrinolytic factor PAI-1 was similar between WT and HGPS animals.

Conclusions: Our results indicate an increased arterial thrombotic response in HGPS mice as compared to WT littermates. This novel observation could provide a mechanistic explanation for the increased incidence of acute cardiovascular events observed in HGPS patients. Further studies are on the way to investigate the molecular mechanism underlying the observed effects; in particular, on the potential involvement of platelets and endothelial adhesion factors e.g. Von Willebrand factor.

Conflict of interest to declare? No

P04

Potential antithrombotic effect of Tafamidis: preliminary results from an in vitro experiment

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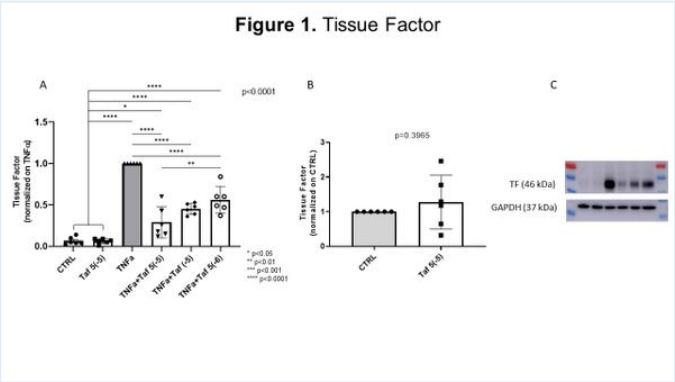

Figure 1. Expression of Tissue Factor (TF) in human aortic endothelial cells (HAECs) treated with increasing concentrations of tafamidis (Taf) after stimulation with TNFα (A) or at baseline (B). Representative western blot (C).

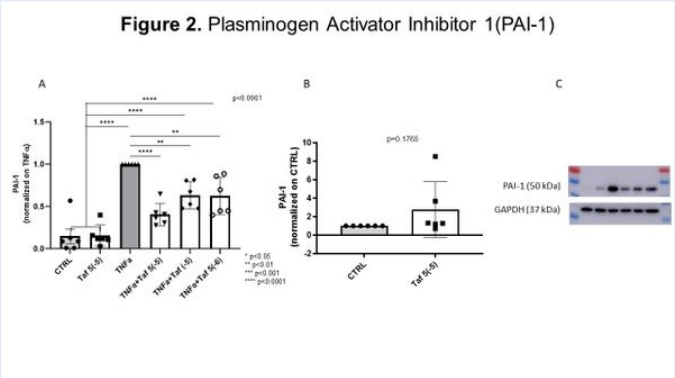

Figure 2. Expression of PAI-1 in human aortic endothelial cells (HAECs) treated with increasing concentrations of tafamidis (Taf) after stimulation with TNFα (A) or at baseline (B). Representative western blot (C).

Introduction: Transthyretin amyloid (ATTR) cardiomyopathy is caused by the deposition of misfolded transthyretin protein in the heart. Its main clinical features are heart failure with preserved ejection fraction (HFpEF) and arrhythmias, particularly atrial fibrillation (AF), associated with an exceedingly high risk of thromboembolic complications such as ischemic stroke.

Tafamidis stabilizes the tetramer form of transthyretin, preventing disassociation and consequent deposition in organs and tissues. Treatment with Tafamidis 80 mg/day was shown to reduce the incidence of hospitalization for cardiovascular causes as well as mortality in patients with ATTR cardiomyopathy.

The aim of the study is to investigate a potential ancillary anti-thrombotic effect of Tafamidis in vitro.

Methods: Primary human aortic endothelial cells (HAECs -p7) were treated with Tafamidis $5x10^{-5}$ M, Tumor Necrosis Factor (TNFα), and TNFα + Tafamidis at increasing concentration ($5x10^{-6}$, 10^{-5}, $5x10^{-5}$ M). Intracellular expression of Tissue Factor (TF), Tissue Factor Protein Inhibitor (TFPI) and Plasminogen Activator Inhibitor 1 (PAI-1) were measured by western blot. Tissue factor activity was measured through a commercially available assay.

Results: Treatment with Tafamidis reduced the expression and activity of TF after stimulation with TNFα, in a linear dose-response fashion (Figure 1). Similarly, treatment with Tafamidis reduced also the expression of PAI-1 (Figure 2). No effect was observed on TFPI.

Conclusions: Patients with ATTR cardiomyopathy have an increased risk of thromboembolic events and ischemic stroke. Our results in vitro show that the treatment with Tafamidis reduces endothelial TF in human primary endothelial cells. This previously unknown pleiotropic effect could contribute to the observed reduction of morbidity and mortality in patients with ATTR cardiomyopathy, treated with Tafamidis.

Conflict of interest to declare? No

POSTER WALK: RHYTHM DISORDERS 1

P05

Clinical validation of automated QTc measurements from single lead ECG using a novel smartwatch

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Introduction: A possible side-effect of various medical drugs is prolongation of the electric repolarization of the heart, measured as the corrected QT-interval (QTc). Patients treated with these drugs should be monitored frequently via an ECG to screen for early changes indicating possible life-threatening arrhythmia. During the Covid-19 pandemic, remote patient monitoring gained importance. The Withings Scanwatch (Withings Scanwatch, Withings SA, Issy les Moulineaux, France) offers automated analysis of the QTc remotely, thereby obviating the need for in-person visits. We aimed to compare automated QTc-measurements using a single lead ECG of a novel smartwatch (Withings Scanwatch, SW-ECG) with manual-measured QTc from a nearly simultaneously recorded 12-lead ECG.

Methods: We enrolled consecutive patients referred to a tertiary hospital for cardiac workup in a prospective, observational study. To obtain a SW-ECG, patients were instructed to keep their index finger on the stainless steel ring on the top case of the smartwatch continuously for 30 seconds The QT-interval was manually interpreted by two blinded, independent cardiologists through the tangent-method, using lead II or V5/V6. Bazett's formula was used to calculate QTc.

Results: We prospectively enrolled 317 patients (48% female, mean age 63.3 ± 17.2 years). Intervals such as HR, PR, QRS and QT were automatically calculated by the SW in 295 (93%), 226 (71%), 249 (79%) and 177 patients (56%) respectively. The diagnostic accuracy of SW-ECG for detection of a QTc-interval ≥ 460ms as quantified by the area under the curve (AUC) was 0.91 (95%CI 86.4-95.9). The Bland-Altman analysis resulted in a bias of 6.6ms (95% limit of agreement (LoA) –58.6ms to 71.9ms) comparing automated QTc measurements via SW-ECG with manual QTc-measurement via 12-lead ECG (Figure 1). In 12 patients (6.9%) the difference between measurements was greater than the LoA. Premature ventricular complexes, noise or differences in heart rate were responsible in 8.3%, 83.0% and 8.3%, respectively, for observed outliners.

Conclusion: In this clinical validation of a direct-to-consumer smartwatch we found fair to good agreement between automated-SW-ECG QTc-measurements and manual 12-lead-QTc measurements. The SW-ECG, however, was only able to automatically calculate QTc-intervals in one half of all assessed patients. Our work shows, that the automated algorithm of the SW-ECG needs improvement to be useful in a clinical setting.

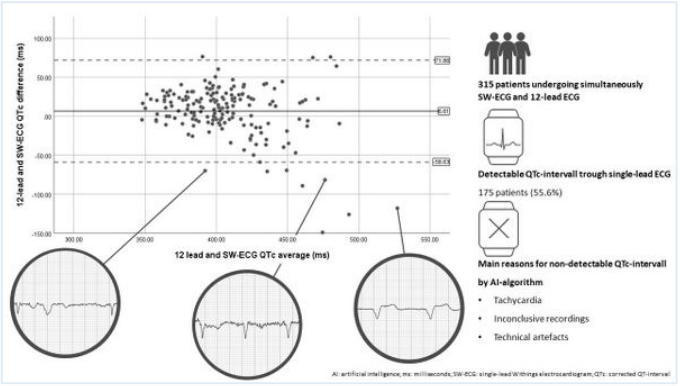

Figure 1

Conflict of interest to declare? No

P06

Healthy lifestyle and atrial fibrillation recurrence after pulmonary vein isolation – a paradox?

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Introduction: Data on the relationship of a healthy lifestyle at the time of atrial fibrillation (AF) ablation with AF recurrence is limited. We therefore investigated the association of healthy lifestyle markers with AF recurrence after ablation.

Methods: In 1439 patients undergoing AF ablation at the University Hospital Basel, a lifestyle score was built. The score included categories of BMI, smoking, blood pressure, fish intake, fruits/vegetable intake, alcohol consumption and physical activity. A higher score indicated a healthier lifestyle and patients were grouped into tertiles. Follow-up included 24h-Holter ECGs at 3 and 6 months and 7d-Holter ECGs at 12 months. Survival analyses and Cox-regression models were used to assess associations of individual factors and score-tertiles with AF recurrence.

Results: Mean age was 61.5 years, 25.9% were female and 59.1% had paroxysmal AF. In 941 patients all lifestyle score variables were available: 129, 675 and 137 patients were in the low, intermediate and high lifestyle group, respectively. Over increasing lifestyle groups, patients were more often female (9.3, 23.3, 38.7%; p<0.0001), had less hypertension (70.5, 53.3, 32.9%; p<0.0001), diabetes (15.5, 6.2, 3.7%; p=0.0002), a smaller left atrial diameter (44.1, 41.0, 37.6mm; p<0.0001) and numerically more paroxysmal AF (56.6, 62.4, 69.4%; p=0.32) with no differences in anti-arrhythmic drugs. In survival analyses (Fig. 1), we saw a trend of more recurrences in the healthiest group compared to the unhealthiest group (logrank p=0.06 for low vs high group). Individually, higher fish intake (logrank p=0.04) and lower blood pressure (logrank p=0.02) were associated with AF recurrence. In Cox-regression models the HR (95% CI) for increasing lifestyle groups was 1.21 (0.98; 1.50, p=0.07). In individual models only higher fish intake (1.25 [1.01; 1.55], p=0.045) was associated with AF recurrence (Table 1).

Table 1 Cox regression models for each individual category of the lifestyle score in univariate and one combined, multivariate model.

	n	Univariate HR (95% CI)	p-value	Multivariate HR (95% CI)	p-value
BMI	1286	1.11 (0.98; 1.25)	0.11	1.09 (0.93; 1.28)	0.27
Smoking	1035	1.01 (0.81; 1.25)	0.95	1.04 (0.82; 1.31)	0.75
Blood pressure	1321	1.07 (0.95; 1.21)	0.28	0.93 (0.79; 1.08)	0.34
Fish	1017	1.25 (1.01; 1.55)	0.045	1.19 (0.94; 1.51)	0.15
Fruits/ Vegetables	983	1.05 (0.91; 1.22)	0.52	1.01 (0.86; 1.18)	0.92
Physical activity	951	0.98 (0.78; 1.22)	0.84	0.98 (0.78; 1.24)	0.88
Alcohol	1030	1.06 (0.93; 1.22)	0.40	1.15 (0.99; 1.34)	0.07

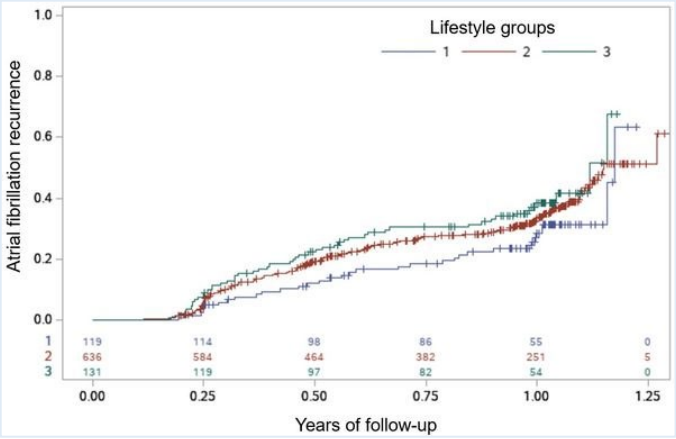

Figure 1 Survival curves for the three lifestyle groups.

Conclusion: AF recurrence was numerically more frequent in patients with a healthier lifestyle, despite less comorbidities and smaller LA diameters. This paradoxical relationship might be due to lifestyle changes after PVI, differences in PVI efficacy or residual confounding. Further studies are needed to better understand this association.

Conflict of interest to declare? No

P07

Relationship between the posterior Atrial Wall and the ESOphagus: esophageal position and temperature MEasurement during Atrial Fibrillation ablation. (AWESOME-AF), a single-center randomized controlled trial

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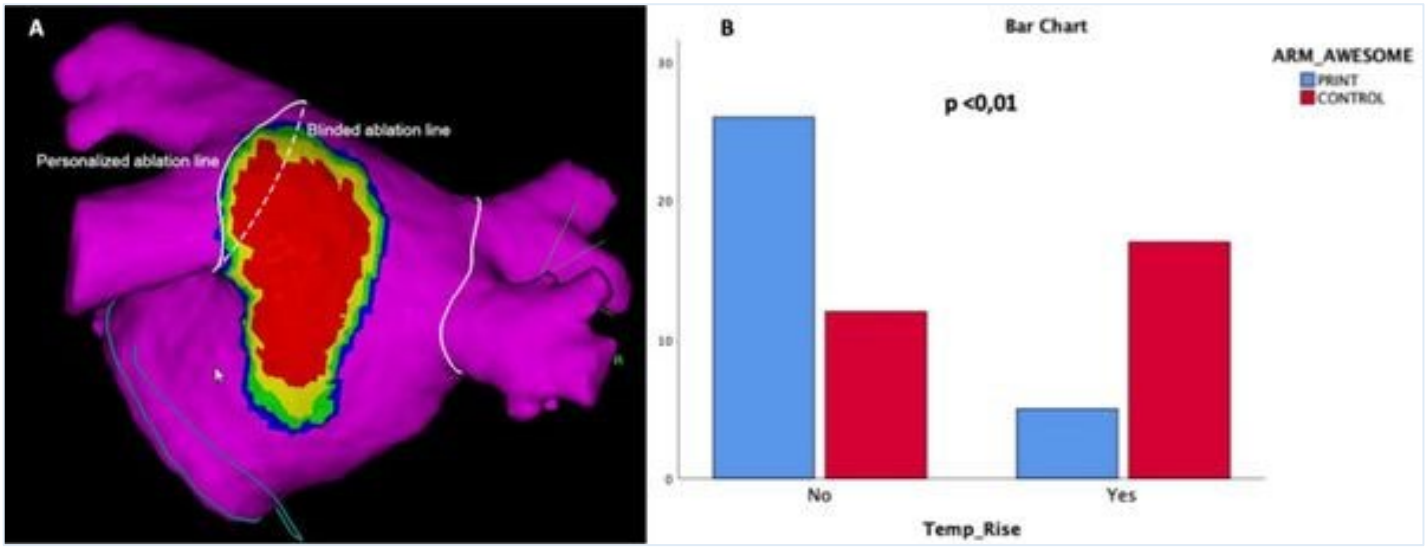
Introduction: Pulmonary Vein Isolation (PVI) implies unavoidable ablation on the left atrial posterior wall (LAPW), which is closely related to the esophagus, resulting in several complications. This study aimed to evaluate the usefulness of the esophageal isodistance print in avoiding temperature rises caused by radiofrequency (RF) application at the LAPW during paroxysmal AF ablation.

Methods: an isodistance map of the atrio-esophageal relationship (esophageal fingerprint) was derived from the preprocedural multidetector computerized tomography MDCT. Patients where randomized on a 1:1 basis in two groups. The PRINT group had a modified PVI line based on the esophageal fingerprint. The CONTROL group underwent standard PVI, and the operator was blinded to the fingerprint (Figure A). Primary endpoint was temperature rise detected by the intraluminal esophageal temperature monitoring probe. The esophageal probe position was verified with the fluoroscopy. Ablation settings were as specified on the *Ablate BY-LAW* protocol.

Results: 60 consecutive patients [42 (70%) men, mean age 60±11 years] referred for paroxysmal AF ablation were randomized. As shown in figure B, a temperature rise (>39,1ºC) occurred in 5 (16%) patients on the PRINT group Vs. 17 (56%) on the CONTROL group (p<0,01).

Conclusion: The esophageal fingerprint allows for a reliable identification of the esophageal position and its use is superior to standard approach in avoiding esophageal temperature rises. The development of new imaging-derived tools can improve patient safety. Long term follow-up is needed to evaluate for impact of PVI line modification on outcomes in terms of AF recurrence.

Conflict of interest: Dr. Berruezo is stockholder of ADAS 3D Medical. Dr. Soto-Iglesias is an employee of Biosense Webster.



P08

Value of peri-procedural electrophysiological testing during TAVR for risk stratification of patients with left bundle branch block

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Background: Despite being the most frequent complication, optimal management of patients with left bundle branch block (LBBB) after transcatheter aortic valve replacement (TAVR) remains unknown. Electrophysiological testing (EPS) has been proposed for risk stratification. However, the optimal timing of EPS remains unknown.

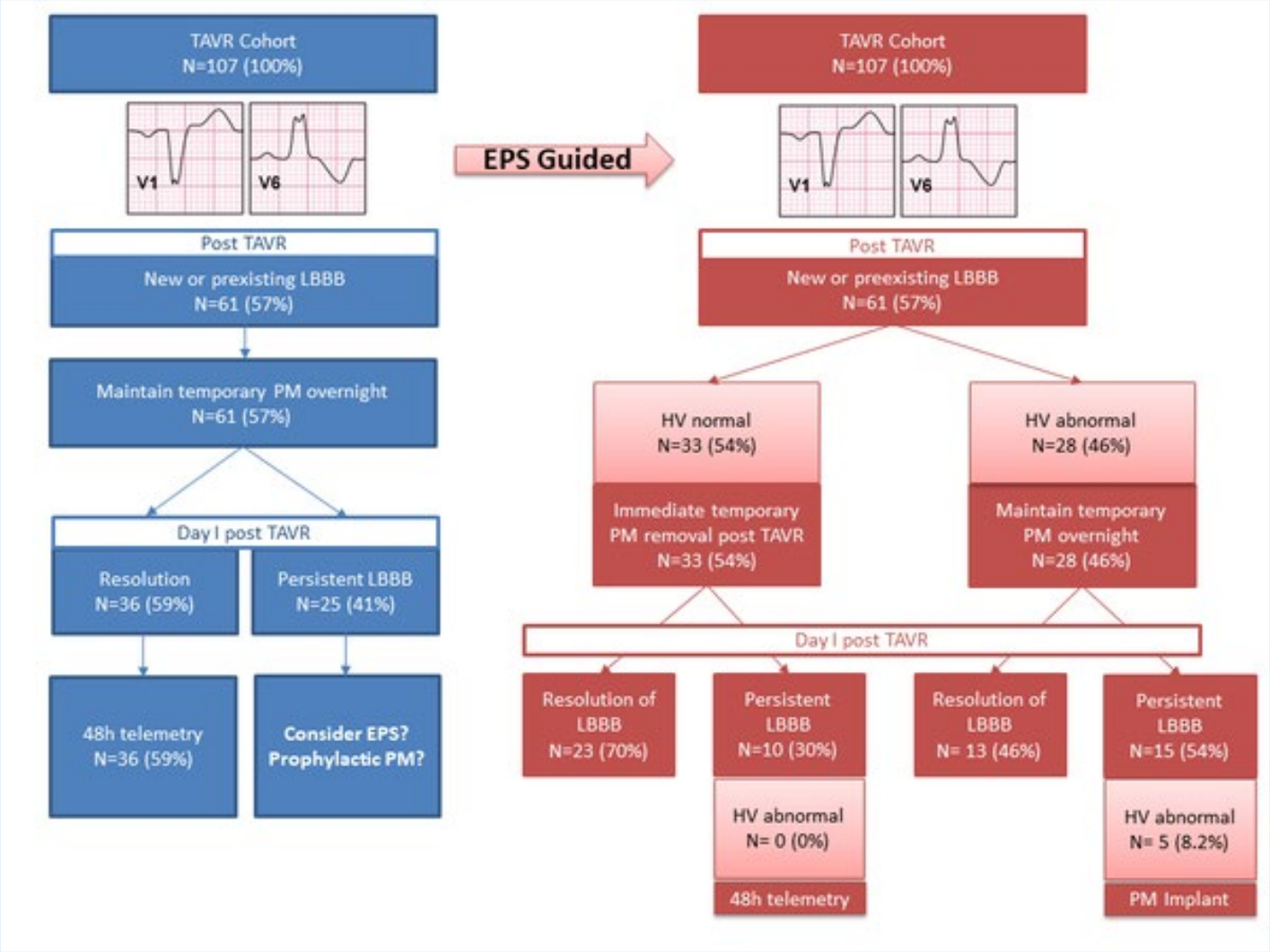
Objective: To study the temporal dynamics of AV conduction in patients with LBBB after TAVR by performing serial EPS and to deduce a treatment strategy.

Methods: We analyzed consecutive patients undergoing TAVR via invasive His-ventricular interval (HV) measurement before, immediately after and one day after TAVR. Infranodal conduction delay was defined as HV interval ≥ 55 ms.

Results: 107 patients undergoing TAVR were studied using EPS pre- and postprocedurally and 25 patients with persistent LBBB were invasively studied additionally one day after TAVR. Among these, 61 patients (57%) suffered acute LBBB and infranodal conduction delay was noted in 28 patients intraprocedurally (46%). LBBB resolved the day after TAVR in 36 patients (59%). In patients with LBBB after TAVR and no infrahisian conduction delay postprocedurally, the HV interval did not prolong in any patient to ≥ 55 ms the following day. Overall, 5 patients (8.2%) with LBBB after TAVR were found to have persistent infrahisian conduction delay 24 hours after TAVR (Figure). During 30-day follow-up, 1 patient (1.6%) with LBBB and normal HV interval after TAVR developed new high-grade AV-block.

Conclusion: Among patients with LBBB post TAVR, infrahisian conduction delay can safely be excluded intraprocedurally, suggesting early intracardiac intraprocedural conduction studies may be of value in these patients.

Conflict of interest to declare? No



P09

Pitfalls and limitations in the assessment of the HV interval in a Transcatheter Aortic Valve Replacement population. A prospective analysis

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Introduction: Identification of patients with new-onset conduction disturbances at risk of AV-block remains a major unmet challenge in Transcatheter Aortic Valve Replacement (TAVR) His-Ventricular interval (HVI) measurement has been proposed in patients at risk. However, the HVI assessment is often overlooked, performed as a single assessment without active mapping, and even single-catheter assessment is sometimes performed. We observed in this specific patient population a higher occurrence of methodological HVI measurement pitfalls and therefore aimed to systematically evaluate them as related to outcomes.

Methods: Consecutive patients who underwent HVI assessment post-TAVR between June 2014 and December 2021. HV interval was classified as normal if < 55 ms, intermediate 55-70 ms and abnormal if > 70 ms.. Incremental atrial pacing to stress the His-Purkinje period was performed whenever possible. All tracings were systematically reviewed offline by two blinded operators. Pitfalls in the assessment of atrioventricular conduction were categorized into types 1 to 5 as reported in Table 1. In sinus rhythm, only proximal HVI were considered defined as the concomitant recording of a near-field atrial signal.

Results: 90 cases were analyzed; median age 81 years1 [76 – 86] years; 37 (41%) male. The median HV interval was 54 [50 – 65] ms. An abnormal HV interval, exceeding the 55 and 70ms cut-off values, was found in 41 (45.9%) and 13 (14.8%) patients, respectively. At least one pitfall was found in 11 patients (12%). Short-term AV block occurred in 3 patients in sinus rhythm in whom no incremental pacing was performed, and in 2 patients with AF despite normal or borderline HVI in both groups.

Conclusion: Pitfalls in the assessment of the HVI are often observed after TAVR. Identification of infra- and especially intra-His disorders requires careful mapping and must be an active process on behalf of the operator. HVI evaluation using a single catheter or in patients with atrial fibrillation may often be misleading considering the value of incremental atrial pacing and the major limitations in AF to assess the most proximal His or intra-His block.

Pitfall	Description	n
1	Normal basal HVI with infra-His block during incremental atrial pacing	3
2	Δ HVI exceeding 10 ms or intra-His block (> 70ms) revealed only after careful mapping despite adequate initial proximal assessment	3
3	Mechanical AV-block during electrode catheter manipulation	3
4	Localized intra-His conduction prolongation with fragmentation depending on the electrode catheter position	1
5	Dynamic changes in the HVI despite stable A-V ratio and electrode position	1

Conflict of interest to declare? No

P10

Durability of CLOSE-guided pulmonary vein isolation in persistent atrial fibrillation - first results from a prospective remapping study

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Introduction: The CLOSE protocol for pulmonary vein isolation (CLOSE-PVI) combines ablation index and inter-lesion distance (≤6 mm) targets. CLOSE-PVI has been shown to result in high clinical success rates. Data on durability of PVI after CLOSE-PVI mainly derive from repeat procedures in paroxysmal atrial fibrillation (AF) patients with recurrent AF. We sought to assess the incidence of pulmonary vein (PV) reconnections during a staged redo procedure performed independently of AF recurrence 6 months after CLOSE-PVI in patients with persistent AF.

Methods: In this prospective, single-center study patients with symptomatic persistent AF (EHRA score >1) undergoing AF ablation were included. CLOSE-PVI was performed during the index procedure. A blanking period of 3 months was applied. Seven-day Holter ECGs were performed at 3 and 6 months post ablation. All patients underwent a staged redo procedure including high-density voltage mapping of the left atrium at 6 months after the index procedure.

Results: Overall, 20 patients were included (median age: 68 years [IQR 63-71]; 20% women; median duration of persistent AF: 8 months [IQR 5-15]; median LAVI 45 ml/m2 [IQR 43-53]). All PVs were successfully isolated with CLOSE-PVI during the index procedure. Four patients (20%) had AF recurrence. The redo procedure was performed after a median of 6.1 months (IQR 5.6-7.3). Of 80 PVs, 71 (89%) were still isolated. No patient had a common ostium. Reconnections were observed in 3 left superior (15%), in one left inferior (5%), in one right superior (5%) and in 4 right inferior (20%) PVs. Fourteen patients (74%) had completely isolated PVs. Two of four patients with AF recurrence (50%) and 12 of 16 patients without AF recurrence (75%) had completely isolated PVs (p=0.33).

Conclusions: CLOSE-PVI achieves durable PVI after 6 months in the majority of patients with persistent AF. In half of persistent AF patients with recurrence after CLOSE-PVI, all PVs are still isolated. These patients may need adjunctive ablation.

