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ANNUAL MEETING OF THE SWISS SOCIETY OF CARDIOLOGY, 2020: ABSTRACTS

The SSC/SSCS – SSP/SSTS Joint Annual Meeting Davos 2020 has been cancelled due to the situation regarding COVID-19.

After very careful deliberation and consideration, a decision was made by the Swiss Society of Cardiology, the Swiss Society of Cardiac Surgery, the Swiss Society of Pneumology, the Swiss Society of Thoracic Surgery in accordance with the congress presidents to cancel the SSC/SSCS – SSP/SSTS Joint Annual Meeting in Davos in June 2020.

Accepted cardio-related abstracts (Abstract submission topics 8-14) are published in this supplement to Cardiovascular Medicine, the official journal of the Swiss Society of Cardiology, the Swiss Society for Angiology, the Swiss Society of Hypertension and the Swiss Paediatric Cardiology Society.

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Aquaporin-1: a H2O2 transporter that modulates aging-associated platelet/endothelial dysfunction in atherothrombosis

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Introduction: Aging is associated with development of cardiovascular diseases, including atherothrombosis. Aquaporin-1 (AQP1) is a water channel that may transport hydrogen peroxide (H2O2). Regarding to the role of oxidative stress in atherothrombosis, we hypothesized that AQP1 modulates aging-associated platelet/endothelial dysfunction.

Methods: Human aortic endothelial cells (HAEC) from passages 4 (young) to 15 (senescent) were probed for AQP1 and the phospho/total proteins AMPK, acetyl-CoA carboxylase (ACC), caveolin-1 and eNOS by immunoblotting. Endothelial cells were transfected with constructs containing H2O2 biosensor HyPer targeted to cell nucleus or cytosol followed by fluorescence imaging. The transcriptional levels of pro-inflammatory/pro-atherogenic vs. anti-inflammatory/atheroprotective genes in the cells were assessed by qRT-PCR. Human blood samples were taken and treated with or without AQP1 inhibitor (Bacopaside II, 10 µM) to examine the platelet adhesion and rolling velocity on vWF under shear flow (100 dyn/cm²). Also, latelet aggregation in response to collagen (2 µM), ADP (1 µM) and TRAP (1 µM) were recorded.

Results: First, the senescence of HAEC was adjusted by a significant increase in β-galactosidase activity from passage 5 to 15. Immunoblot analyses showed that aging leads to significant increases in AQP1 intensity and phosphorylation of caveolin-1 (Tyr14) and ACC (Ser79), along with decreases in phosphorylation of eNOS (Ser1177) and AMPK (Thr172) (P <0.01, n=6). Fluorescence imaging documented a robust H2O2 production in the senescent endothelial cell cytosol, but not nucleus, and activated TNF-α gene, whereas the transcription of hexoxygenase-1 gene enhanced in the young cells (P <0.01). AQP1 inhibition reduced platelet adhesion and thrombus formation, and elevated platelet rolling velocity on vWF under shear flow (P <0.01). Also, a decrease was found in platelet aggregation in response to AQP1 inhibition (P <0.05).

Conclusion: These studies, for the first time, demonstrate that aging induces AQP1 expression in endothelial cells and platelets, and modulates the dephosphorylation of AMPK/eNOS. This may increase the risk of platelet/endothelial dysfunction and production of pro-coagulant/pro-inflammatory factors via ACC activation. Thus, AQP1 inhibition could potentially be exploited as a new therapeutic strategy for age-related atherothrombosis.

Disclosure: Nothing to disclose

Bile acids promote a healthy quiescent endothelial cell metabolism

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Introduction: Endothelial cells (ECs) are the gatekeepers of vascular health and EC metabolism plays an important role in cardiovascular pathophysiology. Upregulation of glucose uptake and anaerobic glycolysis is characteristic of dysfunctional ECs, while fatty acid oxidation characterizes metabolically quiescent healthy ECs. Bile acids (BA) are signaling molecules increasingly recognized as regulators of metabolic homeostasis, known for their antioxidant capacity. After bariatric surgery, circulating BA increase and are important mediators of post-surgical vaso-protective benefits.

Methods: Primary human aortic endothelial cells (HAECs) were used to assess functional and metabolic alterations in-vitro after 24-hour BA treatment, using extracellular flux analyzer, radioactive glycolysis and proliferation assay, caspase-3 activity and DAF-2 stain to assess NO-production.

Results: After RYG, total circulating BA are up to 5 times higher compared to obese controls. Overnight treatment of HAECs with 50µM hydroxilic acid (CA) and chenodeoxycholic acid (CDCA), two of the most abundant BA, at circulating concentrations observed post-bariatric surgery shows a significant downregulation of oxygen consumption and lactate production, a marker of anaerobic glycolysis, in response to glucose administration compared to vehicle-treated, indicating a quiescent endothelial phenotype. Furthermore, endothelial proliferation, measured by rate of radioactive thymidine incorporation into DNA, is also significantly decreased after BA treatment of ECs. CA- and CDCA-treated ECs significantly downregulate apoptosis and increase endothelial NO and H2S production, suggesting that treated cells are functioning better than vehicle-treated controls. ECs treated with BA show an upregulation of fatty acid synthase enzyme mRNA, and seem more dependent on fatty acids for energy production, as assessed by substrate flux analysis. ECs dependency on protein to produce ATP is not altered by BA treatment. Further, EC pro-inflammatory activation induced by TNF-α results in significant upregulation of anaerobic glycolysis, that can be rescued by concomitant incubation with CA and CDCA.