Conflict of interest: The study is supported by Biosense Webster

P11

Diagnostic reliability of AV synchrony self-diagnostics in leadless VDD pacemakers

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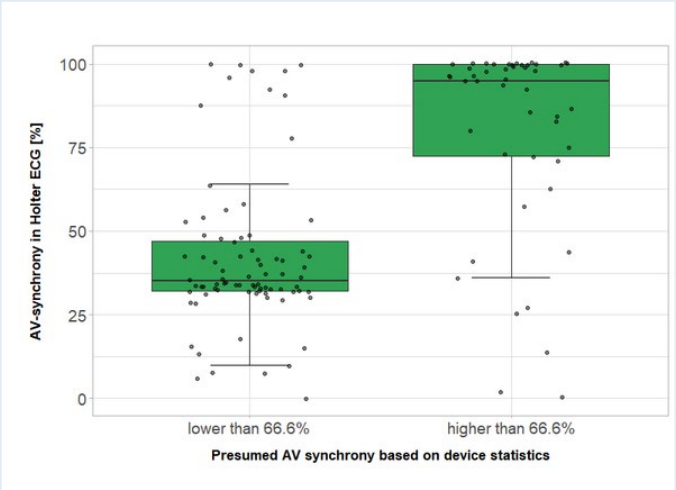
Introduction: Leadless pacemakers (PMs) capable of atrio-ventricular (AV) synchronous pacing have been introduced recently. These devices provide mechanical atrial sensing by detection of the atrial contraction via an accelerometer. Atrial tracking may be disturbed by external influences such as body motions and higher heart rates in real life. To track the amount of AV synchronous pacing, the device statistic classifies all sensed and paced QRS complexes according to presumed AV synchrony. The reliability of this self-diagnostics to estimate the true degree of AV synchrony, however, is insufficiently studied. Our goal was to investigate the informative value of the device statistics offered by leadless VDD PMs regarding true AV snychrony.

Methods: We prospectively included all patients who received a leadless VDD PM (Micra™ AV, Medtronic, US) between 07/2020 and 05/2021 at our center in this observational study. During the regular outpatient follow-ups, device interrogation was performed, which included evaluation of the PM statistics. True AV synchrony (defined as a QRS complex preceded by a p-wave within 300ms) was analyzed repeatedly during follow-up using Holter ECGs.

Results: We analysed 34 Holter ECGs from 20 outpatients (816 hours of ECG in total). Patients had a median age of 80 years (interquartile range 76-86 years), 55% were females. For Holter ECG sequences that showed high degree or complete AV-Block (>80% ventricular pacing), the percentage of paced beats that were presumed to be AV synchronous by the device statistic (ratio "AM-VP"/total VP) correlated well with AV synchrony as assessed using Holter-ECGs (Kendall's τ=0.312, p<0.001). AV synchrony in the Holter ECG was different in patients with <66.6% presumed AV synchrony than in patients with >66.6% presumed AV synchrony (p<0.001, figure). For Holter ECG sequences with mostly preserved intrinsic AV conduction (<20% ventricular pacing), the ratio "AM-VP"/total VP was not predictive for true AV synchrony (Kendall's τ=0.07, p=n.s.). In this situation, however, "VS only" (Kendall's τ=0.110, p=0.005) correlated with true

AV synchrony (due to AV conduction mode switch) and "VP only" showed an inverse correlation with AV synchrony (Kendall's τ=-0.215, p<0.001).

Conclusion: Leadless PMs provide device statistics that show a correlation with true AV synchrony. The clinical setting as well as the device programming (e.g. AV conduction mode switch) significantly influence the predictive value of the different parameters of the device's statistics.



Conflict of interest: None of the authors has received any compensation for this study.

Dr. Noti has received travel/educational grants from Medtronic and Abbott, Boston Scientific and Philips/Spectranetics and speaker honoraria from Medtronic and Abbott. Dr. Roten has received speaker honoraria from Abbott and consulting honoraria from Medtronic. Dr. Baldinger has received travel grants from Microport. Dr. Seiler's spouse is an employee of Boston Scientific. Dr. Tanner has received travel grants from Abbott and an educational grant from Biosense-Webster. Dr. Reichlin has received consulting fees/speaker honoraria/travel support from Abbott, Astra Zeneca, Brahms, Bayer, Biosense-Webster, Biotronik, Boston-Scientific, Daiichi Sankyo, Medtronic, Pfizer-BMS and Roche. Dr. Haeberlin has received travel/educational grants from Medtronic and Philips/Spectranetics. He is consultant/advisor for DiNAQOR and Biotronik and Co-founder/head of Act-Inno. The other authors declare no disclosures relevant to this manuscript.

P12

Occurrence and predictors of severe arrhythmia in patients with myocarditis

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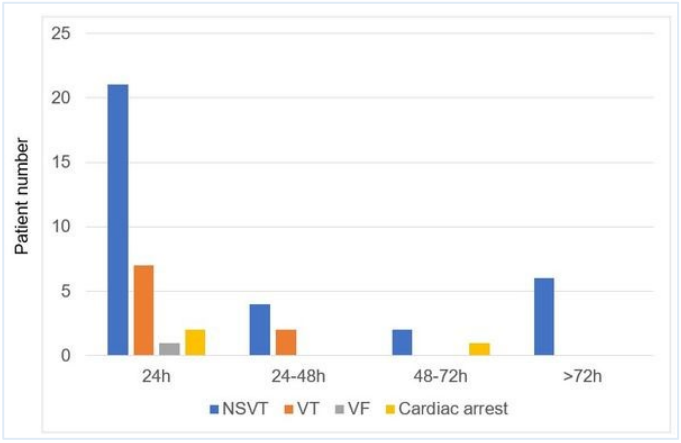
Introduction: Patients with myocarditis are at risk for severe, life-threatening arrhythmia. However, predictors to identify high-risk patients are lacking. We therefore investigated the occurrence and potential risk factors of severe arrhythmia in myocarditis patients.

Methods: 212 myocarditis patients that were hospitalized for arrhythmia monitoring at the University Hospital Basel were retrospectively enrolled. Non-sustained ventricular tachycardia (VT), sustained VT, ventricular fibrillation or cardiac arrest were considered as severe arrhythmia. We used a stepwise logistic regression model to investigate potential predictors. These included age, sex, clinical presentation (chest pain, palpitations, dyspnea, syncope, cardiac murmur, edema, pericardial friction, arrhythmia at presentation, Killip-class), comorbidities (hypertension, diabetes, coronary heart disease), imaging parameters (left ventricular ejection fraction [LVEF], pericardial effusion, edema and LGE on MRI), ECG variables (PQ depression, ST elevation, ST depression) and maximum levels of blood biomarkers (CRP, leukocytes, Troponin T, CK-MB).

Results: Mean age was 40.8 years, 73.1% were male and mean LVEF was 52.9%. During the hospital stay, 40 (18.9%) patients experienced severe arrhythmia: 33 (15.6%) non-sustained VT, 9 (4.2%) sustained VT, 1 (0.5%) ventricular fibrillation and 3 (1.4%) cardiac arrests, not mutually exclusive. Most arrhythmia occurred in the first 72h of monitoring (Figure). Significant predictors selected by the stepwise model (OR [95% CI]) for severe arrhythmia were LVEF (per 1% increase 0.95 [0.92; 0.99], p=0.005), syncope at presentation (7.9 [1.5; 40.4], p=0.01), any arrhythmia at first presentation (6.5 [1.3; 32.7], p=0.02) and CK-MB (per 10-unit increase 1.2 [1.1; 1.3], p=0.001).

Figure Time course of severe arrhythmia during arrhythmia monitoring.



Conclusion: Myocarditis patients with low LVEF, presenting with arrhythmia and syncope and with increased CK-MB are at increased risk for severe arrhythmia and should be closely monitored. Further studies are needed to define, if patients without these risk factors might be safely discharged early.

Conflict of interest to declare? No

P13

Early learning curve and procedural outcome of left bundle branch pacing vs. His bundle pacing

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Introduction: Conduction system pacing (CSP) has become a contemporary alternative to conventional right ventricular pacing. His bundle pacing (HBP) shows excellent hemodynamic results, but implantation can be challenging, pacing thresholds are often quite high and electrode dysfunction is more common compared to conventional systems. Left bundle branch pacing (LBBP) is an alternative technique that also provides physiological ventricular activation, while potentially being easier to implant. However, head-to-head comparisons of the operator's early implantation success rates and procedural outcome for both techniques is scarce.

Methods: We compared baseline and outcome data of the first 20 patients that underwent an HBP and LBBP implantation attempt at our center. All interventions were performed by two primary operators (A.H. and F. N.) and stratified according to the operator (i.e. the first 20 patients from each operator were included in the analysis). Successful implantation was defined if true CSP was achieved; left bundle branch *area* pacing or high right ventricular septal pacing was considered an implantation failure.

Results: Acute procedural success was 80% in the HBP group and 85% in the LBBP group (p=1). Patient baseline characteristics and implantation indications did not differ between groups (table). LBBP was associated with superior electrode performance, whereas implantation/fluoroscopy duration and paced QRS width were not different (calculated post-hoc power for a difference of the QRS width was 33%). Detailed results are shown in the table.

Conclusion: Success rates, intervention duration and paced ventricular activation times did not significantly differ when comparing HBP and LBBP

during the implanters early learning curve. However, LBBP provides superior electrode performance, which may be beneficial for the patient during long-term follow-up (lower energy consumption for pacing, better sensing).

	His-bundle pacing (n=20)	**Left bundle branch pacing (n=20)**	**p-value**
Patient characteristics			
Female gender	8 (40%)	6 (30%)	0.74
Age [years]	76 (68-81)	75 (70-79)	0.86
Parox. or persistent AF	9 (45%)	5 (25%)	0.32
LVEF [%]	60 (51-60)	61 (51-65)	0.12
TAPSE [mm]	20 (17-24)	24 (21-29)	0.17
Baseline QRS width [ms]	115 (100-153)	111 (93-135)	0.43
Implantation indication			0.65
1. Sick sinus syndrome	2 (10%)	3 (15%)	
2. Permanent or intermittent high-degree or total AVB	15 (75%)	11 (55%)	
3. Pace & ablate strategy	2 (10%)	3 (15%)	
4. Other	1 (5%)	3 (15%)	
Procedural outcomes			
Paced QRS width [ms]	100 (91-134)	124 (113-130)	0.29
RV pacing threshold (CSP) [mV]	1.1 (0.7-2.3)	0.7 (0.5-0.9)	0.14*
Sensing [mV]	3.2 (2.7-3.9)	9.0 (7.0-10.9)	**<0.001**
Bipolar impedance [Ω]	492 (459-544)	680 (616-696)	**0.01**
Total intervention time [min]	140 (125-169)	115 (89-170)	0.38
Total X-ray duration [min]	16 (11-24)	11 (8-26)	0.27

Conflict of interest: None of the authors has received any compensation for this study. Dr. Haeberlin has received travel/educational grants from Medtronic and Philips/Spectranetics. He is consultant/advisor for DiNAQOR and Biotronik and Co-founder/head of Act-Inno. Dr. Seiler's spouse is an employee of Boston Scientific. Dr. Tanner has received travel grants from Abbott and an educational grant from Biosense-Webster. Dr. Baldinger has received travel grants from Microport. Dr. Roten has received speaker honoraria from Abbott and consulting honoraria from Medtronic. Dr. Reichlin has received consulting fees/speaker honoraria/travel support from Abbott, Astra Zeneca, Brahms, Bayer, Biosense-Webster, Biotronik, Boston-Scientific, Daiichi Sankyo, Medtronic, Pfizer-BMS and Roche. Dr. Noti has received travel/educational grants from Medtronic and Abbott, Boston Scientific and Philips/Spectranetics and speaker honoraria from Medtronic and Abbott. The other authors declare no disclosures relevant to this manuscript.

POSTER WALK: RHYTHM DISORDERS 2

P14

Electrophysiological differences of deep sedation with dexmedetomidine versus propofol

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Background: Dexmedetomidine and propofol are commonly used drugs for deep sedation during cardiovascular interventions. Patients undergoing these interventions often have impaired sinus node function or atrioventricular (AV) conduction disease. Anesthetics used for deep sedation may further compromise sinus node function and AV nodal conduction, and thereby interfere with the intervention.We compared the electrophysiological effects of dexmedetomidine and propofol on the function of the sinus node and AV conduction.

Methods: We randomized patients undergoing first atrial fibrilation ablation 1:1 to deep sedation by dexmedetomidine (DEX group) versus propofol (PRO group), according to a standardized protocol. At the end of the ablation procedure with the patients still deeply sedated and hemodynamically stable, we conducted a standard electrophysiological study and assessed sinus node function, properties of AV conduction and atrial refractoriness.

Results: Of 160 patients (65±11 years old; 32% female) included into the study, 80 patients were randomized to the DEX and PRO group each. Procedure duration (128±59 minutes) and sedation depth, as assessed by the "Modified Observer's Assessment of Alertness/Sedation" score (median 3; interquartile range 2, 3), was not different among groups. DEX group patients received a mean of 231±111 mcg of dexmedetomidine and PRO group patients a mean of 657±356 mg of propofol. The table shows the results of the electrophysiological study. DEX group patients had lower sinus rate and longer unadjusted sinus node recovery time (SNRT) at pacing cycle lengths of 600, 500 and 400 ms. However, both corrected (SNRT-RR) and normalized (SNRT/RR) SNRT did not differ among groups. Compared to PRO group patients, AV nodal conduction was slower in DEX group patients as evidenced by longer PR and AH intervals, and a higher Wenckebach cycle length and AV node effective refractory period (ERP) was observed. Conduction properties in the His-Purkinje system were not different among groups, as QRS width and HV interval were similar. An arrhythmia, mainly atrial fibrillation, was induced in 33 patients (21%) during the electrophysiological study, without differences among groups.

Conclusions: Sinus rate and AV conduction are slower during deep sedation with dexmedetomidine compared to propofol. These differences in electrophysiological effects need to be taken into account when using these anesthetics during cardiovascular interventions.

	DEX group	PRO group	P value
RR, ms	1138 ± 251	1022 ± 220	0.003
PR, ms	207 ± 46	186 ± 32	0.002
QRS, ms	106 ± 23	102 ± 18	0.249
QTc, ms	424 ± 42	416 ± 39	0.226
AH, ms	111 ± 40	96 ± 28	0.008
HV, ms	44 ± 8	44 ± 9	0.868
Wenkebach cycle length AV node, ms	512 ± 139	456 ± 88	0.005
ERP atrium, ms	270 ± 47	255 ± 37	0.051
ERP AV node, ms	390 ± 118	344 ± 85	0.009
SNRT @ 600 ms	1581 ± 390	1386 ± 363	0.003
SNRT @ 600 ms corrected	427 ± 353	336 ± 305	0.106
SNRT @ 600 ms normalized	139 ± 31	134 ± 29	0.266
SNRT @ 500 ms	1635 ± 743	1447 ± 346	0.055
SNRT @ 500 ms corrected	451 ± 671	387 ± 242	0.452
SNRT @ 500 ms normalized	139 ± 54	138 ± 23	0.901
SNRT @ 400 ms	1597 ± 628	1412 ± 377	0.042
SNRT @ 400 ms corrected	393 ± 511	328 ± 274	0.364
SNRT @ 400 ms normalized	133 ± 40	132 ± 26	0.842

Conflict of interest to declare? No

P15

Bone morphogenetic protein 10 – a novel atrial-specific biomarker to predict adverse outcomes in patients with atrial fibrillation

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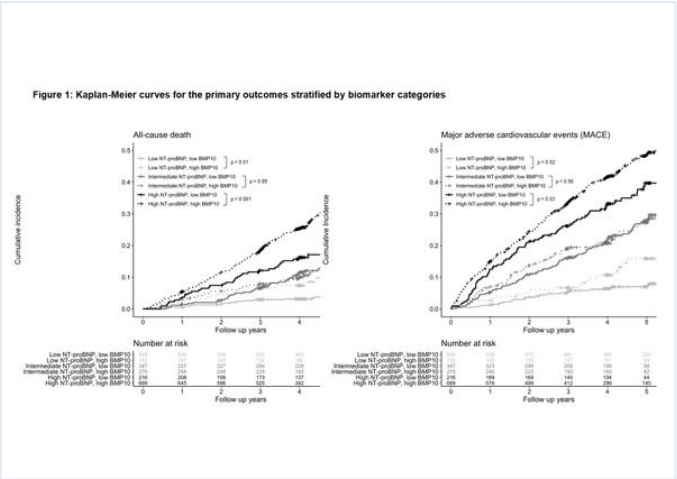
Introduction: Patients with atrial fibrillation (AF) face an increased risk of death and major adverse cardiovascular events (MACE). Bone morphogenetic protein 10 (BMP10) is a novel atrial-specific biomarker, but data about its prognostic value are lacking. We assessed BMP10 as predictor for death and MACE in AF patients compared to N-terminal prohormone of B-type natriuretic peptide (NT-proBNP).

Methods: We measured baseline concentrations of BMP10 and NT-proBNP in AF patients enrolled in Swiss-AF, a prospective multicenter observational cohort study. Primary outcomes were all-cause death and MACE (composite of heart failure hospitalization, cardiovascular death, stroke, systemic embolism, myocardial infarction). Measures of discriminative power were used to compare multivariable Cox proportional hazard models using the different biomarkers.

Results: We included 2219 AF patients with a median follow-up of 4.3 years (IQR 3.9, 5.1). Mean age was 73±9 years (27% women). Incidence rate increased across BMP10 quartiles for the primary outcomes. In the multivariable adjusted Cox regression model, hazard ratio (HR) and 95% confidence interval (CI) of BMP10 was 1.60 (1.37; 1.87) for all-cause death, and 1.54 (1.35; 1.76) for MACE. For all-cause death, the C-index (95% CI) was 0.783 (0.763; 0.809) for BMP10, 0.784 (0.765; 0.810) for NT-proBNP, and 0.789 (0.771; 0.815) for both biomarkers combined. For MACE, the C-index (95% CI) was 0.732 (0.715; 0.754) for BMP10, 0.747 (0.731; 0.768) for NT-proBNP, and 0.750 (0.734; 0.771) for both biomarkers combined. When grouping patients according to NT-proBNP categories (<300, 300-900, >900ng/l), higher incidence rates (Figure 1)

and adjusted HRs were observed for the primary outcomes in patients with high BMP10 for the categories of low NT-proBNP (all-cause death aHR 2.28 [1.15; 4.52], MACE aHR 1.88 [1.07; 3.28]) and high NT-proBNP (all-cause death aHR 1.61 [1.14; 2.26], MACE aHR 1.38 [1.07; 1.80]).

Conclusion: The novel atrial-specific biomarker BMP10 strongly predicts all-cause death and MACE in patients with AF. BMP10 provides additional prognostic information in low- and high-risk patients according to NT-proBNP stratification.



Conflict of interest: The Swiss-AF study is funded by grants provided by the Swiss National Science Foundation (grant numbers 33CS30_148474, 33CS30_177520, 32473B_176178, and 32003B_197524), the Swiss Heart Foundation, the Foundation for Cardiovascular Research Basel (FCVR), and the University of Basel. BMP10 and NT-proBNP were measured free of charge by Roche Diagnostics.

P16

Early results of the Heliostar™ RF balloon ablation catheter for pulmonary vein isolation

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Introduction: Pulmonary vein isolation (PVI) remains the cornerstone for treating of symptomatic atrial fibrillation (AF). Especially for the first-time procedure, single-shot PVI technologies have evolved as a standard of due to shorter procedure time and steeper learning curves for the operators but with similar efficacy. A novel radiofrequency balloon ablation catheter is now available to offer single-shot RF pulmonary vein isolation.

Methods: We prospectively assessed the first 38 consecutive patients undergoing PVI using RF balloon ablation catheter for paroxysmal or persistent AF in two high volume centres. Both centres used a standardised approach including ultrasound-guided vascular access, uninterrupted anticoagulation, transeptal puncture via the RF balloon sheath and a limited 3D mapping software-guided LA geometry created with a circular mapping catheter. All patients had an oesophageal temperature probe to assess oesophageal temperature during ablation (passed orally under sedation) and had uninterrupted oral anticoagulation throughout the periprocedural period.

Results: Overall, mean age was 64±8 years, 23 (61%) were male, 24 (63%) of patients had paroxysmal AF. The majority were de novo interventions (92%). There was no significant difference between the patients demographics in the two hospitals. All veins were isolated in both groups with a total of 144 applications (n = 73 in the sedation group, n = 71 in the GA population). Median fluoroscopy time was comparable (sedation group 1.1 minutes vs GA group 1.2 minutes; P = 0.58), but median procedure time was shorter in the sedation group (65 minute vs 106 minutes; P < 0.001). The median number of RF ablation per patient (sedation group 7 vs GA group 9; P = 0.32) and time to isolation of each vein (sedation group 11 seconds vs GA group 10 seconds; P = 0.9) were similar. Number of acute reconnections requiring further ablations were not significantly different between groups (sedation group 11 [15%] vs GA group 14 [20%]; P = 0.96). One patient sustained transient phrenic nerve injury in the sedation group.

Conclusion: Our early experience shows the novel HS balloon ablation can be performed effectively, efficiently and safely under either GA or conscious sedition. The RF balloon ablation catheter paradigm lends itself to refined workflows, with low fluoroscopy requirements and a short learning curve even in initial cohorts.

Conflict of interest to declare? No

P17

Early experience with the second generation of leadless pacemakers and correlation with ECG parameters

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Introduction: Leadless pacing has evolved as a safe and effective treatment option in selected patients. With the updated generation that allows sensing of atrial contraction, atrioventricular synchronized pacing is now possible in a VDD mode. Previous retrospective analyses have demonstrated that echocardiographic parameters may be helpful in selecting patients with a higher chance of good atrioventricular synchronous pacing behaviour.

Methods: In this retrospective analysis, a total of 136 patients were included from three tertiary center and the correlation between pacing parameters and ECG parameters were analyzed.

Results: Mean age was 78.0 (64.7 - 84.2 years) years with 48.9 % being male. Coronary artery disease was the leading underlying heart disease with 27.1 % affected patients. 61.7 % of the population suffered from sinus rhythm with complete or intermittent atrioventricular block. The majority of devices were implanted at the mid-septal (61.2 %) or high-septal (25.6 %) right ventricle, respectively. Electrical parameters were optimal at implant (*Table* 1) and remained stable over time (*Table* 1). In addition, A4 signal amplitude remained stable too during follow-up compared to the value early after implantation (*Table* 1). From this entire cohort, patients with an ECG available at implant and those in which the device was working predominantly in the VDD mode were selected for further analyses (62 patients). PQ interval measured from the ECG prior to implantation did not correlate with the A4 signal amplitude (*Figure* 1A). Furthermore, P wave amplitudes were measured in all 12 ECG leads. There was a correlation between P wave amplitude from lead V2 with the A4 amplitude (*Figure* 1B; $P = 0.034$, $R^2 = 0.09$), whereas the other right-sided ECG leads (V1/aVR), either alone or in combination, did not correlate with the A4 signal amplitude.

Table 1

Parameter	At implantation	During follow-up (3 months)
Sensing (mV), median [IQR]	7.0 [2.0 – 10.3]	7.9 [2.0 – 13.2]
Treshold [V at 0.24 ms]	0.38 [0.38 – 0.63]	0.44 [0.38 – 0.50]
Impedance [Ohn]	780 [670 – 980]	605 [520 – 745]
A4 amplitude [m/s^2]	1.2 [0.7 – 2.1]	0.9 [0.5 – 1.5]

Conclusions: In our cohort of patients with the second generation of leadless pacemakers, offering VDD pacing, good electrical parameters can be achieved as it has been observed with the first generation. Also the A4

signal amplitude as a marker for atrial contraction remains stable over time. In regard to ECG parameters measured prior to device implantation, only the P wave amplitude in lead V2 correlated with a amplitude of the A4 signal.

Figure 1A

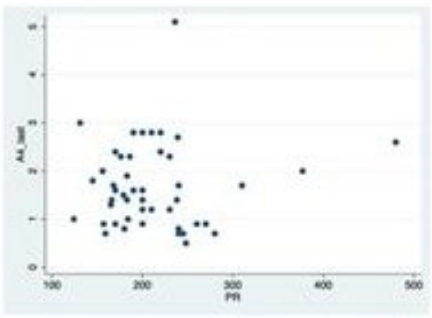
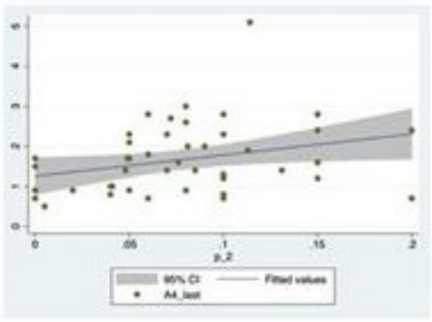


Figure 1B



Conflict of interest to declare? No

P18

Whole exome sequencing identifies two novel extremely rare candidate variants associated with the short QT syndrome in two large pedigrees

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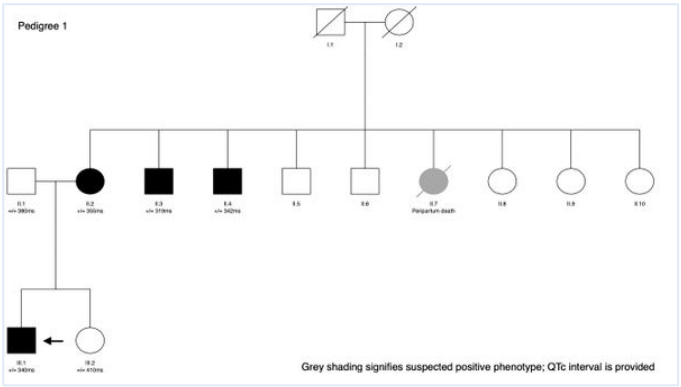
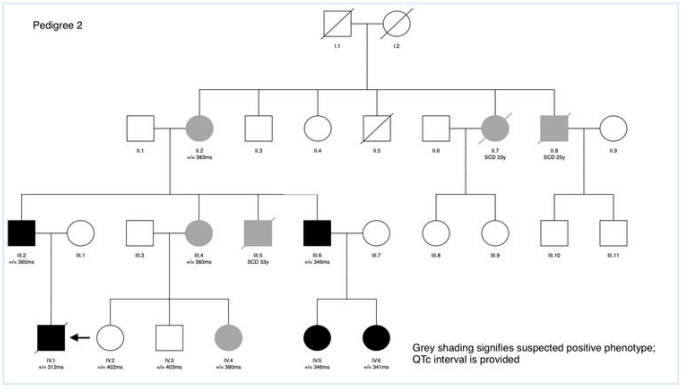
Introduction: Short QT syndrome (SQTS) is caused by pathogenic variants predominantly in the *KCNQ1*, *KCNH2*, *KCNJ2* genes and genes encoding for different subunits of the L-type calcium channel. Recently, a variant in the *SLC4A3* gene has been associated with SQTS. The genetic background causing SQTS and co-segregation analysis was investigated in two affected families.

Methods: Genetic testing of the index patient 1 and molecular autopsy of the index patient 2 was performed by whole exome sequencing (WES). Family screening was done by cardiologic work-up and genetic cascade screening.