Conclusion: BA treatment of ECs promotes the acquisition of a more quiescent phenotype, blunting glycolysis as a main generator of energy, and enhancing fatty acid oxidation. BA treatment is able to blunt TNF-α induced anaerobic glycolysis in EC, supporting a potential therapeutic anti-inflammatory benefit.

Disclosure: Nothing to disclose

Assisted reproductive technologies induced left ventricular hypertrophy progresses to heart failure in mice

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Introduction: More than 6 million persons generated by assisted reproductive technologies (ART) are living worldwide and currently, these techniques account for up to 5% of all births in developed countries. ART induces epigenetic dysregulation of the eNOS gene responsible for premature vascular aging and arterial hypertension in mice and probably in humans (Circulation 2012; 125:1890-96; J Clin Invest 2013; 123:5052-60; JACC 2018; 72:1267-1274). We previously found that ART induces left ventricular hypertrophy in young mice, but there is no information on how cardiac function evolves during lifetime.

Methods: We, therefore, assessed cardiac morphology and function in 6- and 18-month-old male ART and control mice (n = at least 10 animals/group) by echocardiography (Vecho 3100, Visual Sonics).

Results: The major new findings were that 1) 6-month old mice as expected displayed left ventricular hypertrophy (3.95±0.52 vs. 3.21±0.32 mg/kg of body weight, P <0.01, ART vs. Ctrl), whereas left ventricular function was preserved (LVEF 48.4±4 vs. 48.3±3 %, P = 0.96). 2) and, most importantly, 18-month old mice, in addition to ventricular hypertrophy which remained unchanged (P>0.1), now also displayed left ventricular dysfunction (LVEF 43.9±5.1 vs. 49.1±5.1 %, P = 0.013, ART vs. Ctrl) and marked end-diastolic (84.3±23.3 vs. 60.3±12.9 µl, P = 0.01, ART vs. Ctrl) and end-systolic (42.7±16.4 vs. 26.0±7.1 µl, P <0.01, ART vs. Ctrl) left ventricular diastolic volumes.

Conclusion: We show for the first time that ART, in addition to causing premature vascular aging and arterial hypertension, induces left ventricular hypertrophy, which progresses to heart failure in older mice. We speculate that ART-induced premature atherosclerosis and arterial hypertension in humans may have similar long-term consequences on cardiac morphology and function that may predispose to premature cardiovascular morbidity and mortality.

Disclosure: Nothing to disclose
B Bronchial thermoplasty (BT) induced epithelial heat shock proteins secretion reduces cell types specific airway remodeling in severe asthma

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Background: Bronchial thermoplasty (BT) is a therapy for severe asthma which reduces airway remodeling, hospitalization, exacerbation, and steroid use. Although histopathological studies confirmed reduced asthma airway wall remodeling, limited details of the mechanism are known. Reduced HSP60 expression by epithelial cells was reported earlier.

Objectives: 1) characterize BT induced cell type specific HSP secretion by human primary bronchial epithelial (HBEC) and airway smooth muscle cells (ASMC). 2) investigate the effect of HSP70 and 90 on airway remodeling.

Methods: HBEC and ASMC were isolated from 20 patients with severe asthma prior to BT. Experimentally, BT was mimicked by exposing primary human cells to 65°C for 10 seconds. HSPs secretion, cell proliferation, cell cycle regulator, cell remodeling marker were evaluated by immunohistochemistry, Western-blot, and immunofluorescence.

Results: Experimental BT induced cell type specific secretion of HSP40, HSP70 and 90 by HBEC, but not by ASMC. The latter only released HSP60 as a result of heat induced cell damage. Exogenous recombinant human HSP70, or HSP90 activated HBEC proliferation and wound repair, while reducing ASMC proliferation and cell remodeling. These cell type specific proliferation-regulating effects of HSP were reflected by the expression of the cell cycle inhibitor p21VWFIC, and the proliferation marker Ki67. HSP70 and HSP90 increased E-cadherin expression by HBEC, but both HSPs reduced the expression of α-smooth muscle actin, fibronectin, and collagen type I by ASMC. These cell type specific effects of HSP70 and 90 were also reflected in cell signaling through AKT-mTOR-p70S6K pathway and CEBPβ-PRMT1 and lead to corresponding mitochondria activity.

Conclusion: BT reduces airway wall remodeling by stimulating the secretion of HSP70 and HSP90 by epithelial cells, thereby improving epithelium repair and inhibiting smooth muscle cell activity.

Disclosure: Nothing to disclose

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TNFα induces endothelial dysfunction in rheumatoid arthritis via LOX-1 and arginase 2: reversal by monoclonal anti-TNFα antibody infliximab

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Background: Cardiovascular diseases are strongly age-dependent and their prevalence rises with the numbers of elderly people. Arterial stiffness underlies the process of vascular ageing and could be mediated by similar mechanisms as heart failure with preserved ejection fraction (HFpEF) - another often-debilitating age-dependent disease. Fish-derived omega-3 fatty acids (n3-FA) have been described to decrease cardiovascular events in high risk populations. Little is known on the effects of the plant-derived n3 FA alpha-linolenic acid (ALA). More insight is urgently needed, because of the lower costs and greater global supply of ALA. Thus, we aimed to investigate the effects of a long-term dietary intervention with ALA on age-dependent arterial stiffness and diastolic function in a mouse model of ageing.