Results: Index case 1 was diagnosed with SQTS at the age of 28 years, after a syncopal event. Work-up showed a markedly shortened QTc interval (340ms). Family history revealed peripartum death of one relative. Genetic testing of all known implicated genes was initially negative. WES was performed, which disclosed a novel rare heterozygous missense variant (p.(Arg370Cys)) in a highly conserved region of the *SLC4A3* gene. Cardiac and genetic work-up of 5 relatives suggested co-segregation of the candidate variant (pedigree 1) with the SQTS. Index case 2 died from sudden cardiac death (SCD) at 17 years of age and had a positive family history for SCD in three family members under 40 years. A previously recorded 12-lead ECG showed a QTc of 340ms in the index patient. Post-mortem genetic testing of all known implicated genes was negative. In light of our previous findings, reanalysis was performed including the *SLC4A3* gene, which revealed a second rare novel heterozygous missense variant (p.(Ser1039Arg)). Cardiac and genetic work-up of 10 relatives suggested co-segregation of the candidate variant with the SQTS (pedigree 2).

Conclusion: WES and co-segregation analysis in two families with SQTS revealed two novel candidate variants in the *SLC4A3* gene with high penetrance. Functional work-up of these two variants is under way.





Conflict of interest to declare? No

P19

Gender gap in study inclusion: insights from the STAR-FIB cohort study

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Introduction: The underrepresentation of women in cardiovascular clinical trials is well described but cannot be fully explained by sex-specific differences in the prevalence of cardiovascular diseases. Data on potential sex- and gender-related differences in study exclusion reasons are scarce.

The STAR-FIB cohort study aimed to estimate the age and sex-specific prevalence of screening-detected atrial fibrillation (AF) in 800 hospitalized patients aged 65-84 years using serial seven-day ECGs. Recruitment for study inclusion was stratified by sex (female/male, as stated in the patient's records) and age (four age bands, ≥65 to <70, ≥70 to <75, ≥75 to <80, and ≥80 to <85 years), and was truncated for each subgroup after the

inclusion of 100 participants. The aim of the present study was to assess sex and gender differences in patient recruitment for inclusion in the STAR-FIB cohort study.

Method: A screening log containing sex-category, age, and reasons for exclusion was maintained. Exclusion criteria are shown in the figure. For the purpose of the present study, an explorative analysis of all exclusion criteria with respect to sex category was done.

Results: Overall, 11'470 patients were identified for eligibility, 795 patients (49% women; mean age 75 years) were enrolled, and 10'675 patients (52% women vs. 48% men, p =0.13) were not enrolled. The two major exclusion reasons were unwillingness to participate, which was more frequent in women (27.9% of women vs. 18.4% of men, p < 0.01), and the presence of clinical AF, which was more prevalent in men (27.1% of men vs. 20.5 % of women, p < 0.01). A detailed analysis of all exclusion criteria analysed by sex category is provided in the figure.

Conclusion: Clinical AF was more frequent in men, in accordance with the well described sex-driven (biological) higher prevalence of AF in men. In contrast, we found a higher percentage of women unwilling to participate in this study, which may represent a more gender-based (sociocultural) phenomenon. A further exploration of these findings should be performed and may help to identify and potentially overcome modifiable obstacles for study participation.

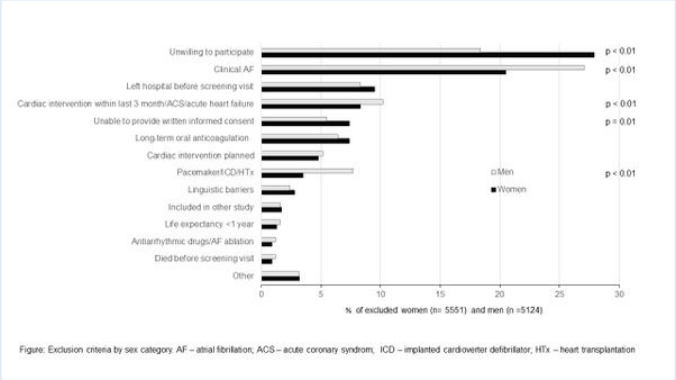

Figure: Exclusion criteria by sex category. AF – atrial fibrillation; ACS – acute coronary syndrom; ICD – implanted cardioverter defibrillator; HTx – heart transplantation

Conflict of interest to declare? No

P20

Algorithm for real-time analysis of intracoronary electrocardiogram

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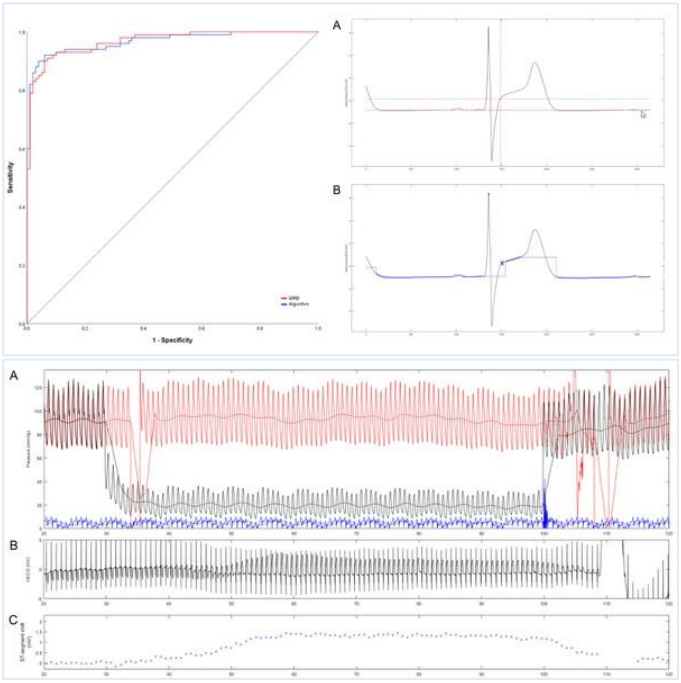
Introduction: Since its first implementation in 1985, intracoronary (ic) electrocardiogram (ECG) has shown ample evidence for its diagnostic value given the higher sensitivity for myocardial ischemia detection in comparison to surface ECG. However, a lack of online systems to quantitatively analyze icECG in real-time prevents its routine use. The present study aimed to develop and validate an autonomous icECG analysing algorithm.

Method: This is a retrospective observational study in 100 patients with chronic coronary syndrome. From each patient, a non-ischemic as well as ischemic icECG at the end of a one-minute proximal coronary balloon occlusion was available. An ECG expert as well as the newly developed algorithm for autonomous icECG analysis measured the icECG ST-segment shift in mV for each icECG tracing.

Results: Intraclass correlation coefficient (ICC) demonstrated low variability between the two methods (ICC 0.968). Using the time point of icECG recording as allocation reference for absent or present myocardial ischemia, ROC-analysis for ischemia detection by the manually determined icECG ST-segment shift showed an area under the curve (AUC) of 0.968±0.021 (p<0.0001). AUC for the algorithm analysis was 0.967±0.023 (p<0.0001; p=0.925 for the difference between the ROC curve AUCs). Time to analysis was below 1000ms for the autonomous icECG analysis and above 5min for manual analysis.

Conclusions: A newly developed autonomous icECG analysing algorithm detects myocardial ischemia with equal accuracy as manual ST-segment shift assessment. Therefore, it provides the technical fundament for an analysing system to obtain and quantify icECG in real-time.



Conflict of interest to declare? No

P21

3D-noncontact noninvasive localization of atrial activation by a novel esophageal-mapping system: preliminary results

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Introduction: Accurate noninvasive diagnostic tools are needed to improve the characterization of increasingly complex heart rhythm disorders and to better target their therapy. We developed a 3-dimentional esophageal-based mapping system (Figure 1), with the aim of non-contact-3D-Mapping of arrythmias.

Method: In this preliminary report, we present our experience in five healthy probands and in three patients undergoing pulmonary vein isolation (PVI) for the treatment of atrial fibrillation while in sinus rhythm. The 3D-esophagus probe was introduced in sitting position in the healthy participants to evaluate its handling and tolerance during 20 minutes, and after conscious sedation in the three patients. The depth of insertion was adjusted to measure the largest amplitude of the esophageal atrial depolarization on the 3-dimensional electrodes. In the patients, both atria were endocardially stimulated at 18 predefined sites. The 3D-map recorded for the purpose of the PVI (Ensite precision ®) was used for positioning the stimulation catheter.

Results: The 3D-esophagus probe could be inserted in the first attempt in all (8/8) participants and was well-tolerated (mean 2.2 on scale 1-10) in all healthy probands. In the three patients, our 3D-esophagus system was able to differentiate stimulations in anterior versus posterior, superior versus inferior and right versus left atrial structures (Figure 2). In addition, the system was able to accurately differentiate the origin of stimulation

from three consecutive electrode pairs from the coronary sinus catheter, spaced 8 mm apart.

Conclusion: Our pilot report demonstrates the feasibility of localization of the origin of atrial depolarization by our novel mapping system and supports further developments (incl. extension of mapping to the ventricles) of this promising non-contact 3D-mapping tool, which will allow accurate and real-time rhythm characterization, even for long-term monitoring.

Conflict of interest to declare? No

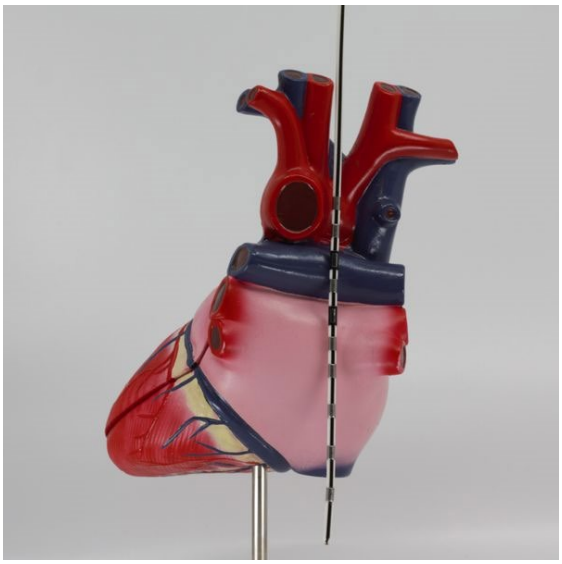

Fig 1: Our 3-dimentional esophageal ECG-probe, with 8 ring electrodes and 2 split electrodes (electrode number 3 and 5 when counting from top to bottom) for 3D recording.

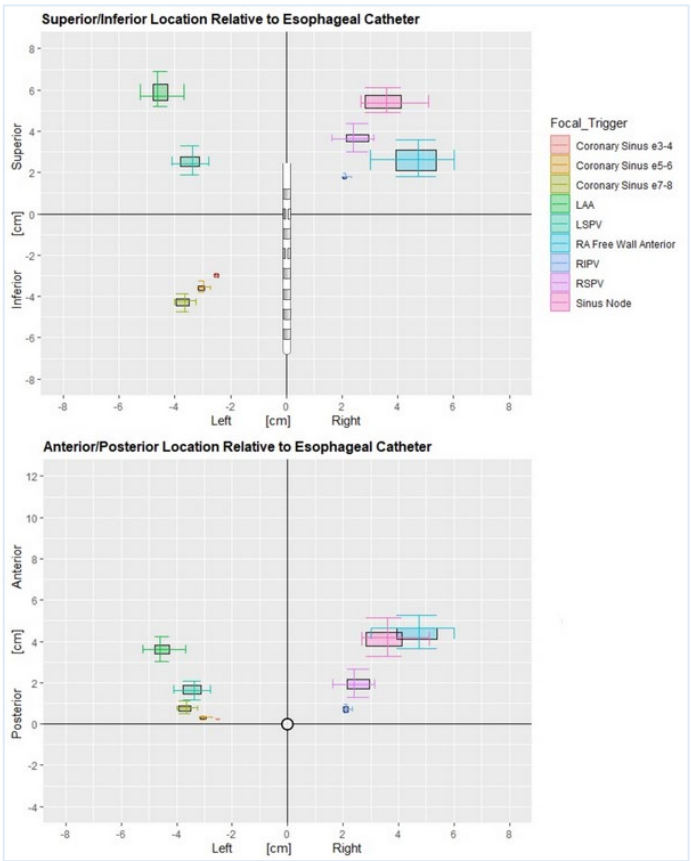

Fig 2: Localization of stimulated focal trigger sites in the atria from one patient of our patients, (Left/right versus Superior/inferior in top panel; Left/right versus anterior/posterior in bottom panel). Due to signal quality, not all 18 stimulated focal trigger sites are displayed.

P22

Value of multipolar substrate mapping during catheter ablation of scar-related ventricular tachycardia

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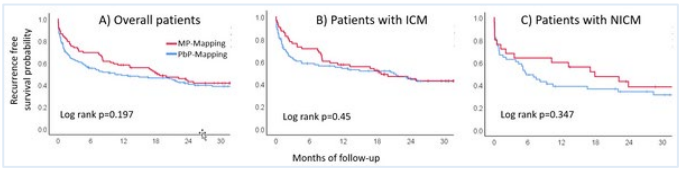

Introduction: Standard bipolar ablation catheters can be used for point-by-point (PbP) electrogram acquisition and definition of arrhythmia substrate during catheter ablation (CA) for scar-related ventricular tachycardia (VT). Multipolar (MP) mapping catheters offer the possibility to acquire multiple electrograms simultaneously and allow for higher spatial mapping resolution. The aim of the study was to evaluate the impact of MP mapping on procedure and outcome for scar-related VT in patients with ischemic cardiomyopathy (ICM) and non-ischemic cardiomyopathy (NICM).

Methods: Consecutive patients who underwent a first CA for scar-related VT between 2013 and 2019 at two Swiss tertiary care centers were analyzed.

Results: Overall, 241 patients were included (median age 69 years [IQR 61-75]; median LVEF 35% [IQR 25-35]; 13% women), including 161 patients (67%) with ICM, and 80 patients (33%) NICM. A MP mapping catheter was used in 88 patients (37% overall; 39% in ICM, and 31% in NICM).

Total procedure time was longer when using a MP mapping catheter as compared to PbP mapping (210 min [IQR 180-245] vs. 183 min [IQR 160-240] p=0.014). Similarly, radiofrequency (RF) time was longer when using a MP mapping catheter as compared to PbP mapping (32 min [IQR 22-42] vs. 23 min [IQR 15-47), p=0.005).

Over a median follow up time of 30 months (15-50), VT-recurrence-free survival was similar after MP mapping and PbP mapping (p=0.197, Figure Panel A). This finding was observed in the subgroups of patients with ICM (p=0.45) and NICM (p=0.347, Figure Panels B & C).

Conclusions: During CA of scar-related VT, MP mapping as opposed to PbP mapping was associated with longer total procedure and RF times. This may reflect the ability of MP mapping to define the VT substrate in more details and to identify more potential ablation targets. However, MP mapping had no impact on recurrence-free survival.

Conflict of interest to declare? No

POSTER SESSION: HEART FAILURE

P23

Myocardial fibrosis of the posterior myocardium in Fabry disease is associated with global rather than regional longitudinal strain reduction

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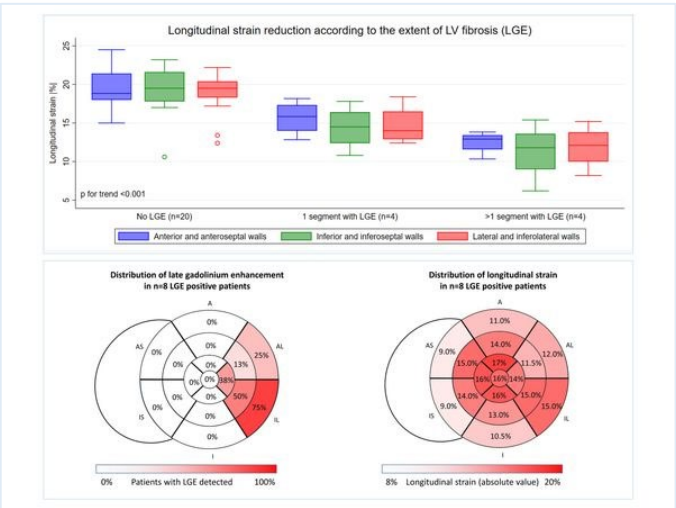
Introduction: Cardiac involvement in Fabry disease includes left ventricular hypertrophy and midwall fibrosis, typically in the basal lateral and inferolateral myocardial segments, which is a marker of adverse prognosis. Longitudinal strain reduction in those segments by speckle tracking echocardiography (STE) was suggested to be an early marker of LV fibrosis.

Methods: Patients with genetically proven Fabry disease with echocardiography and CMR during the same year were included. Global and regional strain were measured by STE and myocardial fibrosis was assessed by late gadolinium enhancement.

Results: Twenty-eight patients were included (46% males) with a mean age of 42±15 years. Delay between STE and CMR was 21 days [0-29.5]. LGE was found in 8 (29%) patients with a patchy mid-wall in the lateral and inferolateral walls. Patients with LGE were older (57±9 vs 36±13 y, p<0.01), had lower renal function (eGFR 79±24 vs 106±19 ml/min, p<0.01), and had higher LV mass index (135±27 vs 65±21 g/m2, p<0.001) and E/e' ratio (13.5 [10.5-23.0] vs 6.7 [5.4-8.0], p<0.001). There was no difference in sex (62% vs 40% male patients, p=0.28) or hypertension. GLS (absolute value) was significantly lower in LGE-positive patients (13.3% [12.6-15.6] vs 19.2% [18.3-21.4], p<0.001). Although the severity of strain reduction was proportional to the extent of LGE, strain reduction was observed in all the LV walls and not only in the LGE-segments (Figure). In the subgroup of patients with LGE, strain was not significantly lower in the basal lateral and inferolateral segments compared to the 15 other segments (13.3% [9.8-16.8] vs 13.5% [12.7-15.5], p=0.88).

Conclusion: LGE is a marker of advanced Fabry cardiomyopathy and is associated with lower GLS. However, the decrease in longitudinal function was global and not restricted to the segments with replacement myocardial fibrosis. Strain might therefore reflects the global cardiomyocyte dysfunction induced by the metabolic abnormality.



Conflict of interest to declare? No

P24

The challenging choice of gene panel size: our experience with hypertrophic cardiomyopathy

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Introduction: The implementation of next generation sequencing (NGS) has led to a rapid expansion in the number of genes included in diagnostic genetic testing for hypertrophic cardiomyopathy (HCM). This tendency is changing with the evidence-based assessment of genes conducted by the National Institutes of Health-funded Clinical Genome resource framework (ClinGen) in order to minimize misinterpretation of variants. Our aim was to evaluate the mutation detection rate and the involved genes in patients with isolated non-syndromic HCM according to the gene panel size we have used since 2015.

Method: Our NGS approach consist of targeted exome sequencing. Before September 2019, we have used in-house gene panels including 65 then 78 cardiomyopathy genes. Since October 2019, we switched to the *PanelAPP* cardiomyopathy panel, including 140 high-evidence based genes causative for the different subtypes of cardiomyopathy.

Results: Between 2015 and 2021, a total of 104 patients with isolated non-syndromic HCM underwent genetic testing. Our mutation detection rate was 49 % (30/61) with the in-house panels, 37% (16/43) with the *PanelAPP* panel and 44 % (46/104) overall. Variants in *MYBPC3* and *MYH7* genes accounted for 82% (38/46) of all clinically significant variants. The other 8 pathogenic or likely pathogenic variants were found in *TNNT2*, *TPM1*, *TNNI3*, *TTN* and *MYPN*. Comparing the two panel sizes we didn't see any difference in the genes found with causative variants. All 16 mutations identified with the *PanelAPP* panel were sarcomeric genes already included in our smaller in-house panel.

Conclusion: Our results confirm the lack of major clinical benefit of large panel in isolated non-syndromic HCM and support the recommendations of the 2021 European Society of Cardiology heart failure guidelines, which suggest to use a small evidence-based HCM panel and to consider additional large panel of genes only if there is a clear family history or a specific phenotype.

Conflict of interest to declare? No

P25

Factors favoring a first driveline infection in a cohort of patients on LVAD support with the HeartMate 3™

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Introduction: Driveline infection(DLI) remains the most frequent complication of LVAD support affecting about 50% of patients at 2 years. We aimed to identify factors favoring a first DLI episode in our cohort of patients supported with the HeartMate 3™(HM3, Abbott).

Method: We retrospectively reviewed data of n=54 adult patients implanted with HM3 and followed at the CHUV between 11/2015 and 12/2021. Patients with hospital stay >6 months following implantation(n=1), early in-hospital death(n=5) or transplantation(n=1) were excluded. Characteristics of patients without DLI were compared with those

presenting a first DLI, which was defined by signs of infection at exit site or along driveline subcutaneous route justifying antibiotic therapy. Exit site dressing protocol changed during follow-up from sterile gauze±Medihoney™ replaced t.i.w. to Tegaderm™ CHG (3M™) with integrated chlorhexidine changed b.i.w , the former being applied in case of allergy. Swab culture of exit site was collected at each visit. Mann-Whitney U test was applied for continuous variables, and chi-squared or Fischer's exact test for categorical variables. Variables were presented as median(IQR) or count(%).

Results: During median LVAD support of 611(699) days, 30/54(55%) patients presented a first DLI. Compared with those without DLI, they were more frequently diabetic (33%vs8,3%; p=0,02) and implanted as a bridge-to-transplant(BTT)/bridge-to-candidacy(BTC) strategy (86,7%vs62,5%; p=0,03), without significant difference of age, gender, BMI, eGFR, COPD, smoking status or preoperative ICU stay (Table 1). Exit site was more frequently colonized with bacteria (86,7%vs58,3%; p=0,01), managed with sterile gauze (73,4%vs41,7%; p=0,01) and with dressing changed by general practitioner(GP) or family member (40%vs8,3%; p=0,008). Colonization with methicillin-sensitive staphylococcus aureus(MSSA), Gram. neg bacteria(GN) or Corynebacterium mostly preceded a first DLI (65,4%vs14,3%; p=0,002). Days on support, ICU length of stay, need of temporary RVAD or renal replacement therapy (RRT) and non-LVAD related/specific infection at the ICU did not differ significantly (Table 2).

Conclusion: In addition to diabetes and strategy of implantation, risks factors for DLI were related to exit site management. Standardized dressing protocol with Tegaderm™ CHG applied b.i.w by educated nurses seem to favor less infection, while bacterial colonization, in particular with MSSA or GN, increased the risk.

Conflict of interest to declare? No

Table 1: preoperative characteristics	**Patients without DLI (n=24)**	**Paitients with at least 1 DLI (n=30)**	**p**
Age (years)	62 (19)	57 (12)	0,25
Male gender	20 (83,3%)	29 (96,7%)	0,15
BMI (kg/m^2)	25,3 (5,8)	26,5 (5,2)	0.25
eGFR (ml/min/1.73 m^2)	60 (38)	60 (26)	0,35
Diabetes	2 (8,3%)	10 (33,3%)	0,02
COPD	4 (16,7%)	3 (10%)	0,68
Smoking history	15 (62,5%)	16 (53,3%)	0,49
Preoperative ICU stay	7 (29,2%)	6 (20%)	0,43
BTT/BTC strategy (vs DT)	15 (62,5%)	26 (86,7%)	0,03

Table 2: postoperative characteristics	**Patients without DLI (n=24)**	**Paitients with at least 1 DLI (n=30)**	**p**
Days on ICU	9 (12)	5 (4)	0,08
Need of temporary RVAD	5 (20,8%)	2 (6,7%)	0,22
Need of temporary RRT	5 (20,8%)	1 (3,3%)	0,07
Non-LVAD specific/related infection during ICU stay	13 (54,2%)	12 (40%)	0,3
Days on LVAD support	576 (677)	613 (641)	0,48
Dressing protocol with sterile gauze±Medihoney™ t.i.w (vs Tegaderm™ CHG b.i.w)	10 (41,7%)	22 (73,4%)	0,01
Bacterial colonization of exit site	14 (58,3%)	26 (86,7%)	0,01
Colonization with MSSA, GN or Corynebacterium	2 (14,3%)	17 (65,4%)	0,002
Involvement of family member or GP in dressing change (vs registered nurse or patient only)	2 (8,3%)	12 (40%)	0,008

P26

Association among myocardial injury and mortality in Influenza: a prospective cohort study

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Background and aim: Myocardial injury (MINJ) defined as elevated high-sensitivity cardiac troponin level (hs-cTnT) above normal values is a well-recognized prognostic marker in different clinical conditions, nonetheless, its relevance in Influenza remains poorly defined. We aimed to assess incidence, predictors, short and mid-term prognostic role of MINJ in hospitalized patients with Influenza.

Methods: Consecutive patients (pts) hospitalized with laboratory confirmed Influenza infection were enrolled in a prospective, observational, multicentre cohort study during the 2018-2019 epidemic. MINJ was prospectively assessed at admission and defined as hs-cTnT level >14 ng/L. Primary endpoint was all-cause death at 28-days. Secondary endpoints were the composite of all-cause death at 28-days, intensive care unit (ICU) admission or need for mechanical ventilation and all-cause death at follow-up.

Results: 145 consecutive pts were enrolled. MINJ was evident in 94 (65.5%) pts and predicted by older age, higher CRP levels, renal impairment or chronic obstructive pulmonary disease. At a 28-days follow-up, 7 deaths (4.8%) occurred, all in patients with MINJ at admission (log rank p=0.048). MINJ showed a strong association with the occurrence of death,

ICU admission or mechanical ventilation (OR 5.74, 95% CI 1.28-53.29; p=0.015).

MINJ remained associated with increased risk of death, ICU admission or mechanical ventilation at 28 days while controlling at bivariable analysis for age <76 years (OR 6.59; 95%CI 1.39-63.54; p=0.011), CRP >34 mg/L (OR 5.19; 95%CI 1.14-48.53; p=0.027), active smoking (OR 6.09, 95%CI 1.33-57.50; p=0.013) and leucocyte count >7 n*10^9/L (OR 7.91, 95%CI 1.10-348; p=0.034). At a median follow-up of 32.7 months, 15 (10.3%) deaths occurred, all among patients with MINJ at index hospitalization leading to a significantly high mortality rate at follow-up among patients with MINJ (log-rank p=0.003).

Conclusions: Influenza related MINJ is common and identifies patients at higher likelihood of short-term adverse events and mid-term mortality.

Figure 1. All-cause death at follow-up.

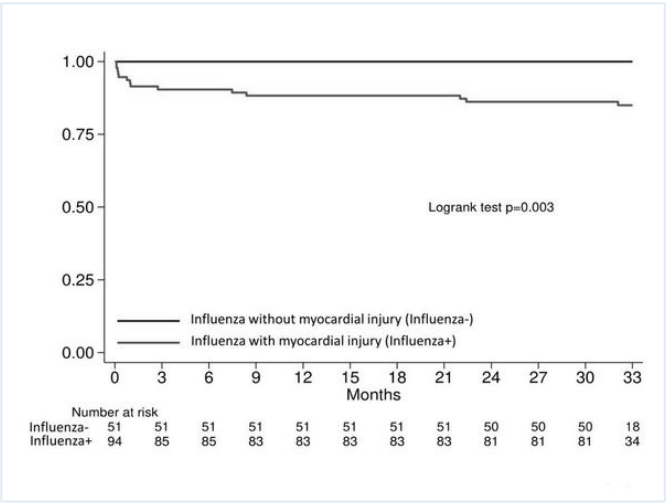
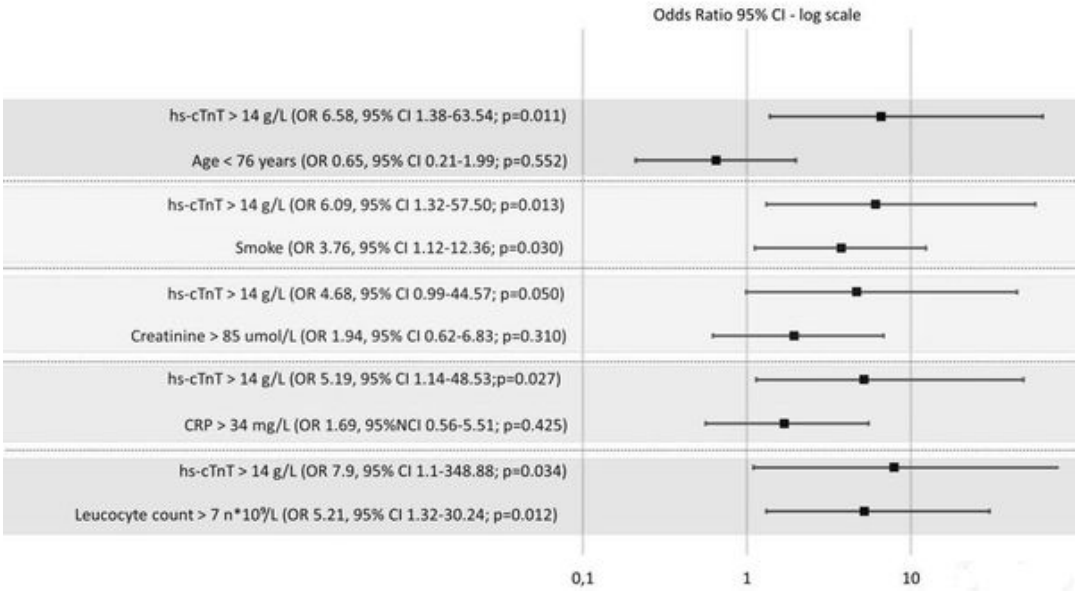


Figure 2. Head-to-head bivariable comparison for the secondary composite endpoint at 28-days.



Conflict of interest to declare? No

P27

The burden of epicardial fat is associated with endothelial function in patients with heart failure with reduced ejection fraction

V.A. Rossi[1], D. Nebunu[1], T. Haider[1], M.P. Nägele[1], F. Paneni[1], F. Ruschitzka[1], I. Sudano[1], A.J. Flammer[1]

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Introduction: Epicardial adipose tissue (EAT) is associated with cardiometabolic effects. The aim of this study was to investigate the association between EAT thickness and endothelial dysfunction in patients with heart failure with reduced ejection fractions (HFrEF).

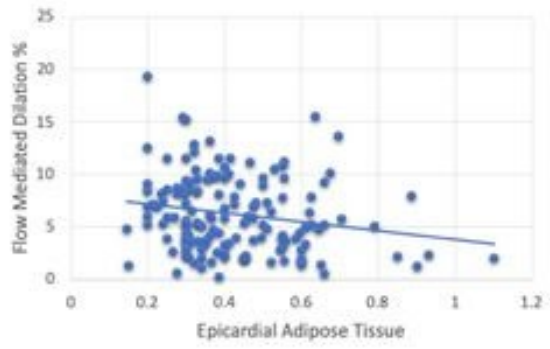
Methods: 164 patients were included in this single-center observational study between 01/2015-12/2021.Epicardial adipose tissue (EAT) was measured via standard transthoracic echocardiography. Vascular function was assessed with flow-mediated dilation (FMD%) in conduit brachial arteries and with flicker-light induced vasodilation of retinal arterioles (FIDart).

Results: Epicardial adipose tissue thickness was associated with impairment in macrovascular endothelial function as assessed by FMD (r=-.195, p=0.017) but not with microvascular function (FIDart). In multivariable regression analyses, the association of EAT with an impairment in macrovascular endothelial function remained significant after correction for confounding factors including age, hypertension, diuretics, left atrial dimension, echocardiographic parameter of elevated left ventricular filling pressures (E/e') and systolic pulmonary artery pressure (FMD%: B=-.172, p=0.024). Interestingly, HFrEF patients due to ischemic heart disease had a higher burden of EAT compared to patients with other cardiomyopathies (0.44±0.1 vs. 0.38±0.2, respectively, p=0.027), while no differences were found in endothelial function. In HFrEF due to IHD a greater EAT thickness was linked to lower cardiovascular adverse events due to CAD

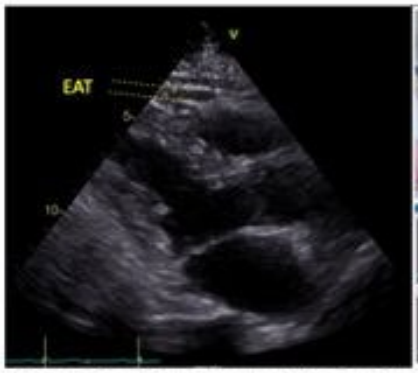
in the 12 months prior to visit (r=-0.266, p=0.020), although no correlations were found between EAT and cardiovascular adverse events during a mean follow-up of 3.3 years.

Conclusions: In patients with HFrEF, EAT accumulation is associated with a worse macrovascular function as measured by lower FMD% but not with impaired microvascular function.

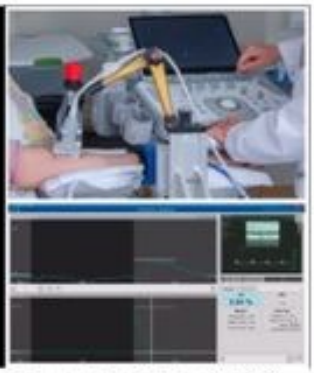
Conflict of interest to declare? No



Correlation between FMD% and EAT in patients with heart failure with reduced ejection fraction



Echocardiographic measurement of epicardial adipose tissue (EAT)



Flow-mediated dilation (FMD %)

P28

Improving INR management of patients with a Left ventricular assist device LVADs; Do you *really * need a health care professional to help you?

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Introduction: Patients with a left ventricular assist device (LVAD) need to be on Vitamin K antagonist (VKA) therapy to avoid thromboembolic complications associated with LVAD. Monitoring of INR is essential to avoid bleeding complications. In selected patients without LVAD, self-testing and self-management of VKA provide a better control of the INR and improve patient's quality of life. We designed and implemented an INR management protocol to facilitate self-monitoring and self-management of VKA in LVAD patients.

Method: Our protocol consists of patient training (as per CoaguCare foundation), auto-monitoring (AMO) and finally auto-management (AMA) phases. During the AMO phase, patients monitor INR 3 times per week and the coagulation team, composed of administrative personal, nurses and doctors, collect the data and prescribe the VKA. After a minimum of 2 months, the patients are transferred to the AMA phase if the coagulation team is confident in the patient's ability to manage VKA. The frequency of INR testing and VKA dosing is at the patient's discretion and reported to the coagulation team on a weekly basis.

Results: Our protocol was successfully implemented in 7 LVAD patients over a cumulative period of 350 days. The median age was 55 years and all patients were male. Five of 7 patients were transitioned to the AMA phase. The time in therapeutic range (TTR) was higher in the AMO phase than the time before enrollment (85% vs. 68%). In the AMA phase, TTR increased even more compared to the AMO phase (89% vs. 85%). So far, no hematological complication has occurred.

Conclusion: These results suggest that the INR management protocol performed with a multi-professional team is a safe and efficient strategy for improving anticoagulation of patients with an LVAD.

Conflict of interest to declare? No

POSTER WALK: VALVULAR HEART DISEASE

P29

Minimally invasive valve surgery with next generation self-expanding transfemoral venous cannulas: performances and safety profile

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Introduction: Devices for peripheral venous cannulation during minimally invasive cardiac surgery (MICS) have significantly progressed over the last decade. Rigid cannulas have evolved toward flexible plastic cannulas, which adopt the concept of collapsed insertion and in situ expansion. Inadequate peripheral venous drainage with rigid cannulas can be challenging and increasing vacuum or pump speed can not always solve the issue. Aim of this study is to report the institutional experience with virtually wall-less venous cannulas during MICS.

Methods: Data from patients undergoin transfemoral venous cannulation with virtually wall-less cannulas (3/8" 24F 530–680-mm lenght) for MICS were prospectively collected and retrospectively analyzed. Intraoperative a rigid guidewire was positioned in the superior vena cava under echocardiographic guidance. The wall-less cannula was then advanced over the wire and connected to the extracorporeal circulation. Rarely, vacuum assist was used to reach a target flow (Cardiac Index) of 2.4 l/min/sm with augmented venous drainage at less than −30 mmHg.

Results: Overall, 33 patients (66 ± 11 years, 22 males, 11 females) underwent MICS for isolated aortic valve replacement (mini-sternotomy, n= 17), aortic replacement combined with other procedures (mini-sternotomy, n= 9) or mitral repair (right mini-thoracotomy, n= 7). Wall-less venous smart cannulas measuring either 530 mm (n = 6) or 680 mm (n = 27) in length were successfully positioned in all patients, without complications. For a mean body height of 170 ± 11 cm and a mean body weight of 81.3 ± 23.1 kg, the calculated mean body surface area was 1.93 ± 0.41 mq, with an expected cardiac target flow of 4.65 ± 0.73 l/min. The mean flow achieved accounted for 5.7 ± 0.97 l/min (increase of 19%, in respect to standard target flow) without using vacuum in all but two cases (using vacuum at 25 and 30 mmHg, respectively). In case of mitral operations, surgical exposure of the mitral and tricuspid valves was always remarkable, with stable bloodless intracardiac cavities during surgery.

Conclusion: The performance of next-generation smart cannulas for venous drainage during MICS proved to be very satisfactory, with a high safety profile. The flows are optimal without vacuum, or at negligible levels, suggesting a steady improved performance over traditional rigid wall cannulas. Remarkable outcomes are expected if routinely adopted, with even a potential for further reduction in suction.

Conflict of interest to declare? No

P30

The role of multivariate scores to determine priority for transoesophageal echocardiography among patients with *Staphylococcus aureus* bacteraemia

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Introduction: Many scores have been developed to identify patients with *Staphylococcus aureus* bacteraemia at low risk of infective endocarditis (IE) for whom transoesophageal echocardiography (TOE) appears less justified. The aim of the present study was to evaluate the use of three multivariate scores (PREDICT, VIRSTA, POSITIVE) in clinical practice.

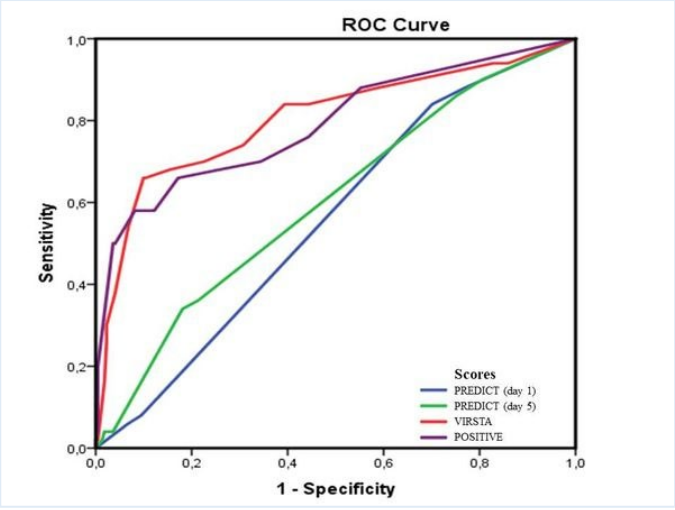
Method: This prospective observational study included patients with *S. aureus* bacteraemia with suspected IE hospitalized at Lausanne University Hospital during a 3 year-period (2018-2020). IE (proven) was defined according to modified Duke criteria.

Results: Among 271 patients with *S. aureus* bacteraemia, 50 patients (26.6%) had proven IE. Patients with IE had higher rates of prolonged bacteraemia (>48h) (56% *vs* 24%; *P*<0.001), new heart murmur (38% *vs* 22%; *P*=0.018), embolic events (66% *vs* 15%; *P*<0.001), prosthetic valve (34% *vs* 5%; *P*=0.009), rigors (54% *vs* 37%; *P*=0.026), sepsis (61% *vs* 42%; *P*=0.017) and immunological criterion (6% *vs* 1%; *P*=0.045). Figure shows the sensitivity, specificity, positive and negative predictive values and AUC of the three scores. VIRSTA showed the best sensitivity (0.94), negative predictive value (0.95) and AUC (0.80) as compared to other scores. Misclassification of patients with proven endocarditis in the low risk group occurred with all scores (VIRSTA: 3 patients; PREDICT: 7; POSITIVE: 15) Multivariate analysis found that embolic events (*P*<0.001; OR 7.2, CI 3.3-15.5), prosthetic valve (*P*<0.001; OR 7.2, CI 2.6-20.1) and prolonged bacteraemia (*P*=0.003; OR 1.5, CI 1.1-2.0) were independently associated with IE.

Conclusion: Although studies suggest the potential utility of these scores to avoid TOE in patients at low risk, in our study the sensibility of this scores was not adequate to confirm this hypothesis. Hence, TOE should always be considered, even in the 'low risk' group. Presence of embolic events, presence of prosthetic valves and prolonged bacteraemia were the best predictors of IE.

Sensitivity, specificity, PPV, NPV & AUC

Scores	Sensitivity	Specificity	PPV	NPV	AUC
PREDICT (day 1)	0.06 (0.01-0.17)	0.93 (0.89-0.96)	0.17 (0.06-0.40)	0.81 (0.80-0.83)	0.59 (0.48-0.64)
PREDICT (day 5)	0.86 (0.73-0.94)	0.25 (0.19-0.31)	0.21 (0.18-0.23)	0.89 (0.79-0.94)	0.60 (0.51-0.69)
VIRSTA	0.94 (0.83-0.99)	0.28 (0.22-0.34)	0.23 (0.21-0.25)	0.95 (0.87-0.98)	0.80 (0.73-0.88)
POSITIVE	0.70 (0.55-0.82)	0.66 (0.59-0.72)	0.32 (0.26-0.37)	0.91 (0.86-0.94)	0.79 (0.71-0.87)



Conflict of interest to declare? No

P31

Pleural effusion: a marker of poor hemodynamics and adverse outcome in patients with severe aortic stenosis undergoing valve replacement

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Introduction: Pleural effusion (PE) is a common chest X-ray finding in patients with advanced valve disease including those with severe aortic stenosis (AS). However, the pathophysiology and clinical value of PE in this setting are not clearly defined. We assessed the hemodynamic correlates and prognostic impact of PE in patients with severe AS undergoing aortic valve replacement (AVR).

Methods: We studied 471 patients (mean age 74±10 years) with severe AS (indexed aortic valve area 0.42±0.12 cm^2/m^2, left ventricular ejection fraction 58±12%) undergoing right heart catheterization prior to AVR. All patients underwent upright chest X-ray the day before cardiac catheterization. Two radiologist independently evaluated all X-rays for the presence of no PE, unilateral PE, or bilateral PE blinded to any clinical data. In case of disagreement, a conservative rating was applied (e.g. no PE if one rating was unilateral PE, and the other was no PE).

Results: There were 32 (7%) patients with unilateral PE and 49 (10%) patients with bilateral PE, and 390 patients had no PE. Patients with bilateral PE had the highest mean pulmonary artery pressure, mean pulmonary artery wedge pressure, and pulmonary vascular resistance, and had the lowest pulmonary artery compliance and stroke volume index while those with unilateral PE had intermediate values. The mean right atrial pressure was also significantly higher in patients with PE compared to those without (Table). After a median post-AVR follow-up of 1361 (957-1878) days mortality was highest in patients with bilateral PE (2.7 times higher than in patients without PE; Figure).

Conclusions: In patients with severe AS, the presence of bilateral PE is a marker of a poor hemodynamic constellation and a substantially increased risk of post-AVR mortality. Both increased fluid filtration (driven by wedge pressure) and attenuated lymphatic drainage (high right atrial pressure) may contribute to the occurrence of PE.

Conflict of interest to declare? No

	Bilateral PE n=49	**Unilateral PE n=32**	**No PE n=390**	**P value**
Indexed aortic valve area (cm^2/m^2)	0.40±0.13	0.44±0.13	0.42±0.12	0.38
Left ventricular ejection fraction (%)	48±16	55±13	59±11	<0.001
Indexed left atrial area (cm^2/m^2)	14.8±3.4	14.5±3.9	13.0±3.8	0.04
Mean right atrial pressure (mmHg)	8±5	8±5	6±3	<0.001
Mean pulmonary artery pressure (mmHg)	34±10	30±12	24±9	<0.001
Mean pulmonary artery wedge pressure (mmHg)	23±8	18±8	15±7	<0.001
Pulmonary vascular resistance (Wood units)	2.8±1.3	2.7±1.9	1.9±1.1	<0.001
Pulmonary artery compliance (ml/mmHg)	2.0±1.0	2.9±1.6	3.6±1.8	<0.001
Stroke volume index (ml/m^2)	30±8	36±10	38±10	<0.001

P32

The relevance of tricuspid regurgitation in patients undergoing percutaneous treatment of mitral regurgitation

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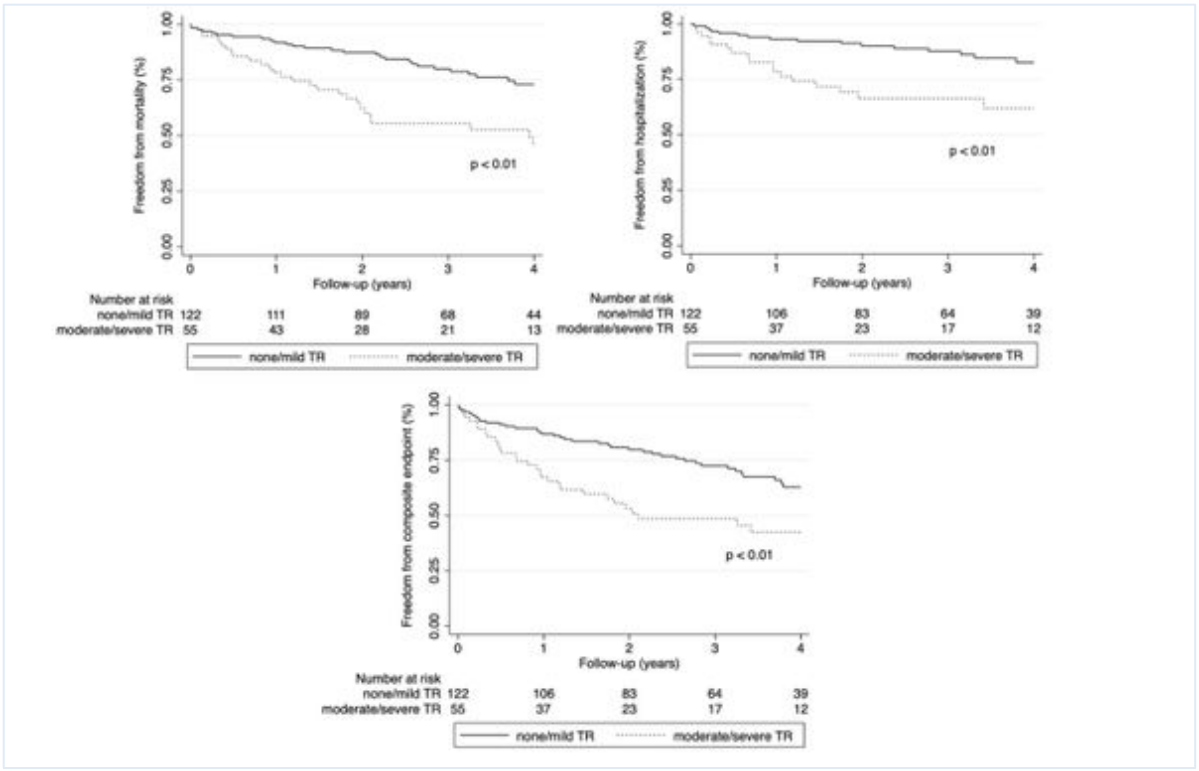
Introduction: Patients undergoing percutaneous treatment of mitral regurgitation (MR) with the MitraClip frequently present with tricuspid regurgitation (TR). It is still uncertain how the presence of concomitant TR impacts long-term outcomes of such patients. Therefore, we sought to investigate the association between TR at baseline and clinical outcomes during a prolonged follow-up period in a real-word patient population undergoing the MitraClip procedure.

Method: Consecutive patients from the prospective MitraSwiss registry with MitraClip implantation at the Heart Center Lucerne between November 2009 and September 2020 were analyzed. Endpoints were all-cause mortality, hospitalization for heart failure and the composite endpoint of the two.

Results: Of 177 patients (mean age 76 ± 9 years, 37% female), 122 (69%) had no/mild TR and 77 (31%) moderate/severe TR at baseline. Patients with moderate/severe TR presented with a significantly lower left ventricular ejection fraction, a higher pulmonary artery systolic pressure (PASP) and a lager tricuspid annulus at baseline. Acute procedural success was achieved in 84% of patients. Despite a significant reduction in mean PASP (45±14 mmHg at baseline, 39±12 mmHg before discharge, p=0.02), concomitant TR remained unchanged. After a median follow-up of 1103 days (IQR 555-1766 days), 70 (40%) of patients had died and 34 (19%) were hospitalized for heart failure. In multivariable analysis, TR at baseline was associated with an increase in all-cause mortality (HR 2.34, 95% CI 1.36-4.03, p<0.01), hospitalization for heart failure (HR 3.19, 95% CI 1.37-7.41, p=0.01) and the composite endpoint (HR 2.00, 95% CI 1.19 -3.36, p=0.01).

Conclusion: The presence of relevant TR at baseline was significantly associated with increased mortality and hospitalization for heart failure during long-term follow-up, independent of right ventricular function and dimension. More research is needed to understand the causal role of TR in such patients and to investigate if simultaneous treatment of TR may improve prognosis in patients undergoing percutaneous treatment of MR.

Conflict of interest: MW serves a proctor for Biosensors. SFS received consulting and speaker fees from Alnylam, Amgen, AstraZeneca, Bayer, Bristol-Myers Squibb, Pfizer, and Takeda. RK has received institutional grants from Abbott, Biosense-Webster, Biotronik, Boston Scientific, Medtronic and SIS Medical. ST serves as a proctor and consultant for Abbott, Biosensors, Boston Scientific and Medtronic, as a consultant for Shockwave, Teleflex, Medira, atHeart and Veosource, has received institutional research grants from Boston Scientific and Fumedica AG, and holds equity in Hi-D Imaging. The other authors declare no conflict of interest.



	Predictors for mortality				Predictors for hospitalization for heart failure			
	Univariate HR (95% CI)	p-Value	Multivariable HR (95% CI)	p-Value	Univariate HR (95% CI)	p-Value	Multivariable HR (95% CI)	p-Value
Clinical characteristics								
Age (per 10y)	1.58 (1.17-2.12)	**< 0.01**	1.08 (0.77-1.51)	0.66	1.22 (0.83-1.80)	0.31		
Female sex	0.85 (0.51-1.42)	0.54			1.19 (0.60-2.38)	0.62		
Height	0.98 (0.96-1.01)	0.20			0.99 (0.95-1.02)	0.44		
Weight	0.98 (0.97-1.00)	**0.02**	0.99 (0.97-1.01)	0.27	1.00 (0.97-1.02)	0.66		
BMI	0.95 (0.90-1.00)	0.06			1.01 (0.94-1.09)	0.82		
Coronary artery disease	1.27 (0.79-2.05)	0.32			1.71 (0.86-3.42)	0.13		
Hypertension	1.14 (0.67-1.93)	0.63			2.55 (0.98-6.64)	0.06		
Diabetes mellitus	1.48 (0.85-2.56)	0.16			3.81 (1.93-7.52)	**< 0.01**	3.17 (1.29-7.79)	**0.01**
Pulmonary disease	1.32 (0.78-2.25)	0.30			0.85 (0.37-1.96)	0.71		
Atrial fibrillation	1.77 (1.10-2.83)	**0.02**	1.23 (0.70-2.17)	0.47	1.05 (0.52-2.11)	0.89		
Oral anticoagulants	1.49 (0.93-2.40)	0.10			1.22 (0.62-2.40)	0.56		
Dilated cardiomyopathy	0.62 (0.25-1.36)	0.24			3.13 (1.48-6.59)	**< 0.01**	1.78 (0.61-5.21)	0.30
NYHA (per class)	1.61 (1.15-2.26)	**< 0.01**	1.29 (0.85-1.97)	0.24	2.70 (1.64-4.45)	**< 0.01**	2.05 (1.04-4.04)	**0.04**
eGFR (per 10ml/min)	0.87 (0.78-0.98)	**0.02**	1.03 (0.90-1.17)	0.66	0.69 (0.57-0.83)	**< 0.01**	0.79 (0.62-0.99)	**0.04**
Hemoglobin (per 10 g/l)	0.69 (0.59-0.80)	**< 0.01**	0.75 (0.63-0.89)	**< 0.01**	0.73 (0.60-0.90)	**< 0.01**	0.83 (0.65-1.08)	0.17
Echocardiography								
LVEF baseline	0.99 (0.98-1.00)	0.20			0.96 (0.94-0.98)	**< 0.01**	0.98 (0.94-1.02)	0.38
LVEDD baseline	0.99 (0.96-1.01)	0.34			1.04 (1.00-1.08)	0.06		
LVEDV baseline	1.00 (0.99-1.00)	0.66			1.01 (1.00-1.01)	**0.04**	1.00 (0.99-1.01)	0.80
PASP baseline	1.01 (0.99-1.02)	0.33			1.01 (0.99-1.04)	0.22		
MG baseline	1.03 (0.80-1.33)	0.80			1.13 (0.79-1.62)	0.51		
Secondary MR	1.03 (0.64-1.64)	0.91			3.19 (1.49-6.85)	**< 0.01**	0.49 (0.13-1.83)	0.29
Moderate/severe TR baseline	2.61 (1.63-4.19)	**< 0.01**	2.34 (1.36-4.03)	**< 0.01**	3.10 (1.58-6.10)	**< 0.01**	3.19 (1.37-7.41)	**0.01**
RV dysfunction baseline	1.46 (0.90-2.37)	0.13			2.20 (1.09-4.45)	**0.03**	0.70 (0.25-1.91)	0.48
TA diameter baseline	0.99 (0.94-1.05)	0.82			0.96 (0.89-1.04)	0.32		

BMI, body mass index; NYHA, New York Heart Association functional class; eGFR, estimated glomerular filtration rate; ACE, angiotensin converting enzyme; MCA, mineralocorticoid receptor antagonist; LVEF, left ventricular ejection fraction; LVEDD, left ventricular end diastolic diameter; LVEDV, left ventricular end diastolic volume; PASP, pulmonary artery systolic pressure; MG, mitral gradient; MR, mitral regurgitation; TR, tricuspid regurgitation; RV, right ventricle; TA, tricuspid annulus.