Methods: C57BL/6 wildtype males were either fed an ALA-rich (high ALA) or a respective control diet for 12 months, starting from 6 months of age. At 9, 15 and 18 months, arterial stiffness was assessed by measuring pulse wave velocity (PWV) in the right common carotid artery using a Vevo 3100 system (VisualSonics, Fig. 1A). At 18 months, diastolic function was assessed echocardiographically. Matrix-Metalloproteinase 2 (MMP-2) protein levels were assessed in carotid lysates of ALA-fed or control mice using western blot. Cardiac histology determined percentage of cardiac fibrosis.

Results: Endothelial stiffness and significantly increased in controls over time, while ALA prevented said increase (Fig 1A). MMP-2 expression, as a mediator of arterial stiffness via degradation of elastic fibers, was decreased in carotid arteries of ALA-fed mice (Fig 1B). Diastolic function was improved in ALA-fed versus control mice (Fig 1C). Interestingly, cardiac fibrosis as an underlying feature of diastolic dysfunction was reduced by ALA diet (Fig 1D).

Conclusion: We demonstrate that long-term dietary supplementation of the plant-derived ALA fully prevents the development of age-dependent arterial stiffness via reduced expression of MMP-2 and improves diastolic function in old age by decreasing cardiac fibrosis. This study demonstrates beneficial physiological effects of ALA and outlines this plant-derived n3 fatty acid as a cost-efficient and safe measure for primary prevention of debilitating cardiovascular diseases, such as stroke and HPEF.
Distinct dietary α-linolenic acid-dependent shifts in the fecal microbiome composition suppresses aging-associated inflammatory responses and thrombus formation

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Introduction: Aging is associated with compositional alterations in the fecal microbiome. The microbiota-derived trimethylamine-N-oxide (TMAO) correlates with arterial thrombotic events, e.g. myocardial infarction and stroke, the leading causes of mortality worldwide. Furthermore, n-3 FA α-linolenic acid (ALA) has been shown to be protective against thrombosis and the associated pathologies. Therefore, we hypothesized that long-term dietary ALA supplementation protects against the aging-associated microbiome dysbiosis, and reduces inflammatory and thrombotic responses.

Methods: 24 week-old male C57BL/6 mice were fed either a high ALA (7.3g%) or low ALA (0.03g%) diet for 12 months. We examined the compositional changes of fecal microbiota of the animals treated with high vs. low ALA via 16S rRNA gene sequencing. The plasma levels of TMAO and its precursors choline and betaine, and LPS were measured by ELISA method. Additionally, the platelet aggregation in response to stimulation by thrombin, along with, thrombus formation on collagen under high-shear flow conditions (to mimic blood flow in stenosed arteries) was investigated, respectively.

Results: Genomic analysis showed that the abundance of phylum Proteobacteria and family desulfovibrio were reduced in the aged high ALA-treated mice (P <0.01 and P <0.001, respectively). However, microbial diversity of Bacteroidetes or Firmicutes and Bacteroidetes/Firmicutes ratio did not demonstrate a significant change between high vs. low ALA groups. Interestingly, the dietary intake of high ALA increased the abundance of Lachnospiraceae (P <0.01) that may exert anti-inflammatory effects. Moreover, high ALA decreased the plasma levels of TMAO and its precursor choline, but not betaine. The pro-inflammatory cytokine TNF-α showed a significant reduction (P <0.01), whereas plasma IL-1β did not change significantly following high ALA supplementation. An increase in the thrombus formation on collagen under high-shear flow (P <0.01) and thrombin-induced platelet aggregation (P <0.05) were found in the aged mice.

Conclusion: These studies demonstrate that an ALA-rich diet makes positive compositional alterations in the aging-associated fecal microbiome dysbiosis that leads to the suppression of inflammatory and thrombotic responses. Hence, long-term dietary ALA supplementation may be exploited as a nutritional antithrombotic strategy during aging.

Keywords: Microbiome; α-linolenic acid; Inflammation; Thrombosis

Disclosure: Nothing to disclose
Increased failure rates of Microport/Sorin Beflex and Vega pacemaker leads compared to Medtronic CapSureFix Novus 5076 leads

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Introduction: Pacing leads constitute the Achilles heel of conventional pacemakers, as failures are relatively common. Post-market surveillance by the manufacturers may overestimate lead performance due to underreporting of certain failure mechanisms. For most pacemaker leads, a 3-year survival rate of >99% has been reported. However, true lead performance may be lower. The aim of this study was to compare the Microport (formerly Sorin/Livanova) Beflex and Vega pacemaker leads to the Medtronic CapSureFix Novus 5076 lead to analyse their real-life performance.

Methods: We analysed the performance of the Microport/Sorin and Medtronic leads implanted at our centre between January 2014 and January 2018. All interventions were performed by electrophysiologists. Only de-novo right atrial and right ventricular lead implantations were included. Lead failures were identified during outpatient follow-up visits and pacemaker interrogation. Failures were defined as any lead issues requiring re-intervention (e.g. lead dislocations, cardiac perforations, electrical abnormalities such as lead noise or high pacing thresholds).