P33

Minimally invasive mitral repair in Barlow disease mid term results

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Introduction: Surgical repair of severe mitral valve regurgitation (MR) in patients with bi-leaflet prolapse can be challenging. The initial results with non-resection repair have shown promising results. Here we present mid-term outcomes on non-resection repair in severe mitral valve regurgitation in Barlow disease.

Methods: Between 2010 and 2020 62 patients with Barlow disease underwent minimal invasive mitral valve repair. The main outcome of this single center retrospective study was the incidence of the mid-term recurrent mitral valve regurgitation, mortality, reoperation related to the mitral valve repair as well as in hospital outcomes.

Results: Minimally invasive repair was performed in all 62 patients. The mean age was 58 ± 11 years and 55% were males. The mean preoperative ejection fraction was 61.0 ± 9.2%, the median LogEuroScore was 2.2 (range 1.5 to 4.0) and 23% of patients had atrial fibrillation. Two patients have had an active endocarditis. There was no perioperative mortality, no postoperative infarction or cerebrovascular event.

Median follow up was 3.0 years (IQR 1.1 to 4 years), with no mortality. Reoperation rate for recurrent MR was 2.61(95%CI 1.08 to 6.26), congestive heart failure rate was 0.52(95% CI 0.07 to 3.70) and stroke rate was 1.56(95%CI 0.50 to4.85) per 100 patient years. The latest echocardiography showed recurrent mitral valve regurgitation >2 in 3 cases, where one patient had severe MR.

Conclusion: In patients with severe mitral valve regurgitation in Barlow disease with bileaflet valve prolapse minimal invasive repair is a simple and efficient approach providing excellent long-term results. With minimal risk for recurrent severe mitral valve regurgitation.

Conflict of interest to declare? No

P34

Feasibility of isolated minimally invasive mitral valve surgery in octogenarians

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Introduction: Minimally invasive mitral valve surgery through a right mini-thoracotomy has become the standard of care in several institutions. Despite the feasibility, safety, and excellent outcomes, there is a data paucity about its use in patients aged over 80 years. In this study, we assess the outcomes of mitral valve surgery via right mini-thoracotomy in octogenarians.

Methods: We performed a retrospective analysis of the preoperative, intraoperative and in-hospital postoperative data of 38 octogenarian patients with severe mitral regurgitation undergoing isolated mitral valve surgery via right mini-thoracotomy in a single-center from 2013 to 2021.

Results: Median patient age was 82 (81-83) years, 16 (42.1%) patients were female and median EuroSCORE 2 was 3.1% (2.3-4.9). A total of 19 (50%) patients underwent mitral valve repair. Median cardiopulmonary bypass duration was 78 (54-100) minutes and median aortic cross-clamping duration was 57 (40-70) minutes. Two (5.3%) patients were converted to sternotomy, 1 (2.6%) underwent renal replacement therapy, 5 (13.2%) underwent reexploration for bleeding or tamponade and 12 (31.6%) underwent permanent pacemaker implantation. The surgical repair success rate was 89.5%, with two (10.5%) patients requiring reoperation due to repair failure. No other patients required reoperation on the mitral valve. The median intensive care unit stay was 1 (1-2) day and the median postoperative stay was 9.5 (8-14) days. There was no perioperative stroke or death.

Conclusion: Despite a relatively increased risk of permanent pacemaker implantation and reexploration for bleeding or tamponade, our institutional data support the feasibility of minimally invasive mitral valve surgery in octogenarians, showing a high repair success rate, short duration of cardiac ischemia and low overall in-hospital morbidity with no mortality.

Conflict of interest to declare? No

P35

Intraoperative CYTOSORB hemoadsorption reduces sepsis-associated mortality in patients with active native and prosthetic left-sided infective endocarditis

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Introduction: Cardiac surgery for infective endocarditis (IE) carries high mortality risk of up to 60%, depending on the severity of the disease, operative technique and strategy, timing of surgery, comorbidities and causative infective agent. An already present inflammation might get aggravated due to cardiopulmonary bypass (CPB)-induced dysregulated immune response. Intraoperative hemoadsorption therapy (iHAT) can alleviate the septic response. Our objective was to assess the efficacy of iHAT in active left-sided native- and prosthetic IE.

Methods: Patients with active left-sided IE between 01/2015 and 04/2021 were analyzed with respect to surgery with or without iHAT. In iHAT, CytoSorb® adsorber cartridge (Cytosorbents, Monmouth Junction, NJ, USA) was applied during CPB. Sepsis, sepsis-related and in-hospital mortality, clinical and laboratory parameters were evaluated.

Results: Final cohort included 202 patients, 135 with active left-sided native and 67 with prosthetic valve IE. Ninety-nine patients received iHAT during CPB, and 103 patients did not. Postoperative sepsis and sepsis-related mortality were reduced in the iHAT group (22.2% vs 37.9%, *P*=0.023 and 8.1% vs 21.4, *P*=0.014, respectively). In-hospital mortality tended to be lower in the iHAT group (14.1% vs 25.2%, *P*=0.071). Postoperatively, C-reactive protein and white blood cell counts were elevated in the control group (10.0 vs 8.80mg/dL; *P*=0.026 and 12.1 vs $9.9x10^6$/µL, *P*=0.025, respectively). IHAT patients demonstrated higher hemoglobin concentrations, lower platelet count and reduced blood transfusions postoperatively (iHAT vs. Control: 9.7 vs. 9.2 g/dL, *P*=0.011, 151 vs. $172x10^3$/µL, *P*=0.032, and 1 vs. 3 Units, *P*=0.16, respectively).

Conclusions: Intraoperative HAT reduced sepsis-associated mortality after surgery for active left-sided native and prosthetic valve infective endocarditis. HAT was safe and without adverse events.

Conflict of interest to declare? No

P36

Midterm outcomes of video assisted minimally invasive mitral valve surgery

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Introduction: Minimally invasive mitral valve surgery (MIMVS) through a right lateral thoracotomy has become a standard of care in cardiac surgery at specialized centres. We present our single centre experience with regards to repair rate, morbidity, mortality and mid-term outcomes.

Method: Between July 22nd 2013 and October 30th 2021 a total of 249 consecutive patients underwent isolated or combined MIMVS. Baseline characteristics, operative variables, postoperative outcomes and follow-up information was collected.

Results: Mean age was 65±12years, median Euroscore 1.2(0.5-7.5). The predominant valve pathology was degenerative disease (95.9%) with 20.9% Barlow's, 18.9% bi-leaflet prolaps and 19.7% atrial fibrillation. Bypass time was 167±49, Cross-clamp time 108±37 minutes. Mitral repair rate was 94.4%. Leaflet resection was performed in 36.2%, neo-chordae implant in 30.1% and in 6.4% both. Further techniques included sliding-plasty (5.2%), PFO-closure (9.6%), cleft-closure (43%), commissuroplasty (8.8%), LAA-Closure (17.3%), kryo-ablation (4%) and tricuspid-annuloplasty (13.3%). Only one patient (0.4%) had to be converted to sternotomy and two (0.8%) needed a rethoracotomy (bleeding). Mean ICU stay was 1.9±3.2days, hospital stay 10.7±4.7days. In-hospital mortality was 1.2%, two patients suffered a permanent stroke (0.8%). Follow up was complete in 95.2% (n=234) for a median of 2.2(0.1-6.4)years. Overall survival of 97.5%. Freedom from reoperation was 97.9%. Valve competence evaluated with annual doppler echocardiography was less or equal to regurgitation grade 2 in all but one patient (99.6%).

Conclusion: MIMVS is a safe approach with low morbidity and mortality in a real world cohort that allows a high and durable repair rate with low reoperation rates and favourable short to mid-term event-free survival in a specialized centre.

Conflict of interest to declare? No

P37

Comparison of outcomes of transfemoral and transapical TAVI approaches after 5 years follow up: a single-center experience

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Introduction: Transapical transcatheter aortic valve implantation is generally considered to be associated with increased morbidity and mortality compared with transfemoral transcatheter aortic valve implantation. We aimed to compare different patient risk profiles, access related complications and long-term survival using inverse probability treatment weighting.

Methods and results: Retrospective, single-center analysis of 925 consecutive patients with aortic valve stenosis undergoing transfemoral (n=802) or transapical (n=123) aortic valve implantation as a single procedure between September 2011 and August 2020. Baseline characteristics revealed a higher perioperative risk as reflected in the EuroSCORE II value (3±5 vs 5±6) and STS (Society of Thoracic Surgeons) score (5±5 vs. 6±5) in the transfemoral and transapical group respectively.

Both groups had a low incidence of post procedure complications. The 30-day follow up according to the Valve Aortic Research Consortium (VARC) II criteria showed in the group of transfemoral TAVI patients a higher incidence of bleeding (n=151 (19%) for transfemoral vs. n=13 (10%) for transapical; p=0.034) and vascular complications (TF-TAVI n=141 (18%) vs. TA-TAVI n=4 (3%); p<0.001). After inverse probability treatment weighting, all-cause mortality at 5 years did not differ between the two groups (hazard ratio (HR) TF/TA TAVI: 0-5years after IPTW; 1.31 (0.92 to 1.88) p=0.138).

Conclusion: With regards to our data, we could demonstrate the short- and long-term safety and efficacy of the transapical approach for TAVI therapies. Though at higher perioperative risk, transapically treated patients suffered from less bleeding or vascular complications than transfemorally treated patients. It is of utmost interest, that 5 years mortality did not differ between the groups.

Conflict of interest to declare? No

POSTER WALK: CORONARY ARTERY DISEASE

P38

Hemadsorption treatment in emergency cardiac surgery - cost-benefit analysis comparing patient outcomes

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Background: Hemadsorption with Cytosorb adsorption (CytoSorbents Inc., USA) in emergency cardiac surgery was prescribed to reduce Ticagrelor and Rivaroxaban-level in human blood.

Methods: Between June 2017 and June 2021, we evaluated the outcomes of 72 consecutive patients (age 65±11 years) with acute coronary syndrome (ACS) and the indication for isolated coronary artery bypass grafting (CABG) in emergencies at our institution. All patients were pre-treated with the P2Y12-receptor-antagonist Ticagrelor and all procedures were performed with Cytosorbents (Cyto-Pat). We also estimated the mean cost per patient, and a bootstrap analysis was performed based on individual data from the case series. We compared the results with our "historical patients" (Hi-Pa) between June 2015 and June 2017 without hemadsorption (n=22).

Results: Bilateral internal mammary artery (BIMA) was used in 67.7% of all cases. Operation time (277±65min vs. 320±75min; p=0.014) and postoperative 24-hours-drainage volume (p<0.001; 277±65ml vs. 866±262ml) was significantly reduced in Cyto-Pat. Only two rethoracotomies (2.8%) had to be performed. In addition, patients in the Hi-Pa required significantly more blood products and had a significantly higher rate of rethoracotomy, associated with a longer stay in the ICU. The variable that had the highest impact on the level of cost savings was the operation duration. Operation time, ICU stay and blood product costs are the top contributors to Cyto-Pat's cost savings at over 4200±1100€.

Conclusions: The results suggest that the clinical benefits derived from the intraoperative use of hemadsorption in ticagrelor-treated emergency cardiac surgery patients could result in significant savings costs over 4200±1100 € per patient.

Conflict of interest to declare? No

P39

Bleeding risk in patients hospitalized for non-ST-segment elevation acute coronary syndromes: performance of the CRUSADE score

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Introduction: Evaluation of bleeding risk is critical to the management of patients with non-ST-segment elevation acute coronary syndromes (NSTE-ACS). The CRUSADE score is the most established tool to estimate major bleeding events after NSTE-ACS. However, its utility in contemporary European populations is uncertain.

Methods: The performance of the CRUSADE score was assessed in patients with NSTE-ACS patients included in the prospective SPUM-ACS study (n=4´787) and main findings were validated in the prospective AMIS Plus registry (n=46'939). Major bleeding during hospitalization was defined as BARC class IIIB, IIIC, IV, or V. Discrimination was evaluated by the area under the receiver operating characteristic curve (AUC). Multivariable-adjusted risk ratios (adj RR) were estimated for each of the 8 score variables.

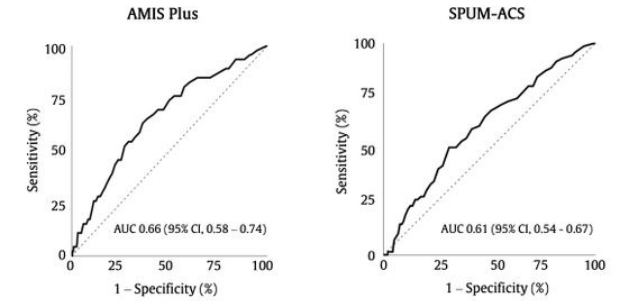

Figure 1. Performance of the CRUSADE Score in predicting major bleeding events in hospital in patients with NSTE-ACS from two contemporary prospective multicentre cohorts in Switzerland. Receiver operator characteristic curves showing poor discriminatory performance of the score. Results represent data of 11954 and 2034 patients with NSTE-ACS from AMIS Plus and SPUM-ACS, respectively. Major bleeding was defined as *Bleeding Academic Research Consortium* Class IIIB, IIIC, IV, or V. Hematocrit levels in AMIS Plus were estimated from the blood hemoglobin concentration using the conversion formula by Kokholm. AUC denotes area under the curve; CI, confidence intervall

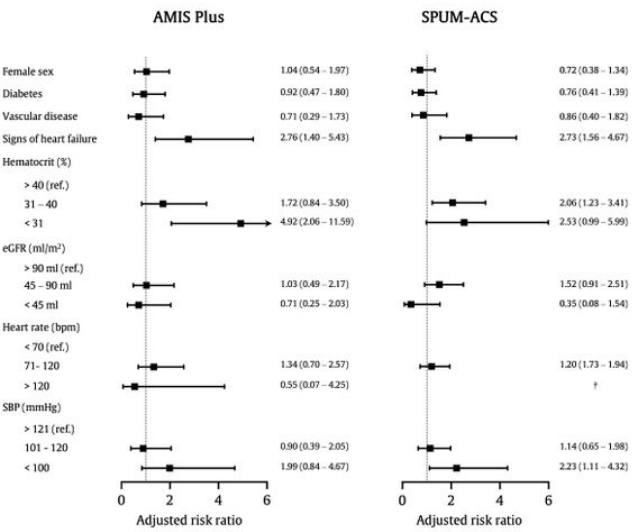

Figure 2. Adjusted relative risks for major bleeding in hospital associated with variables of the CRUSADE Score. Squares represent mean estimates with whiskers indicating 95% confidence intervalls. All score variables were included in the model. Heatocrit levels in AMIS Plus were estimated from the blood hemoglobin concentration using the conversion formula by Kokholm. Major bleeding was defined as *Bleeding Academic Research Consortium* Class IIIB, IIIC, IV, or V. † no event

Results: Risk predicted by CRUSADE exceeded the observed risk by 2.0-fold in SPUM-ACS. Results were consistent across predefined risk categories (very low, low, moderate, high, and very high). CRUSADE showed poor discriminatory performance (SPUM-ACS: AUC 0.61, 95% CI 0.54 to 0.67) and low balanced accuracy (SPUM-ACS: 0.50). Decision curve analyses suggested little to no net benefit from using the score. Adjusting for other score variables, signs of heart failure (adj RR; 2.73; 95% CI 1.56 to 4.67), low hematocrit (<31% vs. >40%; adj RR; 2.53, 95% CI 0.99 to 5.99), and low systolic blood pressure (<100 mmHg vs. >121 mmHg; adj RR 2.23, 95% CI 1.11 to 4.32) were the strongest predictors of major in-hospital bleeds in SPUM-ACS. These findings were similarly observed in AMIS Plus.

Conclusion: The CRUSADE score overestimates bleeding risk in NSTE-ACS. Among all 8 score variables, signs of heart failure, low hematocrit, and low

systolic blood pressure are the strongest predictors of major in-hospital bleeds in both cohorts.

Conflict of interest to declare? No

P40

Bradycardia and acute coronary syndromes: analysis of outcomes from 51001 patients enrolled in acute myocardial infarction in Switzerland Registry

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Introduction: Currently recommended risk prediction scores use incremental models to estimate event rates in relation to heart rate (HR) in acute coronary syndromes (ACS). Nonetheless, several reports suggested a non-linear, bimodal, relationship with high event rates at very low or high HR. We aimed to analyze the prognostic impact of bradycardia, defined as admission HR<50bpm, in patients enrolled in the AMISPlus registry**.**

Methods: Data of patients enrolled between 1999 and 2021, stratified according to admission HR (<50bpm; 50-75bpm; 76-100bpm; >100bpm) were retrospectively analysed. Primary endpoint was in-hospital mortality, secondary endpoint the composite of death, cerebrovascular event and reinfarction. Associations between HR and outcomes were first assessed at univariate and multivariable logistic regression analyses then verified after sequential propensity-score matchings performed among groups.

Results: 51001 patients (mean age 66 years, IQR 56-76) were evaluated. Crude estimates showed a bimodal distribution of primary and secondary endpoints with peaks at low and high HR (in-hospital mortality: HR <50bpm: 5,7%; 50-75bpm: 2,8%; 76-100bpm: 5,0%; >100bpm: 13,6%; p<0,001 and MACE: HR <50bpm: 7,3%; 50-75bpm: 3,7%; 76-100bpm: 6,5%; >100bpm: 15,4%; p<0,001). Independent association of HR<50bpm with mortality was recognized only at primary multivariable logistic regression analysis (OR 1.49; 95% CI 1.01-2.13 p=0.038) but not confirmed at multiple multivariable sensitivity analyses performed after exclusion of patients on negative chronotropic therapy. After propensity-score matching, rates of primary and secondary endpoints equalled among groups with HR<100bpm (in-hospital mortality: HR <50bpm: 5,7%; 50-75bpm: 5,6%; 76-100bpm: 6,7% all comparisons with p:ns; >100bpm: 11,0%; p<0,001 vs HR<50bpm and MACE: HR <50bpm: 7,3%; 50-75bpm: 6,8%; 76-100bpm: 8,4% all comparisons with p:ns; >100bpm: 11,0%; p<0,001 vs HR<50bpm).

Conclusions: HR<50 bpm at admission in patients with ACS highlights a group at higher risk of adverse events. Nonetheless, after adequate correction of baseline differences among different HR groups, event rates equalled in groups with HR<100 bpm.

Table 1. In hospital outcomes. Crude outcomes of patients enrolled in the study, stratified according to HR admission. Number of non-missing observations reported in column Obs.

Outcomes	Obs.	Overall	<50	50-75	76-100	>100	p-value[1]
N		51001	1159	23153	21103	5586	
In hospital-mortality, n (%)	51001	2525 (5.0%)	66 (5.7%)	642 (2.8%)	1053 (5.0%)	764 (13.6%)	<0.001
Recurrent infarction, n (%)	50739	593 (1.2%)	16 (1.4%)	206 (0.9%)	278 (1.3%)	93 (1.7%)	<0.001
Cerebrovascular events, n (%)	50545	405 (0.8%)	10 (0.9%)	119 (0.5%)	178 (0.9%)	98 (1.8%)	<0.001
MACCE, n (%)	50533	3157 (6.2%)	83 (7.3%)	859 (3.7%)	1353 (6.5%)	862 (15.4%)	<0.001

[1]Pearson's Chi-squared test

Table 2. In hospital outcomes after propensity score matching. In hospital outcomes of matched groups stratified according to admission HR.

Outcomes	<50	50-75	p-value[1]	<50	76-100	p-value[1]	<50	>100	p-value[1]
Matched pairs	1159	1159		1159	1159		1158	1158	
In hospital-mortality, n (%)	66 (5.7%)	65 (5.6%)	1.0	66 (5.7%)	78 (6,7%)	0.344	65 (5.6%)	125 (11%)	<0.001
Recurrent infarction, n (%)	16 (1.4%)	14 (1.2%)	0.718	16 1.4%)	17 (1.5%)	1.000	16 (1.4%)	15 (1.3%)	0.859
Cerebrovascular event, n (%)	10 (0.9%)	9 (0.8%)	0.823	10 (0.9%)	17 (1.5%)	0.245	10 (0.9%)	19 (1.7%)	0.134
MACCE, n (%)	83 (7.3%)	78 (6.8%)	0.683	83 (7.3%)	96 (8.4%)	0.350	82 (7.2%)	147 (13%)	<0.001

[1]Pearson's Chi-squared test

Conflict of interest to declare? No

P41

Treatment and outcome of patients with acute myocardial infarction and chronic lung disease: insights from the nationwide AMIS Plus Registry

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Introduction: Little is known about patients with acute myocardial infarction (AMI) and chronic lung disease (CLD). The aim of our study was to analyze risk factors, treatment, and outcome of AMI patients with CLD over the last 20 years using the nationwide AMIS Plus registry.

Methods: All patients with AMI enrolled in the AMIS Plus registry and data on CLD between January 2002 and December 2021 were included. Chronic lung disease was determined according to the definition used in the Charlson Comorbidity Score. Data on baseline characteristics, regular medication, immediate therapy within 24h, in-hospital interventions and treatments, in-hospital outcome, complications and discharge medication were analyzed using descriptive statistics and logistic regression.

Results: Among 53680 AMI patients 5.8% had a CLD. The group with CLD had 26.6% female and 73.4% male patients. Gender distribution was similar between the groups. Patients with CLD were significantly older (71.2 vs. 65.8 y; p<0.001), more frequently diagnosed with NSTEMI, had more comorbidities and were less frequently never smokers (17.4% vs. 35.3%; p<0.001) compared to patients without CLD. In addition, CLD patients were less likely to receive aspirin, P2Y12 inhibitors, beta-blockers, ACE inhibitors and statins (all p<0.001) and were also less likely to undergo percutaneous coronary interventions (82.5% vs. 68.7%; p<0.001). Median length of stay was 2 days longer for CLD patients. Patients with CLD had more major adverse cardiac and cerebrovascular events in-hospital (10.3% vs. 5.9%; p<0.001) and higher crude in-hospital mortality (8.3% vs. 4.7%; p<0.001). However, multivariable regression analysis showed that CLD was not an independent predictor for in-hospital mortality (OR 1.19 (95% CI 0.98-1.45) p=0.081).

Conclusion: Patients with CLD were less likely to receive evidence-based medicine and had a worse in-hospital outcome compared to those without CLD. However, after adjustment, CLD was not an independent predictor of in-hospital mortality.

Conflict of interest to declare? No

P42

Frequency and outcomes of periprocedural myocardial infarction in patients with chronic coronary syndromes undergoing PCI

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Introduction: Definitions of periprocedural myocardial infarction (MI) differ with respect to biomarker threshold as well as ancillary criteria for myocardial ischemia and are limited in terms of validation.

Methods: This study evaluated the frequency and impact of peri-procedural MI by using various MI definitions among patients with chronic coronary syndrome (CCS) undergoing percutaneous coronary intervention (PCI). Between 2010 and 2018, periprocedural MIs were assessed according to the third and fourth Universal Definition of Myocardial Infarction (UDMI), Academic Research Consortium-2 (ARC-2), and Society for Cardiovascular Angiography and Interventions (SCAI) criteria based on high-sensitivity troponin in patients with CCS undergoing PCI enrolled into the Bern PCI registry. The primary endpoint was cardiac death at 1 year.

Results: Among 4,404 patients with CCS, periprocedural MI defined by the third UDMI, fourth UDMI, ARC-2, and SCAI were observed in 18.0%, 14.9%, 2.0%, and 2.0% of patients, respectively. Among patients with periprocedural MI defined by the third UDMI, fourth UDMI, ARC-2, and SCAI, cardiac mortality at 1 year was 2.9%, 3.0%, 5.8%, and 10.0%. The ARC-2 (HR: 3.90; 95% CI: 1.11-3.37) and SCAI (HR: 7.66; 95% CI: 3.64-16.11) were more relevant compared with the third UDMI (HR: 1.76; 95% CI: 1.04-3.00) and fourth UDMI (HR: 1.93; 95% CI: 1.11-3.37) for cardiac death at 1 year.

Conclusion: Among patients with CCS undergoing PCI, periprocedural MI defined according to the ARC-2 and SCAI criteria was 7 to 9 times less frequent compared with the third and fourth UDMI. Periprocedural MI defined by using the ARC-2 and SCAI were more prognostic for cardiac death at 1 year compared with the third and fourth UDMI.

Table 1. Multivariate Cox analysis for cardiac death and all-cause death

	Cardiac death (n=4216)		All-cause death (n=4213)	
	HR (95% CI)	**P value**	**HR (95% CI)**	**P value**
3rd UDMI	1.76 (1.04-3.00)	0.030	1.71 (1.16-2.51)	0.006
4th UDMI	1.93 (1.11-3.37)	0.020	1.68 (1.12-2.53)	0.012
ARC-2	3.90 (1.54-9.93)	0.004	2.78 (1.33-5.81)	0.006
SCAI	7.66 (3.64-16.11)	<0.001	4.74 (2.56-8.80)	<0.001

Variables entered into the multivariable models were: for cardiac death: age, female sex, diabetes mellitus, renal failure, number of stents, total device length, and troponin value at baseline, for all-cause death: age, female sex, diabetes mellitus, renal failure, peripheral artery disease, previous myocardial infarction, left main artery, number of lesions treated, number of stents, drug eluting stents, total device length, and troponin value at baseline.

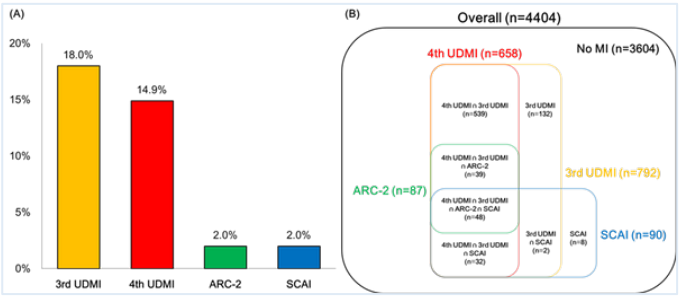

Figure 1. Frequency of peri-procedural myocardial infarction according to different definitions

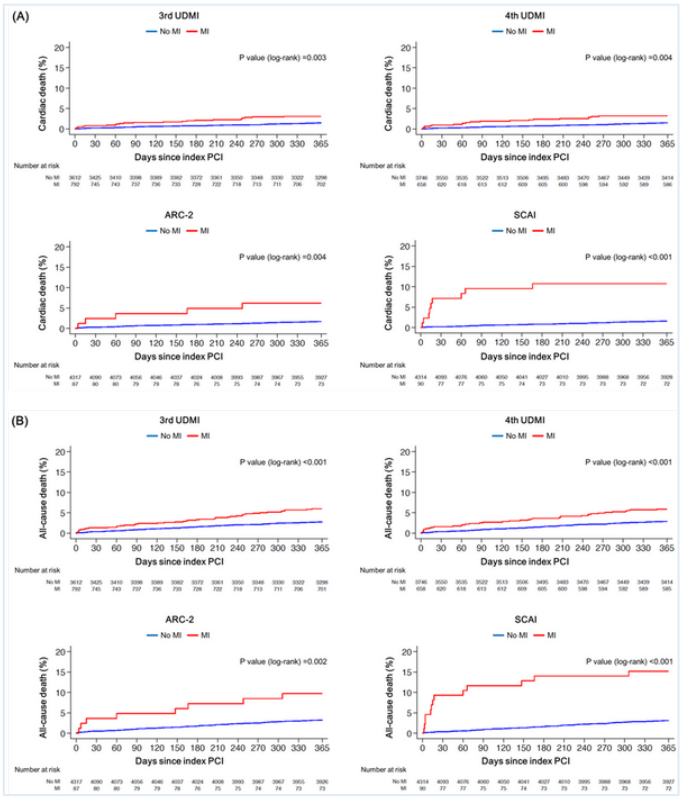

Figure 2. Kaplan-Meier cumulative event curves for cardiac death (A) and all-cause death (B).