Results: A total of 382 Microport/Sorin and 203 Medtronic leads were included for the performance analysis (371 RV and 214 RA leads). The mean age of the observed patient cohort was 74.9±13.0 years and 36% of the patients were females. Median follow-up was 20.4 months (interquartile range 13.8-33.3 months). In the Kaplan-Meier analysis, the overall failure rate of the Microport/Sorin lead was worse compared to the Medtronic lead (p <0.001, reasons for lead failures and Kaplan-Meier survival estimates with point-wise 95%-confidence intervals are shown in the figure). Cumulative failure rates after 1, 2 and 3 years were 5.2% vs. 1.5%, 6.3% vs. 1.5% and 12.4% vs. 3.7% (Microport/Sorin vs. Medtronic).

Conclusion: The observed performance of the Microport/Sorin Beflex and Vega pacemaker lead does not reflect the performance reported by the manufacturer at our centre. Moreover, it is significantly worse than the one from a competitor.

Disclosure: Nothing to disclose

Comparison of the long-term performance of the quadripolar IS-4 and the bipolar IS-1 left ventricular lead for cardiac resynchronization therapy


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Introduction: The implantation of left ventricular (LV) leads for cardiac resynchronization therapy (CRT) and the management of lead-related complications can be challenging. The introduction of the quadripolar IS-4 LV lead may have facilitated the implantation procedure and may have reduced lead-related complications. Data of long-term follow-up (FU) comparing the IS-4 lead with the IS-1 LV lead are rare and conflicting.

Methods: Adults with an indication for a CRT-Defibrillator or CRT-Pacemaker, a successful endovascular IS-4 or IS-1 LV lead implantation, and a minimal FU of three years were included in this retrospective study. The combined primary endpoint was freedom from lead-related complications defined as (i) occurrence of persisting high pacing threshold (>2.75V/0.4ms), (ii) unresolved phrenic nerve stimulation, (iii) LV lead dislodgement/disruption, (iv) the necessity of re-interventions affecting the LV lead, and (v) LV lead deactivation/explantation. Secondary endpoints were all singular complications and all-cause mortality.

Results: Eligible for the study were 133 patients (IS-4 n = 66; IS-1 n = 67) with a mean FU of 4.03±1.93 years. Baseline characteristics of both patient groups did not differ significantly. Freedom from lead-related complications was higher in patients with an IS-4 lead as compared to an IS-1 lead (Figure 1; 87.9% vs. 65.7%; p = 0.002). The secondary outcomes showed a higher rate of LV lead dislodgement/disruption (4.5% vs. 17.9%; p = 0.015) in the IS-1 patient group and more patients suffered from unresolved phrenic nerve stimulation with an IS-1 lead (3.0% vs. 13.4%; p = 0.029). LV lead deactivation/explantation during FU and LV lead-related re-interventions were fewer in case of an IS-4 lead (4.5% vs. 22.4%; p = 0.003; 6.1% vs. 17.9%; p = 0.036, respectively). The rate of persisting high pacing thresholds and all-cause mortality did not differ (4.5% vs. 9.0%; p = 0.492; 22.7% vs. 25.4%; p = 0.712, respectively).

Conclusions: The quadripolar IS-4 LV lead showed in this retrospective study a better long-term performance than the bipolar IS-1 lead.

Disclosure: Nothing to disclose
Effects of cardiac resynchronisation therapy in patients with left bundle branch block and residual conduction

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Aim: To evaluate whether left bundle branch block with residual outcomes after cardiac resynchronisation therapy (CRT).

Methods: All consecutive CRT implants at our institution between 2006 and 2013 were identified from our local device registry. Pre- and post-implant patient specific data were extracted from clinical records.

Results: A total of 690 CRT implants were identified during the study period. Prior to CRT, 52.2% of patients had true left bundle branch block (LBBB), 19.1% a pacing-induced LBBB (pLBBB), 11.2% a rLBBB, 0.8% a right bundle branch block (RBBB), and 16.5% had a nonspecific intraventricular conduction delay (IVCD) electrocardiogram pattern. Mean age at implant was 67.5 years (standard deviation [SD] = 10.6), mean left ventricular ejection fraction (LV EF) was 25.7% (SD = 7.9%), and mean QRS duration was 158.4 ms (SD = 32 ms). After CRT, QRS duration was significantly reduced in the LBBB (p <0.001), pLBBB (p <0.001), rLBBB (p <0.001), RBBB (p = 0.04), and IVCD groups (p = 0.03). LV EF significantly improved in the LBBB (p <0.001), rLBBB (p = 0.002), and pLBBB (p <0.001) groups, but the RBBB and IVCD groups showed no improvement. There was no significant difference in mortality between the LBBB and rLBBB groups. LV EF post-CRT, chronic kidney disease, hyperkalaemia, hypernatremia, and age at implant were significant predictors of mortality.

Conclusion: CRT in patients with rLBBB results in improved LV EF and similar mortality rates to CRT patients with complete LBBB. Predictors of mortality post-CRT include LV EF, presence of CKD, hyperkalaemia, hypernatremia, and older age at implant.

Keywords: Cardiac resynchronisation therapy, heart failure, left bundle branch block, left bundle branch block with residual conduction

Disclosure: Nothing to disclose

Ethanol infusion into the vein of marshall for left atrial tachycardia management: first experience at a Swiss tertiary care center


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Introduction: The ligament of Marshall is an epicardial vestigial fold containing the vein of Marshall (VOM) and the Marshall bundle. It runs epicardially along the mitral isthmus and can bridge endocardial activation. Ablation of the mitral isthmus line is notoriously difficult. Chemical ablation of this region by ethanol infusion into the VOM is an alternative strategy.

Methods: In June 2019, we started ethanol infusion into the VOM for mitral isthmus line ablation in selected patients. We cannulated the coronary sinus with a steerable sheath and placed a left internal mammary artery catheter into the great cardiac vein to perform an angiography. If a suitable VOM was present, we positioned an angioplasty guide wire with a preloaded angioplasty balloon into the proximal VOM. After proximal balloon occlusion and selective angiography of the VOM, we injected 96% ethanol into the VOM. Both before and after chemical ablation, we generated a 3D left atrial voltage map with a multipolar catheter.

<table>
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<th>Mitral isthmus block during infusion</th>
<th>Additional RF ablation to VOM</th>
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[Summary of all successful VOM cases: AF = atrial fibrillation, RF = radiofrequency, VOM = vein of Marshall]

Results: We attempted VOM ethanol ablation in 10 patients (7 male; median age 59 years). The indication was perimital flutter in 5 patients, VOM-related tachycardia in one, and mitral isthmus ablation as part of a persistent atrial fibrillation ablation strategy in 4. In 7 patients, radiofrequency ablation of the mitral isthmus line was attempted before VOM ethanol ablation and was not successful. A VOM was present in all patients. VOM dissection occurred in two patients (20%) during cannulation, precluding ethanol infusion in one (small VOM). In another patient with a small VOM we did not attempt ethanol ablation. In the remaining 8 patients (80%), a mean of 5.6±2.4 ml of ethanol was infused into the VOM. Chemical ablation terminated perimital flutter in 3 of 5 patients (60%) and blocked the mitral isthmus line in 5 of 8 patients (63%). Additional, limited radiofrequency ablation after VOM ethanol ablation, targeting the valvular side of the mitral isthmus line in the remaining 3 patients resulted in mitral isthmus block in all 8 patients. Post procedurally, we observed a small pericardial effusion in two patients, mild pericarditis in one and groin hematoma in one. Figure 2 shows an exemplary voltage map before and after chemical ablation of the VOM.

Conclusion: Chemical ablation of the VOM is feasible. With additional radiofrequency ablation, acute mitral isthmus block is achieved in the majority of patients. Long-term success of this approach will need to be assessed.

[Angiography (RAO 30°) within the great cardiac vein (A) and selective angiography (B) after proximal balloon occlusion to visualize the VOM (arrows)]
Introduction: Patients with atrial fibrillation aged >65 years should receive anticoagulation to prevent acute ischemic stroke. However, many patients may not benefit from such stroke prevention because atrial fibrillation is silent.

Methods: The STARFIB cohort study was a hospital-based, prospective cohort study. Consecutive patients aged 65-85 years admitted to the inpatient service were included into the study. A complete chart review was performed to identify patients with an established diagnosis of atrial fibrillation (herein after referred to as overt atrial fibrillation). Patients without overt atrial fibrillation were invited to undergo three 7-day continuous Holter ECGs separated by 2-month intervals to screen for silent atrial fibrillation. It was prespecified to include 100 patients for each sex and of each of the following age groups: 65-70; 70-75; 75-80; and 80-85 years.

Results: Between January 2015 and February 2019, a total of 11'470 consecutive patients were admitted. Atrial fibrillation was already known in 2'529 patients, corresponding to a prevalence of overt atrial fibrillation of 22.0% (95% confidence interval [CI] 21.3% to 22.8%). The prevalence of overt atrial fibrillation was significantly higher in men (25.1%; 95% CI 24.0% to 26.2%) than in women (19.2%; 95% CI 18.2% to 20.2%; p <0.001) and increased significantly with age in both sexes (p <0.001 for both; Figure). Of 8'944 patients without overt atrial fibrillation, 795 patients (9% of the population without overt atrial fibrillation) underwent screening for silent atrial fibrillation, evenly distributed for sex and age groups. The median cumulative Holter ECG time per patient was 500 hours (IQR 375; 504). Overall, we found 38 cases of silent atrial fibrillation, 15 (39.5%) were found during the first 7-day Holter ECG, 5 (13.2%) during the second, 9 (23.7%) during the third, and 9 (23.7%) through means other than a Holter ECG.

Conclusions: In a large hospital-based patient population, we found a prevalence of overt and of silent atrial fibrillation of 22% and 5%, respectively. The prevalence of both overt and silent atrial fibrillation was higher in men compared to women.
minimizing ablation and procedure time with a high rate of first pass isolation, as compared to previous PV ablation protocols. Further studies are needed to evaluate the long-term results of this approach.

Methods: 41 consecutive patients referred for AF redo procedure were included. LAWT maps were computed from the multidetector computed tomography (MDCT) as the local distance between the LA endo and epicardium. Each PV line was subdivided into 8 segments and mean LAWT was computed. During the procedure, the local gap was defined as the earliest activation site at the reconnected segment of the circumferential PV line (Figure 1A & 1B).