Conflict of interest: Dr. Bär reports research grants to the institution from Medis Medical Imaging Systems, Abbott, and Bangerter-Rhyner Stiftung

P43

Heavy weekly alcohol consumption vs. binge drinking after an acute coronary syndrome: does it make a difference for the risk of major adverse cardiovascular events?

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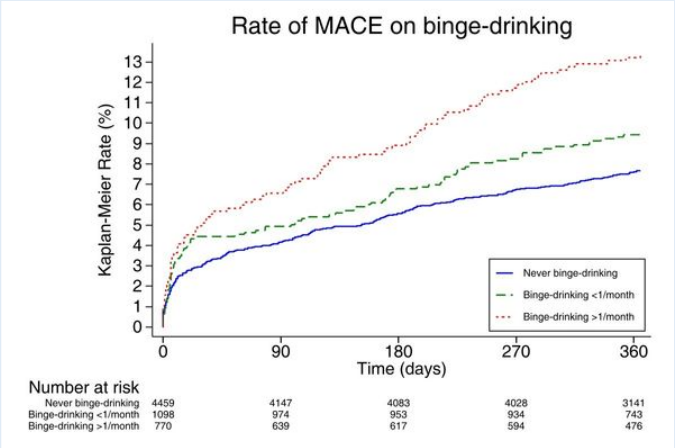
Introduction: The association between heavy weekly alcohol consumption or binge drinking and the risk of major adverse cardiovascular events (MACE) after acute coronary syndromes (ACS) is unclear.

Methods: We analysed data of 6053 patients hospitalized in 4 Swiss centres for an ACS and followed over 12 months. Weekly alcohol consumption was measured at baseline. Binge drinking was defined as the consumption of ≥6 units of alcohol on one occasion, for the 12-months period preceding the one-year follow up. We defined MACE as a composite of cardiac death, myocardial infarction, stroke or clinically indicated target vessel coronary revascularization. We applied Cox regression to assess the risk of MACE associated with heavy alcohol weekly consumption (>14 standard units/week) compared to light consumption (<1 standard unit/week) or abstinence, as well as the risk with binge drinking, compared to no binge drinking, adjusting for baseline differences (age, sex, BMI, smoking, diabetes, PAD, stroke, hypertension, use of aspirin, anticoagulation, statin, beta-blocker, ACE-inhibitor or ATII receptor blocker).

Results: At baseline, 817 (13.4%) patients reported heavy weekly alcohol consumption and 717 (11.8%) reported to have at least one episode of binge drinking per month. The risk for MACE was not increased in those with heavy weekly consumption compared to light consumption (8.7% vs. 8.5%, HR 0.96, 95%CI 0.69-1.33, P=0.80) or no consumption (8.7% vs. 10.3%, HR 1.26, 95%CI 0.88-1.80, P=0.21). However, the risk of MACE was higher in those reporting binge drinking less than one episode a month (9.4% vs. 7.7%, HR 1.67, 95%CI 1.32-2.12, P<0.001), as well as in those with at least one episode of binge drinking per month (13.4% vs. 7.7%, HR 2.07, 95%CI 1.62-2.65, P<0.001) when compared to no binge drinking (Fig.1).

Conclusion: In contrast to regular heavy alcohol consumption, binge drinking is associated with significant increased risk of MACE 12 months after ACS.

FIGURE 1: Kaplan-Meier rates of incident MACE (cardiac death, MI, stroke or clinically indicated target revascularization) after ACS by frequency of binge drinking of alcohol



Conflict of interest to declare? No

P44

Acute myocardial infarction and work inability: insights from the AMIS Plus registry

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Introduction: The impact of acute myocardial infarction (AMI) on the ability to pursue professional life is not well defined. Using a nationwide database, we aimed to describe the ability to return to work after AMI in Switzerland and identify factors associated therewith.

Methods: AMI patients of working-age enrolled in the AMIS Plus registry between 01/2006 and 09/2020 with data on self-reported work status before and 12 months after AMI were included. Using the Kruskal-Wallis rank sum test or Fisher's exact test we compared patient characteristics between those who did not reduce work hours, those who reduced, and those no longer working 12 months after the AMI.

Results: Of 4315 AMI patients (median (IQR) age 54 (49, 59)), 3204 (74.3%) did not reduce work, 592 (13.7%) reduced and 519 (12.0 %) stopped working. Patients not reducing were youngest (median age (IQR)): 54y (49y, 58y), those who reduced: 56y (51y, 60y), those who stopped: 56y (51y, 61y), p<0.001) and more often men (no reduction: 90%, reduced: 80%, stopped: 82%, p<0.001). Patients who reduced

showed worst cardiac function at AMI reflected in the highest rates of Killip class>2 (no reduction: 1.8%, reduced: 5.2%, stopped: 3.3%, p<0.001) and resuscitation before admission (no reduction: 4.1%, reduced: 6.9%, stopped: 4.0%, p=0.008). Patients who stopped work had the most comorbidities such as past AMI (no reduction: 8.6%, reduced: 10%, stopped: 13%, p=0.003), hypertension (no reduction: 45%, reduced: 50%, stopped: 54%, p<0.001), diabetes (no reduction: 10%, reduced: 13%, stopped: 16%, p<0.001) and cerebrovascular disease (no reduction: 0.8%, reduced: 1.2%, stopped: 2.3%, p=0.007).

Conclusion: Our data showed that 1:7 had reduced and 1:8 stopped professional activity 1 year after AMI. Younger age, being male and lower rates of comorbidities such as a past AMI, hypertension, diabetes and cerebrovascular disease were important factors associated with returning to work after AMI.

Conflict of interest to declare? No

P45

Out-of-hospital management and outcome of ST-elevation acute coronary syndromes in Swiss Canton Ticino: 10 years of the preH-ACS registry

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Introduction: Acute coronary syndrome with ST elevation (STE-ACS) is one of the most frequent causes of emergency medical services (EMS) activation. The organization of regional networks and their coordination with Hospital Departments is crucial for providing a fast access to reperfusion. In Canton Ticino, since 2010, the preH-ACS registry enrolled all patients with a confirmed diagnosis of STE-ACS. Aim of this study was to evaluate incidence of STE-ACS and performance of pre-hospital emergency network.

Results: Since January 1st 2010 to December 31st 2020, 2015 STE-ACS occurred in Canton Ticino (male gender 72%, mean age 66±13 years). 13% were managed with a combination of ambulance and helicopter and 87% were managed with ambulance only. Prevalence on the territory significantly varied, with a higher proportion of events in the biggest urban agglomerates. Yearly incidence ranged from 51 per 100'000 inhabitants/year in 2010, to 42 per 100'000 inhabitants/year in 2020. Median time from EMS call to ambulance on scene, from FMC to ECG execution and from FMC to PCI, were largely within those recommended in International Guidelines (9 min [IQR 7, 13], 5 min [IQR 4, 9] and 75 min [IQR 63, 93], respectively). Chest pain treatment significantly improved over years, with only 1% of patients reported severe chest pain at hospital arrival in 2020, respect to 4% in 2010 (p for trend 0.02). Survival increased from 67% to 85%. At multiple regression analysis, age, heart rate and systolic blood pressure were associated with survival.

Conclusions: Yearly incidence of ST elevation ACS in Swiss Canton Ticino was almost stable over years, with a territorial prevalence of events largely related to urban areas distribution. Regional EMS network showed a good performance with optimal times of activation and chest pain management. Poor hemodynamic presentation and the older age were independently associated with a lower probability of survival.

Conflict of interest to declare? No

P46

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Introduction: *During cardiopulmonary bypass (CPB) gaseous micro-emboli (GME) are constantly generated and some enter the patient's arterial circulation, despite the presence of filters. Those GME are potentially dangerous and may lead to local ischemia, local and systemic inflammatory reactions, and end-organ damage.*

The aim of this study was to characterize the dimensions and volumes of GME released by perfusionist manoeuvres.

Methods: An ultrasonic bubble counter BCC300 (GAMPT GmbH, Germany) was used to count and measure passing bubbles at 3 locations in the the heart-lung machine during the whole CPB period. The time periods of drug administrations and blood draws were marked by the perfusionists and extracted from the bubble count recording for detailed analysis.

Results: Each manoeuvre resulted in release of a cloud of microbubbles, identified as a peak in the count (Figure 1). Each peak had a unique composition of bubble sizes and quantities, whereby the arterial cannula probe measured smaller peaks than the upstream probes, indicating an incomplete filtering effect of the CPB components. For this analysis, bubbles with a diameter of 40-2000µm were considered and peaks were characterized by variables as count, accumulated volume and diameter calculations. From all cases (n=52), one peak at start of CPB was extracted, as well as all administrations (n=296) and blood draws (n=169). Arterial cannula measurements are summarized in Figure 2. Large variations between cases were observed, some reaching concerning quantities and sizes. A brand effect was noticed but not statistically confirmed.

There was no significant difference between administrations and blood draws, but the difference between these manoeuvres and the initial peak was significant for every variable (p= <0.001).

Conclusions: We quantified clouds of GME with various variables and discovered that GME released at the start of CPB account for more and larger bubbles than those generated during perfusionist manoeuvres.

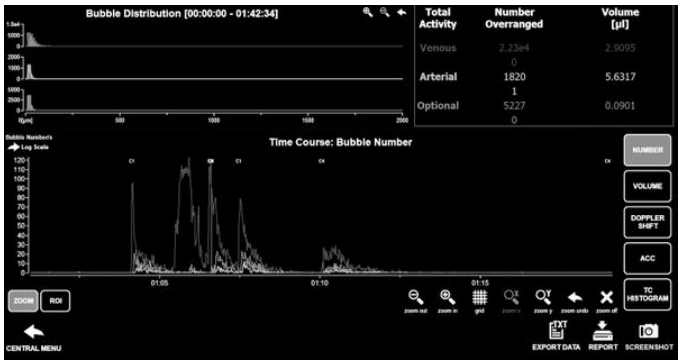

Figure 1: A typical example of a bubble recording with peaks. The light grayline indicates bubbles in the arterial cannula, while dark gray and middle gray are before and after the oxygenator, respecitvely.

Count [40-2000µm[	mean	sd	[Min - Max]
Initial peak	155.98	274.38	[0 - 1300]
Administration	3.47	15.46	[0 - 191]
Blood draw	3.04	6.65	[0 - 54]

Average Diameter µm	mean	sd	[Min - Max]
Initial peak	143.76	108.55	[0 - 419]
Administration	71.81	63.69	[0 - 350]
Blood draw	62.60	47.02	[0 - 320]

Volume nl [40-2000µm[	mean	sd	[Min - Max]
Initial peak	3126.94	5615.43	[0 - 25367]
Administration	2.71	14.82	[0 - 165]
Blood draw	5.98	48.15	[0 - 593]

Median Diameter µm	mean	sd	[Min - Max]
Initial peak	86.89	71.89	[0 - 300]
Administration	63.60	57.90	[0 - 350]
Blood draw	46.57	31.23	[0 - 320]

Overranged (>2000µm)	mean	sd	[Min - Max]
Initial peak	0.21	0.69	[0 - 4]
Administration	0	0	0
Blood draw	0	0	0

Maximal Diameter µm	mean	sd	[Min - Max]
Initial peak	759.11	588.98	[0 - 1950]
Administration	104.21	110.58	[0 - 540]
Blood draw	101.33	40.0	[0 - 980]

Figure 2: Summary of the composition of all analysed bubble count peaks in the arterial cannula, categorized by peak type.

Conflict of interest to declare? No

P47

Minimal extracorporeal circulation system using microplegia in urgent coronary artery bypass grafting

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Introduction: Data analyzing the use of the minimal extracorporeal circulation (MiECC) in the setting of an emergency operation in patients with recent acute myocardial infarction (MI) is limited. To address this major gap in clinical knowledge, we aimed to analyze our experience using the MiECC in patients with recent MI undergoing coronary artery bypass grafting (CABG) surgery.

Methods: We conducted a single center study including patients with recent MI (≤7days) undergoing isolated CABG surgery using MiECC. Primary endpoint was major cardiovascular or cerebrovascular events (MACCE) defined as postoperative stroke, myocardial infarction or death.

Results: From January 2012 until April 2020, 139 patients (mean ± standard deviation (SD) age 66 ± 10 years) underwent CABG surgery using the MiECC in conjunction with microplegia. 55% (n=77) of the patients had an acute MI within 1-7 days preoperatively, whereas 20% (n=28) and 24% (n=34) had an acute preoperative MI within 6-24 hours and <6 hours, respectively. Left internal mammary artery (LIMA) was used as a graft in 97% (n=135) of the operations. Total arterial revascularization was performed in 17% (n=23) and number of distal anastomoses was geometric mean 4 (95% confidence interval 3-4). Inotropic support at the end of the operation was seen in 67 patients (48%). MACCE was seen in 10 patients (7%). In-hospital mortality was 1% (n=2).

Conclusion: The use of MiECC with microplegia in patients with recent MI undergoing CABG surgery is feasible and safe and therefore can be considered to benefit from the advantages of the MiECC even in this vulnerable patient cohort.

Conflict of interest to declare? No

P48

Sex differences in acute coronary syndromes – sign for improvement?

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Introduction: We previously described sex differences in baseline characteristics, interventional therapy and mortality in patients admitted for acute coronary syndromes (ASC) in Swiss hospitals and enrolled in the AMIS Plus registry between 1997 and 2006 (1). This present analysis aimed to reassess whether anything changed over the last 15 years.

Method: All AMIS Plus patients enrolled between 2007 and 2021 were included. Baseline characteristics, therapy and outcome were analysed according to sex and age groups. Multivariate analyses were performed to assess independent predictors of in-hospital mortality.

Results: Among 42,471 patients, 10,825 (25.5%) were women. Women were still older (71.6±12.6y vs. 64.2±12.6y for men), had more comorbidities (Charlson Comorbidity Index>1: 26.5% vs. 21.7%), were less likely to receive drug therapy (e.g., P2Y12 inhibitors 83.3% vs. 89.2% or statins 73.0% vs. 78.5%) and underwent percutaneous coronary intervention (PCI) less frequently (OR 0.77; 95%CI 0.73-0.83). These findings paralleled our observations for the period 1997-2006. However, the increase in PCI use over the years, particularly in women, led to a marked decrease in differences between men and women with respect to revascularization, from 16.6% in 2006 down to 2.0% in 2020. Unadjusted in-hospital mortality was higher in women (OR 1.55; 95%CI 1.41-1.70), but this significance disappeared after adjustment for baseline differences (OR 1.07; (95%CI 0.96-1.20)). However, in women under the age of 50 years, crude mortality,(3.1% versus 1.6%) was significantly higher than in same-aged men; adjusted OR 1.78 (95%CI 0.99-3.20).

Conclusions: Sex differences in the baseline characteristics of ACS patients and the use of evidence-based drugs persisted but the sex gap in PCI access slowly but surely diminished. Female sex per se was not an independent predictor of in-hospital mortality in the overall population but it showed a strong trend among patients younger than 50 years of age.

Heart 2007;93:1369-1375

Conflict of interest to declare? No

POSTER WALK: PREVENTION & REHABILITATION

P49

Prognostic impact of carotid plaque imaging using total plaque area added to SCORE2 in middle-aged subjects. The Arteris Cardiovascular Outcome (ARCO) cohort study

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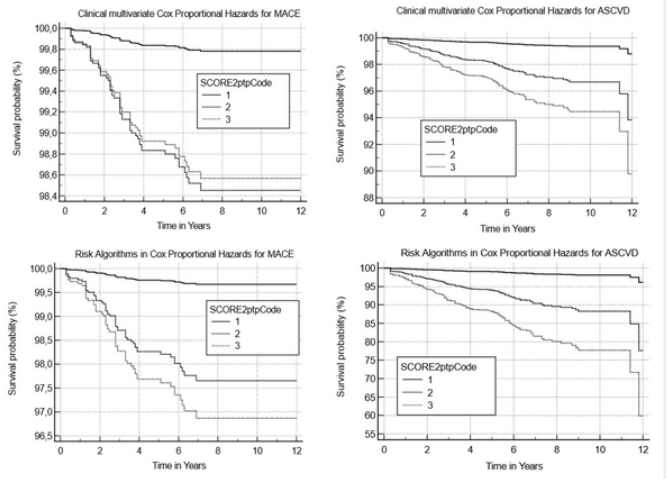
Introduction: A large number of cardiovascular events occur in seemingly healthy individuals. Atherosclerosis imaging can improve the outcome and treatment regime of such subjects.

We aim to assess the predictive value of atherosclerosis imaging beyond cardiovascular risk calculators in subjects aged 40-65 years.

Method: We compared PROCAM, SCORE and SCORE2 with carotid ultrasound (total plaque area, TPA) in subjects without known cardiovascular diseases. Follow-up was obtained by phone or mail.

Figure 4: Display of the Cox proportional Hazards with SCORE2ptp as the categorical variable, stratified for clinical variables and risk tools according to tables 5 and 6.



Results: In 2842 subjects (age 50±8, 38% women) 154 (5.4%) cardiovascular events occurred (ASCVD: 41 myocardial infarctions, 16 strokes or TIA, 21 CABG, 41 PTCA, 35 coronary artery disease defined by invasive angiography) during a mean follow-up time of 5.9 (1-12) years. PROCAM risk was 5±6%, SCORE risk 1.3±1.6% and SCORE2 5±3%. Both for the primary outcome (AMI, STROKE=MACE) and the secondary outcome (adding CABG, CAD and PTCA=ASCVD) hazards increased significantly for TPA 3rd tertile (MACE 6.7, ASCVD 22.5) and for SCORE2ptp Code 3 (MACE 7.7, ASCVD 10.1) after adjustment for risk factors (age, smoke, sex, systolic BP, lipids, medication). Model performance was statistically improved regarding model fit in all models using TPA. Net reclassification improvement (NRI) for SCORE2ptp increased significantly by 32% for MACE (p=0.0001) and 44% for ASCVD (p<0.00001).

Conclusion: TPA posttest risk integrated into SCORE2 added prognostic information to SCORE2 alone, supporting the assessment of ASCVD risk with carotid ultrasound in subjects aged 40-65 years.

Table 5: Cox proportional Hazards model using clinical variables and posttest risk categories of SCORE2 for MACE and ASCVD

	Coefficients and Standard Errors for MACE					
Covariate	b	SE	Wald	P	Exp(b)	95% CI of Exp(b)
cAge	0,05236	0,02137	6,0039	0,0143	1,0538	1,0105 to 1,0988
Sex_Code	-1,6124	0,577	7,8099	0,0052	0,1994	0,0644 to 0,6178
SMOKE_Code	1,4975	0,2837	27,859	<0,0001	4,4704	2,5636 to 7,7954
Fam_Code	0,6265	0,2803	4,9951	0,0254	1,871	1,0801 to 3,2408
BPs	0,03067	0,00754	16,555	<0,0001	1,0311	1,0160 to 1,0465
SCORE2ptpCode=2	1,9659	0,7207	7,4406	0,0064	7,1412	1,7390 to 29,3252
SCORE2ptpCode=3	2,0354	0,6282	10,497	0,0012	7,6554	2,2347 to 26,2253

Excluded: CHOL, HDL, LDL, TG

	Coefficients and Standard Errors for ASCVD					
Covariate	b	SE	Wald	P	Exp(b)	95% CI of Exp(b)
cAge	0,06947	0,01394	24,844	<0,0001	1,0719	1,0431 to 1,1016
Sex_Code	-1,332	0,3237	16,938	<0,0001	0,2639	0,1400 to 0,4977
SMOKE_Code	1,071	0,1712	39,126	<0,0001	2,9182	2,0863 to 4,0819
Fam_Code	0,6247	0,1718	13,219	0,0003	1,8678	1,3337 to 2,6157
LDL	0,165	0,07513	4,8235	0,0281	1,1794	1,0179 to 1,3665
SCORE2ptpCode=2	1,6346	0,4412	13,728	0,0002	5,1276	2,1596 to 12,1746
SCORE2ptpCode=3	2,3154	0,3892	35,399	<0,0001	10,129	4,7239 to 21,7187

Excluded: BP, CHOL, HDL, TG

Conflict of interest to declare? No

P50

Differential associations of emotional and physical domains of the MacNew Heart with changes in 6-minute walking test

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Introduction: Cardiac rehabilitation (CR), a key component of secondary prevention in cardiac patients, contributes fundamentally to improved cardiovascular health outcomes. Health-related quality of life (HRQOL) serves as a multidimensional and widely employed outcome measure of therapeutic interventions in CR, yet, its predictive properties on exercise capacity change during CR are poorly understood. Aim of this study was to examine the association between baseline HRQOL and its individual domains on improvement of exercise capacity during CR.

Methods: Study participants were 13,717 inpatients of six Swiss CR clinics from 2012 to 2018. We measured HRQOL at admission to CR with the MacNew Heart questionnaire and exercise capacity at admission and discharge using the six-minutes walking test (6MWT). Following factorial analyses, we performed univariate and multivariate analyses to test the predictive properties of baseline global HRQOL and its domains for improvement in exercise capacity, adjusting for demographic and clinical characteristics.

Results: Mean improvement in 6MWT was 114 meters (*SD* = 90), achieved after 17.4 days (*SD* = 5.5). Lower emotional HRQOL (*b* = 7.85, *p*= < .001) and higher physical HRQOL (*b* = -5.23, *p* < .001) were associated with less improvement in the 6MWT. Global MNH and social HRQOL showed no association with exercise capacity improvement.

Conclusion: Patients entering CR with low emotional and high physical HRQOL are at risk for a lower gain in exercise capacity during CR. Global MNH alone does not provide a reliable assessment of HRQOL; thus a focus on specific domains of HRQOL is needed.

Conflict of interest to declare? No

P51

Introduction of patient-reported outcome measures in a cardiac surgery center

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Introduction: Patient-reported outcome measures (PROMs) using standardized questionnaires have gained increasing popularity within the last years. The non-profit International Consortium for Health Outcomes Measurement (ICHOM) published a standard set of outcome measures for patients with Coronary Artery Disease (CAD) including PROMs such as angina, dyspnea, depression, functional status and health-related quality of life. Although PROMs have important clinical implications for value-based healthcare, data is limited. The aim of this study was to report the experience and first results when introducing PROMs in a Department of Cardiac Surgery.

Methods: Routine PROMs after cardiac surgery were initiated in 2018 as part of a hospital wide quality program. All patients undergoing coronary artery bypass grafting (CABG) surgery were asked to participate. Standardized PROM acquisition was performed digitally using the tool heartbeat ONE (Heartbeat Medical Solutions GmbH, Berlin). Questionnaires (PHQ-2 Patient Health Questionnaire, Rose-Dyspnoe Scale, SAQ-7 Seattle Angina Questionnaire) were either administered via iPad (in-hospital) or via a web-based tool (from home) preoperatively, 30 days postoperatively and after 360-720 days postoperatively (midterm).

Results: 70 patients (median [Interquartile range, IQR] age 67 (60 to 75) years, 14% female) between April 2018 and August 2019 had a complete follow-up preoperatively, 30 days postoperatively and at midterm. 91% (n=64) underwent an isolated CABG surgery and 9% (n=6) concomitant procedures. Median (IQR) length of stay on the intensive care unit and hospital stay were 1.0 (1.0 to 2.0) and 8.0 (7.0 to 9.0) days, respectively. Compared to the situation preoperatively, after a median (IQR) midterm follow-up of 637 (371 to 732) days, most of the outcome measures showed a beneficial development, e.g. postoperatively, 69% of the patients would be mostly or completely satisfied, if they would have to live with this complaints (pain/angina) for the rest of their lives compared to 27% preoperatively.

Conclusion: Introduction of PROMs in a Cardiac Surgery Center is associated with logistical expense. However, this data helps to evaluate the therapy's impact on patient reported outcomes; a parameter, which so far, is underrepresented in current outcome research. Being of substantial value for the Department of Cardiac Surgery and the strategic development of the entire hospital, we will continue gathering these data.

Conflict of interest to declare? No

P52

Evolocumab use in clinical practice in Switzerland: final data of the Heymans study

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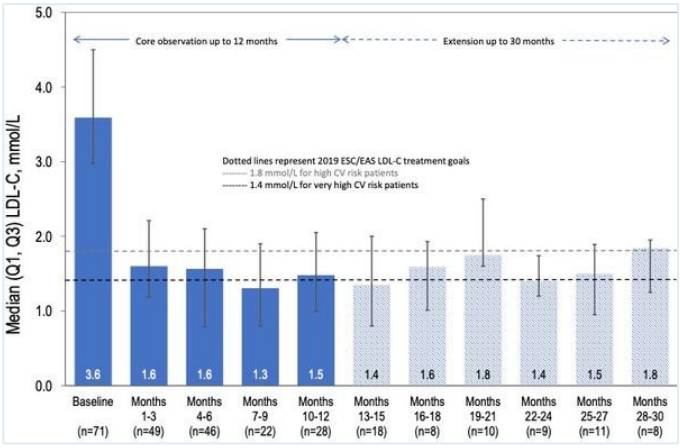
Introduction: Elevated low-density lipoprotein cholesterol (LDL-C) is a major risk factor for cardiovascular (CV) disease. Lowering LDL-C according to guideline recommendations reduces CV risk. Guidelines of the Swiss Atherosclerosis Association (AGLA) and the European Society of Cardiology (ESC)/European Atherosclerosis Society (EAS) recommend a ≥50% LDL-C reduction from baseline and LDL-C <1.8 mmol/L or <1.4 mmol/L in high-risk or very high-risk patients, respectively. Guidelines recommend proprotein convertase subtilisin/kexin type 9 inhibitors (PCSK9i) if LDL-C goals are not achieved at maximally tolerated statin doses ± ezetimibe.