Results: 41 patients [31 (75.6%) male, age 60±10 y]; Mean LAW was 1.36 ± 0.20 mm. Mean PV line WT was higher in left PVs than in the right PVs 1.68 ± 0.57 vs. 1.31 ± 0.39 mm p <0.001. Mean WT of the reconnected points was 44% higher than the mean WT of the segment where the reconnection was located. Mean reconnection point WT was at the 87th percentile of the circumferential line in the LPVs and at the 76th percentile in the RPVs. The reconnected point WT was higher in the LPVs than RPVs 2.13 ± 1.14 vs. 1.47 ± 0.48 mm p <0.001. The most frequent location for reconnections was the left anterior carina (71%), with a mean WT of 2.24 ± 0.91 mm; and the right anterior carina (56%) with a mean WT of 1.57 ± 0.62mm (Figure 2A & 2B).

Conclusion: Reconnection points were more frequently present in the thicker segments of the PV line. The most frequently reconnected segments were the left and right anterior canines. Atrial wall thickness maps derived from MDCT are useful to guide AF redo procedures.

Disclosure: Nothing to disclose

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Tailored loW voltagE zonEs ablaTion using contact force sensing technology in patients with persistent atrial fibrillation (TWEET-AF): a pilot study

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Introduction: Although pulmonary vein (PV) isolation (PVI) is very effective in paroxysmal atrial fibrillation (AF), in patients (pts) with persistent AF, PVI often is not sufficient. Many studies suggested that low voltage zones (LVZs) outside of the PV might be involved in the complex mechanisms perpetuating AF. However ablation strategies involving substrate modification (SM) did not show additional benefits in persistent AF pts. Those studies were performed before the introduction of contact force technology, and the most likely explanation for these results could be the inability to achieve effective transmural lesions and continuous linear ablation. We hypothesized that the use of contact force technology would improve ablation efficacy. Therefore, we analyzed the long-term outcome after two different ablation strategies in pts with persistent AF depending on whether there was evidence of LVZs in the left atrium or not.

Methods: The presence of LVZs were defined as sites of >3 adjacent low-voltage points <0.5 mV during electrophysiology study. Depending on the location of the LVZ, mainly linear ablation was performed. Catheter ablation was performed using TactiCath™ or SmartTouch™ ablation catheters aiming at contact values ≥10g <20g and FTI >400g/s. Ablation was performed in a temperature-controlled fashion with energy of 30W except at the posterior wall (20-25W).

Results: 121 consecutive pts with persistent AF (46 female, median age 66 [59-72] years, mean duration of AF 16 [7-73] months, CT derived LA volume index 66 [56-75]/m²) were included; pts without LVZs underwent PVI alone (n = 74), in pts with LVZs, PVI + SM (n = 47) was performed (mitral isthmus line in 2, supero-septal line in 39, and roof line in 47; bidirectional block was achieved in 100%, 97%, and 100%, respectively). After a median follow-up of 13 [6-21] months, 86% of pts without and 78% with substrate were in sinus rhythm, mainly without antiarrhythmic drugs (89% PVI only, 84% PVI + SM) (Figure).

Conclusions: In patients with persistent AF without LVA, PVI alone leads to excellent 2-year freedom from AF. In pts with LVZs, additional substrate modification with CF sensing technology is associated with improved success rates compared to previous studies.
Efficiency of the RADPAD® No Brainer® surgical cap in reducing head and brain exposure during pacemaker and defibrillator implantation

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Introduction: The RADPAD® No Brainer® cap is marketed as a protective gear that significantly reduces operator’s brain exposure to scattered radiation. The efficiency of the RADPAD® No Brainer® in reducing brain exposure in clinical practice remains, however, unknown to date. Our study investigates the RADPAD® No Brainer® efficiency in reducing brain radiation exposure.

Methods: Five electrophysiologists performing device implantations over a 2-month period wore the RADPAD® cap with two strips of 11 thermo-luminescent dosimeters pellets covering the front head both above and under the shielded cap. Phantom measurements were performed to further investigate brain dose distribution.

Results: Our study showed that the right half of the front head’s operator was the most exposed region during left subpectoral device implantation (panel A, red box plots). The RADPAD® cap attenuated the skin front head exposure by a factor of 2.6 [2 ; 6.6] (panel A, green box plots). However, phantom measurements showed that the RADPAD® cap did not provide any protection to the brain compared to control conditions (attenuation factor 1.1 [1.0 ; 1.1], panel B, red box plot). The RADPAD® cap worn as a horizontal protruding plane below the chin, however, reduced brain exposure by a factor of 1.7 [1.3 ; 1.9] (panel B, green box plots).

Conclusion: During device implantation, the RADPAD® No Brainer® decreased skin front head exposure but had no impact on brain dose distribution. The RADPAD® No Brainer® worn as a horizontal plane below the chin reduced brain exposure. This finding confirms that the brain exposure comes from upwards patient’s scattered radiation.

Disclosure: Nothing to disclose

Association of omega-3 fatty acids with type of heart rhythm in patients with atrial fibrillation

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1Department of Internal Medicine, Cantonal Hospital Baden, Baden, 2Department of Neurology, University Hospital of Zurich, Zurich, “Clinical Trial Unit,” Department of Cardiology, 3Cardiovascular Research Institute Basel, University Hospital of Basel, Basel, 4Center for Molecular Cardiology, Laboratory for Platelet Research, University of Zurich, Schlieren, 5Department of General Internal Medicine, Bern University Hospital, University of Bern, 6Institute of Primary Health Care, University of Bern, 7Division of Cardiology, Ospedale Regionale di Lugano, Lugano, Switzerland, 8Royal Brompton and Harefield Hospitals and Imperial College, London, United Kingdom, 9Center for Molecular Cardiology, University of Zurich, Schlieren, Switzerland, 10Population Health Research Institute, McMaster University, Hamilton, ON, Canada

Background: Atrial fibrillation (AF) increases the risk of ischemic stroke, particularly in patients with persistent or permanent AF. In experimental studies, Omega-3 fatty acids (n-3 FAs) were shown to have anti-arrhythmic properties, influencing heart rate, heart rate variability and cardiac remodelling. Its effects on AF however remain unclear, with epidemiological and clinical studies showing mixed results.