Method: As part of the European HEYMANS observational cohort study, patients from Switzerland were followed prospectively from evolocumab initiation (baseline) as per Swiss reimbursement criteria (http://www.spezialitätenliste.ch). Demographic/clinical characteristics, lipid-lowering therapy (LLT) and lipid values were collected from medical records (6 months before evolocumab and 12 months [core period] and 30 months [extension] post-initiation). Due to the non-interventional study design, no additional visits/measurements were mandated, reflected in the infrequent LDL-C measurements especially in the extension. The final analysis is presented.

Results: Seventy-five patients were analyzed. At baseline, mean (SD) age was 59.3 (10.6) years; 70 (93%) were in secondary prevention, 64 (85%) reported intolerance to any statin, 25 (33%) had diagnosed familial hypercholesterolemia. Sixty-eight and 34 completed the core period and the extension, respectively; 58/68 (85%) and 26/34 (76%) were receiving evolocumab at 12 and 30 months, respectively.

At baseline, 35 (47%) received statin±ezetimibe-based LLT and the median (Q1, Q3) LDL-C was 3.6 (3.0, 4.5) mmol/L. Within 3 months of evolocumab initiation, LDL-C levels decreased by 54% to 1.6 mmol/L. This was maintained over time (Figure 1). Forty-two patients (61%) achieved LDL-C <1.4 mmol/L at least once during observation.

Conclusion: In Switzerland, evolocumab use was associated with a substantial LDL-C reduction by >50%, which was sustained over time. Over 60% of patients achieved their recommended LDL-C goals.



Conflict of interest: IS reports grants from Amgen, during the conduct of the study; grants and personal fees from Amgen, AstraZeneca, Daiichi Sankyo, Medtronic, MSD, Recordati, Sanofi and Servier, outside the submitted work; IB, MS, AA, and ND are employees of and hold stock in Amgen; FM and SK declare no conflict of interest.

POSTER WALK: CLINICAL CASE REPORTS

P54

Recurrent pneumonia post atrial fibrillation ablation

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Introduction: Atrial fibrillation (AF) ablation is the most common cause of acquired pulmonary vein stenosis (PVS). Symptoms are not specific, including dyspnea, cough, fatigue, chest pain, hemoptysis, and recurrent pulmonary infection. Therefore, the diagnosis and treatment are often delayed.

Case summary: A 50-year-old man who underwent radiofrequency catheter ablation of AF five months ago presented chest pain, hemoptysis, cough, shortness of breath leading to several medical consultations and thoracic imaging. Chest CTs showed ground-glass opacities of the left inferior lobe, which developed into heterogeneous condensation. He was treated as a recurrent and resistant pneumonia during several weeks. Facing persistent pulmonary symptoms, he was finally referred to our institution. After reviewing the first injected chest CTs, severe stenosis of left inferior pulmonary vein was suspected (**figure-1a**) and confirmed by a late-time injected CT scan (**figure-1b**). He was treated by stenting of the left inferior pulmonary vein with a vascular bare metal stent (OTW OMNI ELITE 8.0x19mm). The intervention was guided by fluoroscopy and transesophageal echocardiography under general anesthesia (**figure-2**). A dual antiplatelet therapy with aspirin and clopidogrel was introduced for 3 months followed by long-term aspirin monotherapy. The treatment resulted in immediate relief of symptoms and a near complete resolution of pulmonary opacities on chest CT after 4 months.

Discussion: The presentation of PVS is variable and can be asymptomatic. The associated symptoms are not specific, and they usually appear after a mean of 4.0±3.0 months post ablation procedure. The treatment consists of angioplasty of the pulmonary vein and can provide a significant symptomatic improvement. However, there is a 46% risk of restenosis at 32 months requiring a continuing follow-up.

Conclusion: This case highlights that the diagnosis of PVS is often delayed or missed. It should be considered when a patient presents with suggestive symptoms post AF ablation.

Conflict of interest to declare? No

Figure-1:

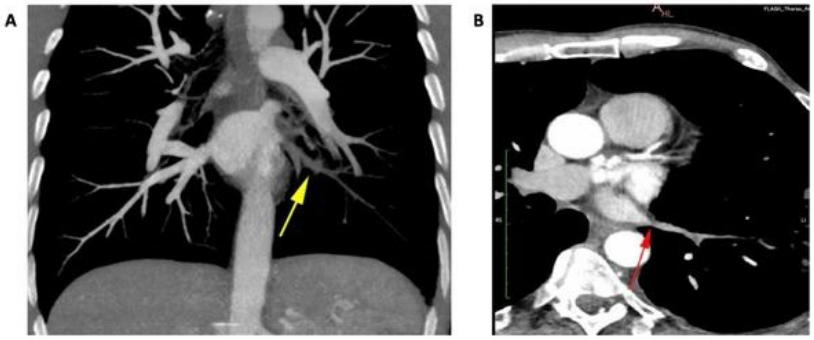
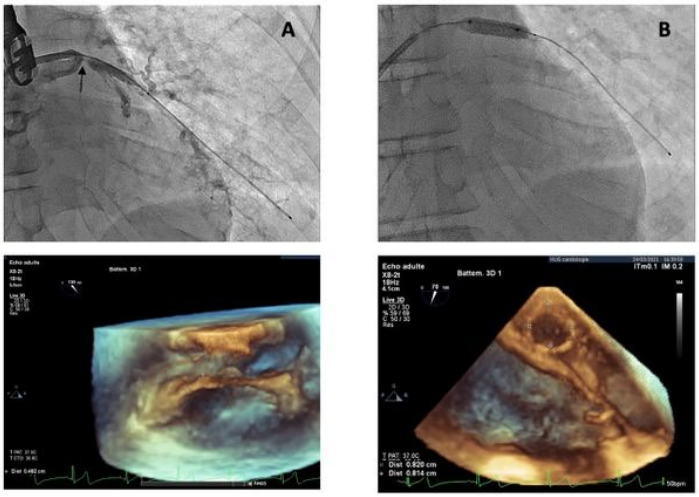


Figure-2:



A: Severe stenosis of left inferior pulmonary vein (LIPV) in fluoroscopy (upper image) and transesophageal echocardiography (lower image): left inferior pulmonary vein systolo-diastolic flow mean gradient 4.3 mmHg and max gradient 10 mmHg
B: Stenting (OTW OMNI ELITE 8.0 x 19mm) of LIPV in fluoroscopy (upper image) and transesophageal echocardiography (lower image): left inferior pulmonary vein systolo-diastolic flow mean gradient 2 mmHg and max gradient 7 mmHg

P55

Arrhythmic storm by intoxication with common yew: a case report

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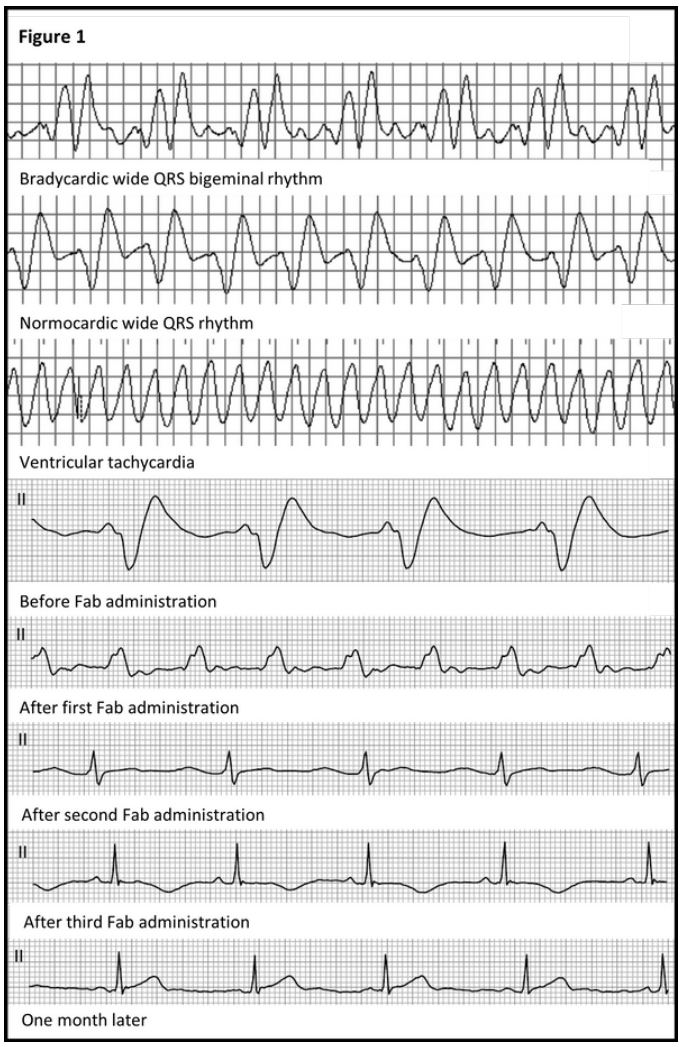
Introduction: Taxus baccata (common yew) is a widespread ornamental shrub in Europe known for its toxic effect through taxine alkaloids, especially taxine B, a cardiotoxic substance with negative inotropic and dromotropic effect through calcium and sodium channel antagonist effect. We report the case of a 15 year-old female who, as suicide attempt, ingested yew's foliage.

Case report: At arrival of ambulance (Figure 1), she had bradycardic wide QRS bigeminal rhythm with pulse. She confessed the yew's ingestion of unknown quantity. A few minutes later, she became unconscious with ventricular tachycardia then fibrillation and was treated with 4 synchronized cardioversion (100J/200J/200J/200J) and amiodarone 150mcg i.v. After intubation, she developed 4 pulseless electrical activity episodes with chest compressions and adrenaline i.v. bolus and return of spontaneous circulation. In emergency room, a severe lactic acidosis (pH 7.03, pCO2 46.9mmHg, lactatemia 11.9mmol/L) was documented. In the absence of a specific antidote and considering a toxic-induced arrhythmic storm with unstable hemodynamics and depressed systolic ventricular function, peripheral venoarterial ECMO was initiated. Activated charcoal was administered. Despite its relative ineffectiveness to eliminate taxine B due to its low water solubility and high molecular weight, hemofiltration was used to wash out other possible toxics. The yew intoxication was confirmed by detection of 3,5-dimethoxyphenol (metabolite) in urine. Toxic-screening was otherwise negative.

As mentioned in a few case reports, despite unknown exact mechanism, digoxin-specific antibody fragments (Fab) were administrated 3 times with concomitant decrease of conduction disturbance observed on electrocardiogram within 24 hours. The evolution was then positive permitting weaning from ECMO after 74 hours without any somatic residual lesions. The complete normalization of conduction disturbance and repolarization were documented on electrocardiogram at 1 month.

Conclusion: ECMO is an obvious life-saving therapy in arrhythmic storm. Digoxin-specific antibody fragments should be considered and started as soon as possible in Taxus baccata intoxication.



Conflict of interest to declare? No

P56

Q (query) fever endocarditis - when you hear hoofbeats don't forget the zebra

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Introduction: Q fever is a zoonotic bacterial disease caused by Coxiella burnetii. In Switzerland, 40-60 cases are reported every year. Diagnosing Q fever endocarditis remains challenging.

Methods/results: We report the case of a 24 year old patient who underwent mechanical aortic and mitral valve replacement at the age of 15 years for post rheumatic heart disease and bicuspid aortic valve stenosis. Early echocardiography follow-up revealed mild to moderate dysfunction of the aortic and a patient prosthesis mismatch of the mitral valve prosthesis.

Over the past 3 years, the patient has suffered from recurrent episodes of epistaxis developing chronic iron deficiency anemia. Between 2020-2021, he presented with 3 major episodes of acute hemorrhagic pulmonary edema, one of which required veno-venous extracorporeal membrane oxygenation (figure 1). These episodes were repeatedly triggered by flue-like respiratory symptoms and chronic anemia resulting in severe functional mechanical mitral valve stenosis (figure 2). On repeat transthoracic and transesophageal echocardiography, neither valvular thrombosis nor vegetations were seen. Several blood cultures revealed no bacterial growth. The recent environmental and travel history was unremarkable.

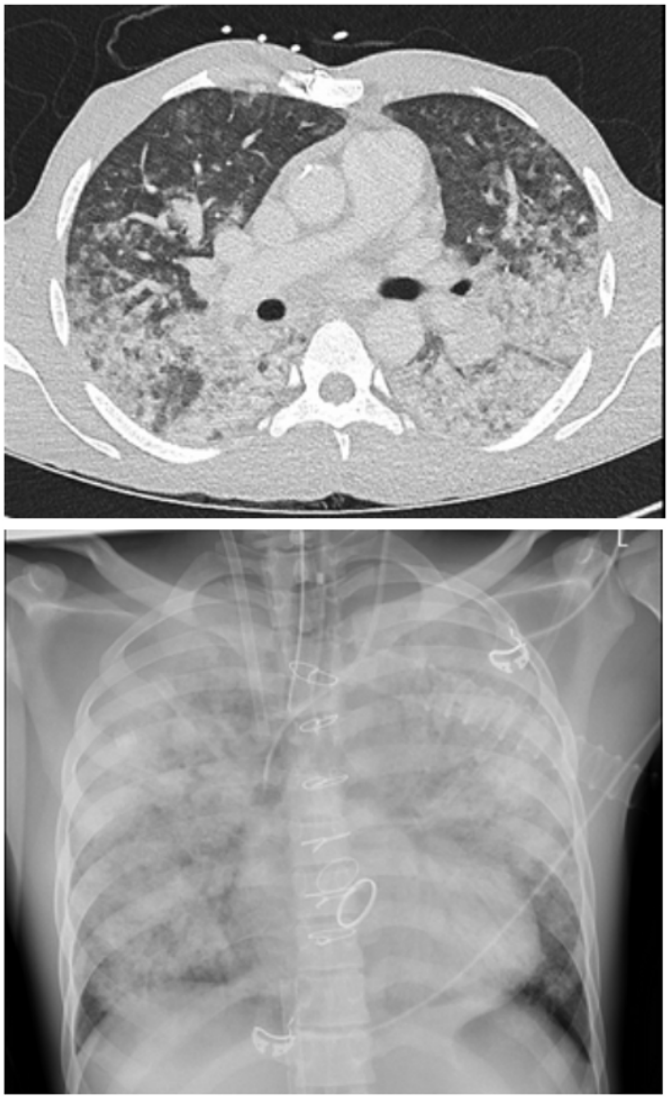

Figure 1. CT and Chest-X ray with bilateral diffuse alveolar opacification.

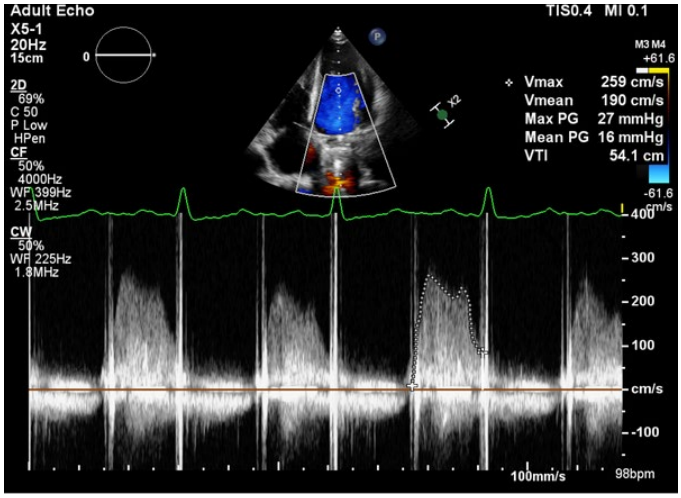

Figure 2. Transthoracic echocardiography: CW-Doppler of transmitral inflow revealing severe functional mechanical mitral valve stenosis (dpmean 16mmHg; HR 98bpm; Hemoglobin 63g/l)

Anemia persisted despite aggressive intravenous iron supplementation and transfusions. After his most recent episode with fever and hemoptysis, screening for blood culture negative endocarditis unexpectedly revealed high titers of C. burnetii IgG and IgM antibodies. Diagnosis of Q-Fever endocarditis was confirmed with subsequent FDG-PET-CT scan. On oral treatment with hydroxychloroquin and doxycycline the clinical course has remained uneventful so far.

Conclusion: In the past 10 years, 5 cases of Q-fever endocarditis were diagnosed in our clinic (table 1). Most of them did not report suspicious environmental exposure and diagnostic delay was often substantial. This case highlights that clinically fulminant, atypical sequelae may mask underlying causes. Sharing a history of specific rare disease can be a valuable resource for future colleagues and helps recognizing the medical "zebras".

Conflict of interest to declare? No

Table 1. Case characteristics of previous Q-fever endocarditis

Patient	Diagnosis / Infected valve (Q - Fever)	Presentation	Vegetations (y/n)	Symptom onset to diagnosis (months)	Clinical course
1 (52 yo ♂)	Repaired Tetralogy of Fallot / Bioprosthetic pulmonary valve endocarditis	Fever, B-symptoms, cough	y	3	24 mnt. oral antibiotic treatment, uneventful clinical course, complete resolution of vegetations, no valvular destruction
2 (22 yo ♂)	D-TGA, Rastelli / RV-PA Contegra-graft endocarditis	Fever, B-symptoms	y	4	24 mnt. oral antibiotic treatment, valvular destruction, percutaneous pulmonary valve replacement 10y post endocarditis
3 (46 yo ♀)	Postrheumatic mitral valve disease / Mechanical mitral valve endocarditis)	Fever	(y)	2	22 mnt. oral antibiotic treatment, uneventful clinical course, no valvular dysfunction
4 (39 yo ♂)	Bicuspid aortic valve / Native aortic valve endocarditis	Fever	y	1	14 mnt. oral antibiotic treatment, uneventful clinical course, no valvular destruction
5 (24 yo ♂)	Postrheumatic mitral valve disease, bicuspid aortic valve / Mechanical mitral valve endocarditis	Fever, hemoptysis	n	13	Ongoing, good clinical response to oral antibiotic treatment

P57

Young woman with type A aortic dissection – a long journey through unexpected complications

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Introduction: Although early survival after type A aortic dissection has improved thanks to advances in cardiovascular surgical techniques, long-term mortality and morbidity remain high. A thorough follow-up and early detection of vascular complications are crucial for improving patient prognosis.

Results: A 43 year old woman presented with acute type A aortic dissection and underwent emergency aortic arch replacement, reinsertion of the supra-aortic vessels with a multi-branched 26mm Dacron graft and resuspension of her newly diagnosed bicuspid aortic valve. She survived with satisfying surgical outcome, but early post-operative course was complicated by a stroke with transient deficits. Patient history revealed arterial hypertension and a positive family history for aortic aneurysms. After discharge, she recovered completely and underwent close follow-up with serial multimodal imaging.

A CT scan after 10 months showed a large (25mm) pseudoaneurysm of the proximal graft anastomosis (fig.1). She underwent straightforward Bentall procedure. Early imaging unexpectedly revealed a new, non-ischemic inferolateral left ventricular pseudoaneurysm (LVP, fig.2). Due to progressive enlargement within one month and considering the high morbidity of a third sternotomy, percutaneous closure with 16 Balt pushable coils was attempted, aiming complete LVP obliteration. Despite promising CT scan results after one month, LVP bulged cranially, showing increasing dimensions (19mm) one year post coiling. Hence, surgical LVP patch-closure was performed. Unfortunately, she suffered an intra-procedural stroke with hemiparesis and motor aphasia. Surgically, she recovered properly and was discharged in a rehabilitation clinic. Hemiparesis and aphasia have significantly improved.

Results of aortopathy genetic testing are pending.

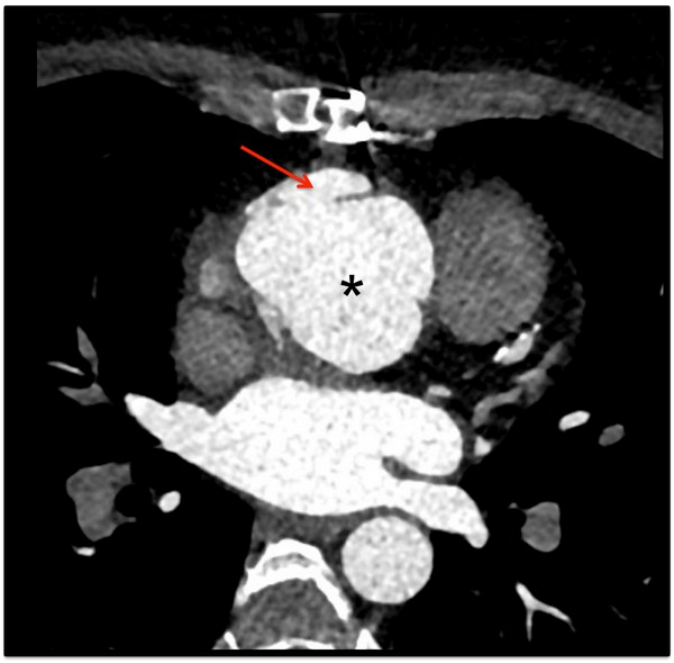

Figure 1. CT scan: Pseudoaneurysm of the proximal graft anastomosis (arrow); native aortic root (*).

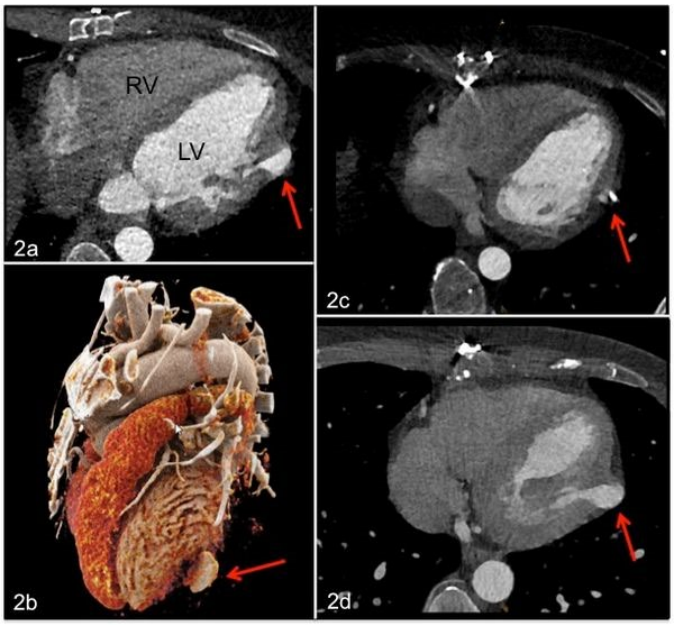

Figure 2. CT scan: 2a/b. Left ventricular pseudoaneurysm (LVP; arrow) after Bentall procedure with 3D-reconstruction; 2c. LVP obliteration one month after coiling; 2d. LVP recurrence with cranial bulging after one year.

Conclusion: Aortic pseudoaneurysms and further potentially life-threatening mechanical complications are frequent after type A aortic dissection surgery. Routine follow-up with multimodal imaging in dedicated centers is appropriate for early detection. Treatment is generally complex and should be defined by a multidisciplinary team.

Conflict of interest to declare? No

P58

Successful combined treatment of a pulmonary artery angiosarcoma: a case report

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Introduction: Pulmonary artery angiosarcoma is a rare malignant vascular tumor, commonly misdiagnosed as pulmonary embolism with a dismal prognosis. We present a case of a patient treated with a multimodal therapy

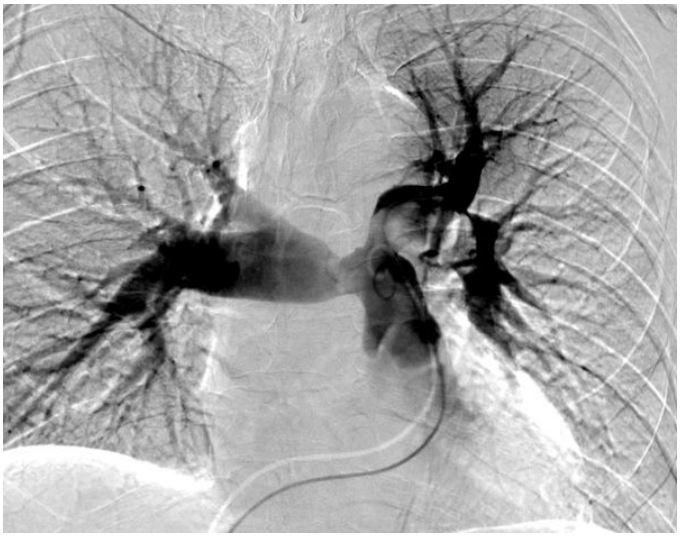
Case report: A 73-year-old patient admitted to the hospital for evaluation of a persistant fever evolving for three months. A total body CT scan, colonoscopy and oesogastroduodenoscopy performed earlier did not show any neoplastic lesion. Anticoagulation started for a period of 3 months for pulmonary embolism involving the inferior lobar arteries of the left lower lobe.

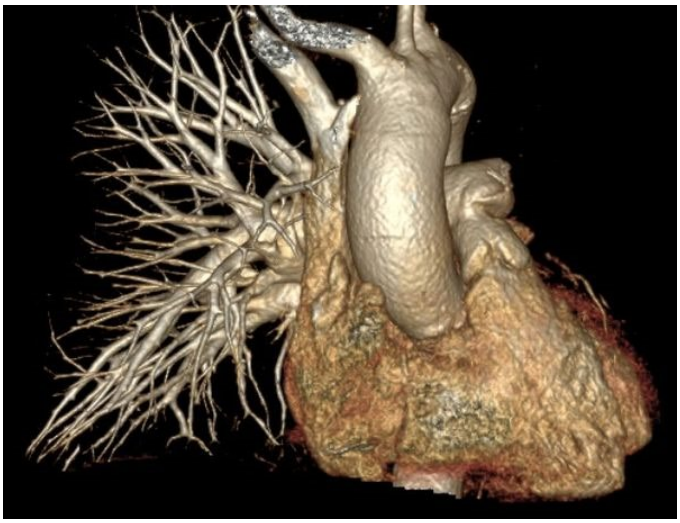
The laboratory workup showed an increase in CRP to 118mg/l and a sedimentation rate of 83mm/h. 18F-FDG PET-CT revealed a metabolically active mass in the pulmonary trunk extending mainly to the left pulmonary artery. Endobronchial ultrasound (EBUS) with biopsy showed a sarcomatoid tumeur obstructing the left pulmonary artery. A dilatation of the pulmonary artery trunk with significant pulmonary insufficiency and pulmonary hypertension found on echocardiography.

On arrested heart, the patient underwent a left pneumonectomy, excision of the pulmonary artery trunk and partial excision of the right pulmonary artery (RPA). Reconstruction performed using a 27-mm pericardial conduit. A termino-terminal suture at the level of the RPA and a latero-terminal anastomosis between the conduit and the pulmonary artery trunk 1 cm above the pulmonary valve performed. The other distal end of the conduit stapled.

The anatomopathology showed a high grade undifferentiated angiosarcoma with no clear margins at the level of the anastomosis. The patient benefited radiotherapy and chemotherapy. The follow-up CT scan at one year showed no evidence of local or distant recurrence of the angiosarcoma.