In this study, we examined the association of the n-3 FAs eicosapentaenoic acid (EPA), docosapentaenoic acid (DPA), docosahexaenoic acid (DHA) and alpha-linolenic acid (ALA) with rhythm type (paroxysmal vs. persistent / permanent AF) and resting heart rate in patients with AF.

Methods: In this cross-sectional sub-study of the Swiss atrial fibrillation (Swiss-AF) cohort study, we determined whole blood n-3 FAs by gas chromatography according to the HS-Omega-3 Index methodology in 2369 patients with AF. Total and individual n-3 FAs were correlated with type of AF as binary outcome (persistent/permanent vs. paroxysmal AF) and heart rate. Analyses were corrected for sex, age, BMI, smoking, alcohol intake, family history of AF, physical activity, hypertension, diabetes, chronic kidney disease, coronary artery disease, deep vein thrombosis, thyroid disease, obstructive sleep apnoea syndrome, beta blocker and antiarrhythmic drugs.

Disclosure: Nothing to disclose
Results: 1060 (44.7%) patients with paroxysmal, 720 (30.4%) patients with persistent and 589 (24.9%) patients with permanent AF were identified. After adjustment, no statistically significant associations were found, however a pattern of lower risk for persistent/permanent AF with higher levels of EPA odds ratio [OR] 0.85, 95% confidence interval [CI] 0.60 - 1.20) and a pattern of higher risk for persistent/permanent AF with higher DPA (OR 1.24, 95% CI 0.90 - 1.73) was detected. No association was found with DHA (OR 0.97, 95% CI 0.86 - 1.09), ALA (OR 0.94, 95% CI 0.44 - 2.01) and total n-3 FAs (OR 0.97, 95% CI 0.90 - 1.05) (Figure 2). A lower HR was associated with higher total n-3 FAs (OR 0.99, 95% CI 0.98 - 1.00) and DHA (OR 0.99, 95% CI 0.97 - 1.00) but not with EPA, DPA or ALA.

Conclusions: Higher levels of n-3 FAs were not associated with the prevalence of permanent or persistent AF but with a lower heart rate in patients with AF largely treated with beta-blockers and antiarrhythmic drugs.

Disclosure: Nothing to disclose

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Tracking the efficiency of ablation in persistent atrial fibrillation using intracardiac dominant frequency and left-to-right atrial gradient

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1Cardiology, CHUV, 2Applied Signal Processing Group, Swiss Federal Institute of Technology, Lausanne, 3Cardiology, Hôpital de La Tour, Geneva, 4Cardiology, Inselspital, Bern, 5Cardiology, University Hospital of Basel, Basel, Switzerland

Introduction: We previously reported that patients (pts) with persistent atrial fibrillation (peAF) unresponsive to catheter ablation (CA) exhibit high bi-atrial intracardiac dominant frequencies (DF) and negative left-to-right DF gradient at baseline (BL). In this study, we hypothesized that bi-atrial DFs and left-to-right DF gradient can track the efficiency of CA en route to peAF termination.

Methods: In 40 consecutive pts (61±8 y, sustained AF 19±11 m), pulmonary vein isolation (PVI) and left atrium (LA) ablation were performed until peAF termination. Synchronous recordings were made from catheters positioned into the left atrial (LAA) and the right atrial appendage (RAA) at BL, during PVI, and during CFAEs and linear ablation. DF was defined as the highest peak within the power spectrum.

Results: peAF was terminated within the LA in 70% (28/40, LT) of the pts, while 30% (12/40, NLT) were not. Over a mean follow-up of 34±14 months, all NLT pts had a recurrence, while LT pts presented a recurrence in 71% (20/28, LT_Rec) and remained in sinus rhythm (SR) in 29% (8/28, LT_SR). The figure shows that: (a) all three groups displayed a gradual bi-atrial organization during CA as shown by decreasing DF values, but the LT_SR pts exhibited the highest relative changes in DF from BL (p < 0.05, ΔLAA = -11%); (b) the LAA-to-RAA DF gradient already disappeared after PVI in LT_SR pts, while LT_Rec pts displayed a more gradual decline and NLT pts no significant change.

Conclusion: Extensive LA ablation in peAF decreases both bi-atrial DFs and left-to-right DF gradient. The strong reduction of the LAA-to-RAA DF gradient after PVI in LT_SR pts is suggestive of a significant contribution of the PVs in driving peAF.

Disclosure: Nothing to disclose

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Causes of recurrences after stereoratic radio-ablation for refractory ventricular tachycardia


CHUV University Lausanne, Lausanne, Switzerland

Introduction: Stereotactic radio-ablation (STAR) has been recently introduced for the management of ventricular tachycardia (VT) refractory to antiarrhythmic drugs (AADs) and catheter ablation (CA). VT recurrences were reported after STAR but the mechanisms remain unknown. We report causes of recurrence after STAR for refractory VT.