Conclusion: Radical surgery with wide resection margins is the treatment of choice for patients with localized disease. At the advanced stage, surgery is palliative. Adjuvant chemotherapy, radiotherapy or both could increase life expectancy and quality of life.





Conflict of interest to declare? No

P59

Minimal-invasive mitral valve repair after breast augmentation: a case report

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Introduction: Performed via right anterior mini-thoracotomy, minimal-invasive mitral valve surgery (MIMVS) has gained in popularity to become the preferred approach for isolated mitral valve procedures in numerous centers in recent years. Breast implants represent a technical challenge for right anterior mini-thoracotomy and have been considered a relative contraindication for MIMVS. However, the literature is scarce describing this particular clinical scenario and strong evidence-based recommendations are lacking.

Methods: We report the case of a 55-year-old female patient addressed with severe mitral regurgitation due to a posterior flail leaflet. Medical history was relevant for subpectoral breast augmentation. We describe our minimal-invasive approach of mitral valve repair through a right inframammary incision with perioperative preservation of the breast implant *in situ* (Figure 1)

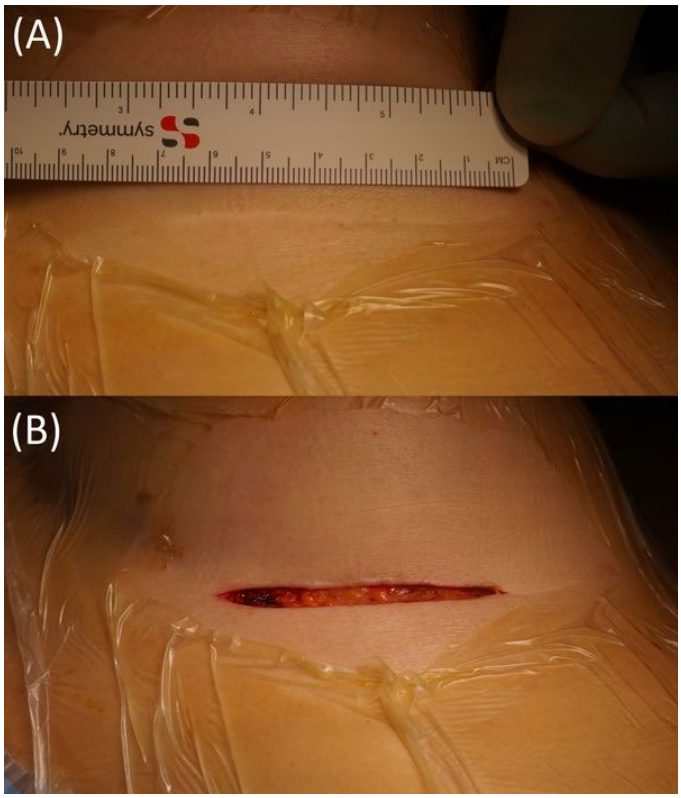

Figure 1: A: Inframmary scar from the breast augmentation. **B:** surgical incision

Results: The operative and postoperative courses were uneventful. Echocardiography before discharge showed a mild residual mitral regurgitation. After two months, the clinical examination revealed no local complications and satisfying cosmetic results.

Conclusion: Both minimal invasive surgery and breast augmentation are increasing. This case illustrates the feasibility of MIMVS after breast augmentation. We advocate the perioperative preservation of the breast implant *in situ* to minimize the risk of damage and secondary migration of the prosthesis. The involvement of a plastic surgeon in the preoperative work-up is warranted.

Conflict of interest to declare? No

P60

Pericardial Skirt reinforcing Sapien 3 to reduce paravalvular leak when addressing mitral disease in the context of severe mitral annular calcification (MAC)

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Background: Mitral annular calcification (MAC) represents a heavy challenge for heart surgeons during mitral valve (MV) surgery, with increased perioperative risk.

Case presentation: We describe a series of cases with MAC (n=5), which is well represented by an elderly high-risk female patient with severe kidney disease, who presented with symptoms and signs of heart failure (STS Score 7.7%). Echocardiogram showed severe mitral stenosis and regurgitation with severe circular calcification of the mitral annulus. Given the high-risk profile and unavailability of suitable percutaneous therapeutic options, it was decided to perform mitral valve replacement with a Sapien 3 Ultra TAVI bioprosthesis, implanted under direct exposure in mitral position. The case describes the technical details adopted in these selected patients since 2019 at our Institution. In detail, to reinforce and prevent the SAPIEN in MAC implant from paravalvular leakages, it was decided to sew a perikardial skirt around the TAVI prosthesis, fixing it to the annulus and perivalvular atrial surface. This novel technique lead us to abolish any kind of leakage between the prosthesis and the rigid calcium surface, mantaining mean gradients of the TAVI prosthesis around 3 mmHg. Clamping times were 47± 7 mins. We did not documented intra- and post-operative leakages of patients. This surgical option in these high-risk surgical patients does not need predilatation and provides an effective solution.

Conclusion: Direct open surgical implantation of Sapien 3 valve can be implanted safely in patients with severe MAC, sewing a perikardial skirt around the TAVI prosthesis, fixing it to the annulus and perivalvular atrial surface, without need of predilation. Perioperative and acute post-operative results are very satisfactory.

Conflict of interest to declare? No

POSTER WALK: CONGENITAL AND PEDIATRIC CARDIOLOGY

P62

Lymphopenia and immunoglobulin deficiency in adult patients with a Fontan circulation

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Introduction: Patients with a functionally univentricular heart and a Fontan palliation are prone to a wide range of extra-cardiac complications. Lymphopenia and immunoglobulin deficiency are insufficiently characterized in this population. The aim of this study was to analyze prevalence and associations of lymphopenia and immunoglobulin deficiency in a cohort of Fontan patients.

Method: Ninety-five consecutive patients with a Fontan circulation that were seen at our institution between 2011 and 2021 were screened. Laboratory results and clinical characteristics were extracted from the patient's charts.

Results: Fifty-five patients (47% male) underwent evaluation of lymphocyte and / or immunoglobulin subpopulations at a mean age of 28.9 ± 9.7 years. Baseline characteristics are depicted in ***Table 1***. Seven patients (7 / 55, 12.7%) had immunoglobulin G (IgG) levels below the lower limit of normal (i.e. < 7.0 g/l). Patients with IgG deficiency had a higher prevalence of protein-losing enteropathy (43% versus 4%, p = 0.001). Fifteen patients (15 / 52, 28.8%) had lymphocyte counts below the lower limit of normal (i.e. < 850/µl). Lymphocyte counts and lymphocyte subpopulations were comparable in groups with and without protein-losing enteropathy. There was a moderately positive correlation between absolute lymphocyte counts and IgG levels (r = 0.301, p = 0.032). In a subgroup of 24 patients that underwent liver biopsy, there was no difference in terms of absolute lymphocyte counts and immunoglobulin subpopulations in patients with a low (i.e. 1-2) and high (i.e. 3-4) congestive hepatic fibrosis score.

Table 1: Demographics and clinical characteristics (N = 55)

Age (years), mean ± SD	28.9 ± 9.7
Gender (male), n (%)	26 (47.3)
Age at Fontan completion (years), mean ± SD	5.9 ± 4.5
Type of Fontan, n (%)	
Atrio-pulmonary Fontan	13 (23.6)
Total cavo-pulmonary connection	34 (61.8)
Other	6 (10.9)
Anatomy, n (%)	
Tricuspid atresia	11 (20)
Double-inlet left ventricle	18 (32.7)
Hypoplastic left heart syndrome	9 (16.4)
Other	17 (30.9)
Protein-losing enteropathy, n (%)	5 (9.1)
Fontan pressure (mmHg), mean ± SD (N = 24)	13.8 ± 4.9
Congestive hepatic fibrosis score*, n (%) (N = 24)	
1-2	9 (37.5)
3-4	15 (62.5)
Lymphopenia (<850/ µl), n (%) (N = 52)	15 (28.8)
Immunoglobulin G deficiency (<7.0 g/l), n (%)	7 (12.7)
Albumin (g/l), mean ± SD	44.3 ± 7.2
*Congestive hepatic fibrosis score: 0 = No fibrosis; 1 = Central zone fibrosis; 2 = Portal fibrosis; 3 = Bridging fibrosis; 4 = Zirrhosis	

Conclusion: IgG deficiency is present in 13% of patients with a Fontan circulation and seems to be associated with the presence of protein-losing enteropathy. Lymphopenia is more common and occurs in a quarter of all patients with a Fontan circulation; however, its etiology is likely more complex and multifactorial.

Conflict of interest to declare? No

P63

Percutaneous patent foramen ovale closure: comparison of the Figulla Flex-II and Amplatzer occluder

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Introduction: Percutaneous closure of a patent foramen ovale (PFO) in the prevention of recurrent paradoxical thromboembolic events has been shown to be safe and effective in randomized controlled trials. However, it remains uncertain if differences in the structure and design of the occluder-devices might have impact on outcomes. The aim of this study was to compare results of percutaneous PFO closure using two widely used self-expanding double-disc occluders.

Methods: Between February 2017 and June 2021 consecutive patients who underwent percutaneous PFO closure at the Heart Center Lucerne with the Figulla Flex-II™ and the Amplatzer devices were included in this prospective registry. The primary endpoint was the incidence of a residual shunt assessed by contrast-echocardiogram at six-months follow-up. Secondary endpoints included procedural safety/efficacy and major adverse cardiovascular events during hospital-stay and six-months follow-up.

Results: 131 consecutive patients [age 51.5±12.2 years, 58 (44%) women, and RoPE score 7 (IQR 5-7)] underwent percutaneous PFO closure with the Figulla Flex-II [n=59 (45%)] or Amplatzer [n=72 (55%)] device. Indications for closure were crypotogenic stroke in 119 (90.8%), peripheral embolism in 8 (6.1%), hemodynamically relevant shunt in 1 (0.8%), prophylactic in 3 (2.3%) patients. At baseline right-to-left shunt ≥ grade 2 was present in 128 (97.7%) patients. An atrial-septal-aneurysm was found in 47 (35.8%) patients. Immediate procedural success was 98.5% (Table 1). No procedural complications were encountered. In 2 patients a small PFO could not be crossed, and the procedure had to be aborted.

At six-months echocardiographic follow-up a residual shunt grade ≥2 was observed in 8 (6.1%) patients (Figulla Flex-II: 8% vs. Amplatzer: 4%, *p*=0.43, Figure 1). Rate of atrial fibrillation and recurrent thromboembolic events were similar for both devices: 3.8% and 2.3% (*p* = 1.0 and *p* = 1).

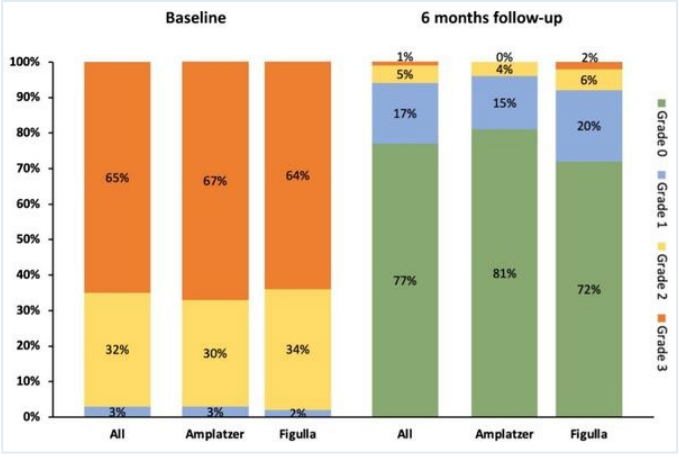

Figure 1. Echocardiographic assessment of right-to-left shunt at baseline and six-month follow-up.

Table 1. Procedural data and periprocedural complications					
		All n=131	Figulla-II n=59	Amplatzer n=72	*p*-value
Device size					
Figulla	16/18 mm	-	11 (18.6)	-	-
	23/25 mm	-	47 (79.7)	-	-
	27/30 mm	-	1 (1.7)	-	-
	31/35 mm	-	0	-	-
Amplatzer	18/18 mm	-	-	9 (12.5)	-
	18/25 mm	-	-	60 (83.2)	-
	30/30 mm	-	-	-	-
	25/35 mm	-	-	3 (4.2)	-
Procedural success		129 (98.5)	58 (98.3)	71 (98.6)	0.70
Device embolization		0	0	0	-
Major Vascular complications		0	0	0	-
Major bleeding		0	0	0	-
Data are displayed as n (%), mean ± SD.					

Conclusions: PFO closure with the self-expanding Figulla Flex-II and Amplatzer double-disc occluder is safe and effective.

Conflict of interest: ST is a consultant and/or proctor for Biosensors, Boston Scientific, Abbott, Medtronic, Carag and Medira, has received institutional research grants from Boston Scientific and Fumedica and holds equity in Hi-D Imaging. MW is proctor for Biosensors. MB has received consulting and travel fees from Abbott Vascular and SIS Medical. The other authors have no conflicts of interest to declare.

P64

T1 mapping parameters in bicuspid aortic valve disease: evolution during follow-up and their relation to degree of stenosis, regurgitation and arrhythmias

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Introduction: Interstitial fibrosis due to valvular heart diseases like bicuspid aortic valve (BAV) is discussed as a potential substrate for the development of arrhythmias. Cardiac magnetic resonance (CMR) is able to evaluate the degree of the interstitial fibrosis with the help of T1 mapping and calculation of the extracellular volume (ECV). This study investigate the evolution of T1 mapping parameters over time and their relation to the severity of the underlying valvulopathy and arrhythmias.

Methods: BAV patients with stable clinical situation, who underwent at least one CMR exam, were included. On a 1.5T scanner, an ECG-triggered modified Look-Locker inversion recovery (MOLLI) sequence (using the scheme 3(3)3(3)5) was acquired on a single short-axis basal slice covering the left ventricle (LV). Native myocardial T1 relaxation time (T1) and ECV were calculated for six LV segments as well as mean values for the whole LV (Figure 1).

Results: 75 patients (age 40±18years) were included of whom 29 underwent two CMR exams. Mean time between CMR exams was 21±12 months. All LV segments could be analyzed. Nine patients presented arrhythmias and 3 of them non-sustained ventricular tachycardia. Severe aortic regurgitation and stenosis were present in 11 and 8 patients, respectively. ECV but not native T1 values significantly increased between first and second CMR (table). Nine and 14 patients presented elevated native T1 values (>1040ms) and ECV (>28%), respectively. There was no relation of native T1 values nor of ECV to LV enddiastolic volume or ejection fraction (p>0.05). ECV was related to aortic regurgitant fraction (r=0.476, p=0.02) and to the mean aortic gradient (r=0.628, p<0.001, Figure 2). Native T1 values and ECV did not differ between patients with and without supra- or ventricular arrhythmias (p>0.05).

Conclusions: ECV increases over a short to median follow-up in BAV patients and appears to be related to the degree of valvular regurgitation and stenosis. These findings suggest the development of an interstitial fibrosis, which is, however, not associated to supra- or ventricular arrythmias. A longer follow-up in a larger population would be interesting to more precisely depict the evolution of T1 mapping parameters and there influence on arrhythmias.

	First CMR	Second CMR	p
Mean native T1	999 ± 32	1016 ± 50	0.824
Mean ECV	0.23 ± 0.03	0.25 ± 0.03	<0.001

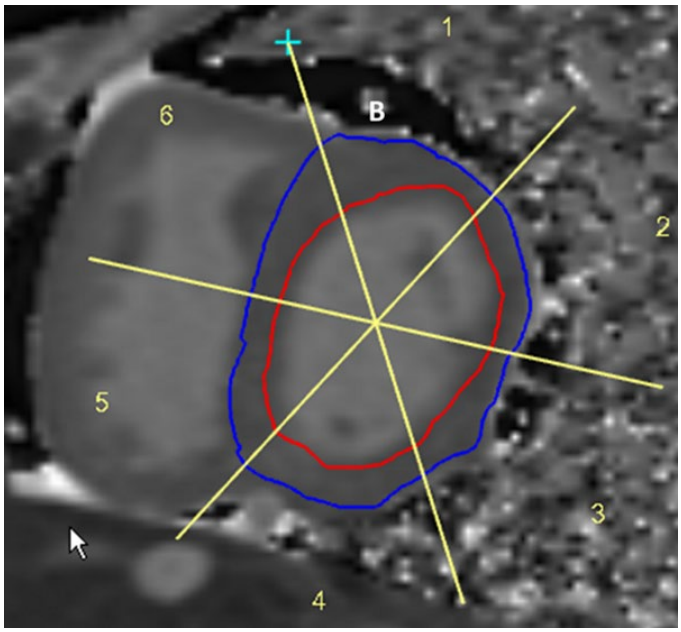

Figure 1. Endocardial and epicardial borders were traced manually on the LV. The LV was automatically divided into 6 equal segments (1=anterior, 2=antero-lateral, 3=infero-lateral, 4=inferior, 5=infero-septal and 6=antero-septal) and the mean T1 relaxation time was calculated for each segment.

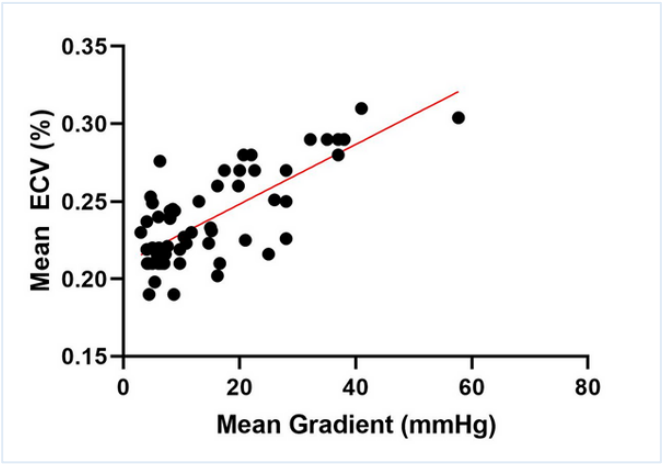

Figure 2

Conflict of interest to declare? No

P65

Impact of left atrial size and function on new atrial arrhythmias during a 5-year follow-up in adults with congenital heart disease and left heart obstruction: a retrospective single-center study

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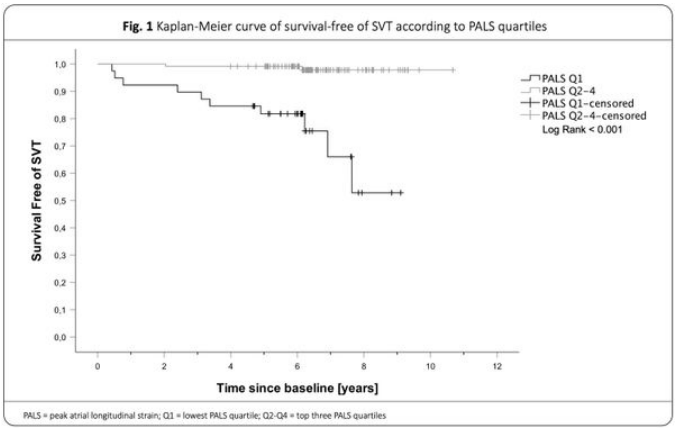
Introduction: Atrial arrhythmias are a common cause of morbidity and mortality in adults with congenital heart disease (ACHD). In acquired heart disease, left atrial (LA) strain has been shown to predict supraventricular tachyarrhythmias (SVT). This study sought to investigate if LA strain is also a reliable predictor of SVT in the ACHD population.

Method: Baseline clinical and echocardiographic data, including LA function parameters and strain, were obtained retrospectively in 157 ACHD patients with left heart obstruction and sinus rhythm (aortic valve stenosis or aortic coarctation, with and without previous repair) with a 5-year follow-up (median age 28, IQR 22-42 years). Diagnosis of sustained SVT was determined from clinical reports during the follow-up period (standard 12-lead ECG, ECG Holter). Exercise capacity was assessed with cardiopulmonary exercise testing.

Fig. 1 Kaplan-Meier curve of survival-free of SVT according to PALS quartiles



PALS = peak atrial longitudinal strain; Q1 = lowest PALS quartile; Q2-Q4 = top three PALS quartiles

Table 1 Baseline characteristics

		Total cohort N = 157
Patient characteristics		
Age	*years*	28 (22 – 42)
Male	*N (%)*	112 (71.3 %)
BMI	*kg/m²*	24.34 (21.81 – 26.50)
Heart rate	*beats/min*	70 (62 – 76)
Systolic blood pressure	*mm Hg*	129.0 ± 15.2
Diastolic blood pressure	*mm Hg*	73.6 ± 9.6
NYHA functional class	*N (%)*	
I		146 (93.0 %)
II		10 (6.4 %)
III		1 (0.6 %)
Hypertension	*N (%)*	52 (33.1 %)
Diabetes	*N (%)*	1 (0.6 %)
Past heart surgery	*N (%)*	101 (64.3 %)
Time since surgery	*years*	6.78 (2.54 – 16.03)
Patient working diagnosis		
Aortic valve stenosis	*N (%)*	103 (65.6 %)
Native aortic valve		72 (45.9 %)
Replaced aortic valve		26 (16.6 %)
Repaired aortic valve		5 (3.2 %)
Coarctatio of the aorta	*N (%)*	54 (34.4 %)
Repaired		51 (32.5 %)
Unrepaired		3 (1.9 %)
Valve characteristics		
Aortic Stenosis	*N (%)*	17 (10.8 %)
Moderate		15 (9.6 %)
Severe		2 (1.3 %)
Aortic insufficiency	*N (%)*	38 (24.2 %)
Moderate		33 (21.0 %)
Severe		5 (3.2 %)
Mitral stenosis	*N (%)*	1 (0.6 %)
Moderate		1 (0.6 %)
Mitral insufficiency	*N (%)*	4 (2.5 %)
Moderate		3 (1.9 %)
Severe		1 (0.6 %)
Echocardiographic characteristics		
Left ventricle		
LV internal end-diastolic diameter	*mm*	49.0 (45.78 – 54.75)
LV mass index (N = 153)	*g/m²*	109.0 (85.0 – 132.5)
RWT (N = 154)		0.422 (0.355 – 0.500)
LV Hypertrophy category (N = 153)		
Concentric remodeling	*N (%)*	42 (26.8 %)
Concentric hypertrophy	*N (%)*	42 (26.8 %)
Eccentric hypertrophy	*N (%)*	20 (12.7 %)
LV ejection fraction (Simpson, Biplane)	*%*	61.76 ± 6.50
E-wave (N = 148)	*cm/s*	0.84 (0.70 – 0.96)
A-wave (N = 142)	*cm/s*	0.55 (0.49 – 0.70)
DT (N = 144)	*ms*	194.0 (158.5 – 229.8)
e' septal (N = 151)	*cm/s*	8.92 ± 2.25
E/e' (N = 148)		9.21 (7.42 – 11.78)
E/A (N = 142)		1.46 (1.15 – 1.80)
Left atrium characteristics		
LA max diameter in PLAX	*mm*	35.0 (30.0 – 41.0)
LA maximal volume index	*ml/m²*	25.22 (20.70 – 31.58)
LA minimal volume index	*ml/m²*	9.73 (7.70 – 13.17)
LA emptying fraction	*%*	59.6 ± 10.7
LA expansion index	*%*	145 (112 – 213)
PALS	*%*	40.37 (34.58 – 46.49)
PACS	*%*	16.35 (21.23 – 12.76)
Right ventricle characteristics		
TAPSE (N = 140)	*mm*	20.4 ± 5.0
DTI	*cm/s*	12.3 ± 2.8
Impaired RV function	*N (%)*	4 (2.5 %)

Values are mean ± SD, n (%) or median (interquartile range).

A = late diastolic mitral inflow velocity; BMI = body mass index; DT = E-wave deceleration time; DTI = tissue doppler imaging; E = peak early diastolic mitral flow velocity; e' = peak early diastolic mitral annular velocity; LA = left atrial; LV = left ventricular; NYHA = New York Heart Association Functional Classification; PALS = peak atrial longitudinal strain; PACS = peak atrial contraction strain; RV = right ventricular; RWT = relative wall thickness; TAPSE = tricuspid annular plane systolic excursion.

Results: During a median follow-up of 6.2 years, SVT was diagnosed in 12 patients (7.6 %). Patients who developed SVT were older, had larger LA dimensions and left ventricular mass, a lower peak left atrial longitudinal strain (PALS) and less exercise tolerance. PALS was a good predictor of SVT risk with an area under the receiver-operating-curve of 0.854. By Cox regression analysis, patients in the lowest quartile for PALS had a 19-fold higher hazard ratio of SVT ($p < 0.001$) in comparison with the top three quartiles. **Conclusion:** PALS provides predictive information about the occurrence of SVT in the ACHD population. Including the measurement of LA strain in the follow-up of these patients may permit to better identify patients at risk of future atrial arrhythmias.

Conflict of interest to declare? No

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Prevalence and impact of cardiac involvement in Turner syndrome

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Introduction: Turner syndrome (TS) patients have a higher mortality risk than age-matched females which is mainly due to cardiovascular disorders (CVD). Recently, an increased prevalence of partial anomalous pulmonary venous connection (PAPVC) was described for TS patients. Data on the clinical impact of PAPVC, e.g. the need for surgical correction, however, is scarce. This study evaluates in a contemporary TS population the prevalence and impact of CVD with a special focus on PAPVC.

Methods: TS patients of all ages followed in a tertiary center were included in this study. Clinical data and reports of supplementary exams like echocardiography, cardiac magnetic resonance imaging (CMR) or computed tomography (CT) were retrospectively collected. In addition, CMR and CT images were reviewed for PAPVC.

Results: Seventy-eight Turner patients were included in this study, 52 adults and 26 children (mean age 25y, range 5 – 67y). Sixty-five underwent echocardiography and 41 CMR. CT was performed in only 3 patients. CVD were present in 45% of patients and more frequently found in karyotype 45X (79%), followed by 46Xi (40%), 45X,46XX (38%), 45X,47XXX (25%), $p<0.02$. Congenital heart disease (CHD) lesions were the most frequently encountered pathologies, in decreasing order of prevalence: bicuspid aortic valve (BAV, N=16, 21%), PAPVC (N=6, 8%), aortic coarctation (N=4, 5%). A prolonged QT interval was observed in 4 patients (5%).

Only one out of six patients with PAPVC underwent surgical repair. Eight (10%) patients underwent the following procedures: aortic coarctation repair (4, 44%), aortic dissection repair, arterial switch for transposition of great arteries, Ross operation and ascending aortic replacement (1, 11%; respectively).

Conclusions: Almost half of TS patients present CVD which appear to depend on the underlying karyotype. CHD is the most frequent CVD with BAV being the most prevalent followed by PAPVC, aortic coarctation and a prolonged QT interval. The impact of PAPVC seems to be of minor importance, rarely requiring surgical repair unlike e.g aortic coarctation.

Conflict of interest to declare? No

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EMH Swiss Medical Publishers Ltd.
Swiss Medical Weekly
Farnsburgerstrasse 8
CH-4132 Muttenz, Switzerland
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ISSN online supplement: 2504-1622