Methods: From 09.2017 to 01.2020, 12 patients (pts) (66±8y, LVEF 44±14%) suffering from refractory VT were enrolled. The underlying cardiopathy was ischemic in 3, inflammatory in 3 and idiopathic in 6 pts. 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 interventricular septum (IVS) in 10, the infero basal left ventricle (LV) in 2, the LV apex in 1 and the antero-basal LV in 4 pts. After a median follow-up of 9±7 months, VT burden decreased by 78% (mean value, from 89 to 20 VT/season). Out of the 12 pts, 9 (75%) presented some form of VT recurrence (table): 1) that spontaneously resolved in 2 pts; 2) remote from the VT-sub in 2 cases; 3) managed with AADs that had failed before STAR in 2 cases; 4) within the treated VT-sub in 3 cases. In the latter 3 cases, one recurrence came from the antero-basal LV adjacent to the circumflex artery (mean dose 14 Gy), and two were located within the treated IVS (one displaying marked fibrosis, and one with sarcoidosis (mean dose 20 and 21 Gy respectively)). Only 4/12 (33%) pts required additional CA.

<table>
<thead>
<tr>
<th>Case</th>
<th>STAR Localization</th>
<th>Sus- tained VT re- currence</th>
<th>Recurrence local- ization</th>
<th>Time to VT re- currence</th>
<th>Treat- ment of VT recurrence</th>
<th>Dosime- try at site of recurrence (Gy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 10</td>
<td>IYR, IYS, and IVRD, IVS, and anterobasal IVS</td>
<td>No</td>
<td>None</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>3 5</td>
<td>IYR, and anterobasal IVS</td>
<td>Yes</td>
<td>ICD recording only</td>
<td>12 months, 6 months</td>
<td>No Treatment, Spontaneous resolution</td>
<td>NA</td>
</tr>
<tr>
<td>6 7</td>
<td>IYR, IYS, and anterobasal IVS</td>
<td>Yes</td>
<td>ICD recording only, ICD recording only, Infero-basal IVS</td>
<td>13 months, 6 weeks</td>
<td>Amiodarone, No recurrence since</td>
<td>NA, 19.5 (9.3-23.4)</td>
</tr>
<tr>
<td>2 4 8 9</td>
<td>IYR, IYS, and anterobasal IVS</td>
<td>Yes</td>
<td>ICD recording only, ICD recording only, Infero-basal IVS</td>
<td>4 months, 7 months, 6 months</td>
<td>CA procedure, No recurrence since</td>
<td>8.2 (3.6-15.2), 21.7 (17.8-23.3), 14.4 (9.9-20.2), 3.4 (1.2-17.6)</td>
</tr>
</tbody>
</table>

Conclusion: STAR appears to be an efficient tool for the management of refractory VT, leading to a strong VT burden reduction. Recurrences may still occur at sites remote from the irradiated volume, within the IVS or in under-dosed sites adjacent to critical structures.
**Methods:** In some patients with primary prevention, CRT can lead to “super-response” (i.e. improved left ventricular ejection fraction (LVEF) ≥ 50%). At the time of battery depletion, the question might come up whether downgrading from a CRT-D to a CRT pacemaker should be offered to such patients. Advantages include extended device longevity, lower costs and no risk of inappropriate shocks. Its obvious disadvantage might be the risk of occurrence of malignant arrhythmias despite normal LVEF. Few data exist on the outcome of patients in whom a downgrading was performed. Despite normal LVEF, few data exist on the outcome of patients in whom a downgrading was performed. Few data exist on the outcome of patients in whom a downgrading was performed.

**Results:**

All patients (n=311)

<table>
<thead>
<tr>
<th>Response with downgrade</th>
<th>Response without downgrade</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=134</td>
<td>n=177</td>
</tr>
</tbody>
</table>

- **Male gender:** 260 (84%) vs 6 (40%)
- **Age at implant [years]:** 66 +/- 10 vs 68 +/- 9
- **LVEF at baseline [%]:** 26 +/- 7 vs 25 +/- 5
- **LVEF before downgrade [%]:** NA vs 56 +/- 5
- **Non-ischemic cardiomyopathy:** 157 (50%) vs 12 (80%)
- **Hypertension:** 201 (65%) vs 8 (53%)
- **Diabetes:** 85 (27%) vs 4 (27%)
- **Chronic kidney disease (MDRD <60ml/min):** 144 (46%) vs 7 (47%)

**Introduction:** In some patients with primary prevention, CRT can lead to “super-response” (i.e. improved left ventricular ejection fraction (LVEF) ≥ 50%). At the time of battery depletion, the question might come up whether downgrading from a CRT-D to a CRT pacemaker should be offered to such patients. Advantages include extended device longevity, lower costs and no risk of inappropriate shocks. Its obvious disadvantage might be the risk of occurrence of malignant arrhythmias despite normal LVEF. Few data exist on the outcome of patients in whom a downgrading was performed.

**Methods:** From our prospective ICD-cohort, we followed CRT-D patients who experienced super-response at the time of generator exchange (GE) and were candidates for a downgrade. Only patients with primary prevention and no arrhythmias beyond 18 months after implantation were considered (arrhythmias occurring within the first 18 months were considered as non-relevant as they occurred during cardiac remodelling). Vital status, mode of eventual death, hospitalisation for sustained ventricular tachycardia (VT) and relevant arrhythmias from device interrogation were determined in January 2020.

**Disclosure:** Travel expenses by Biosense Webster

**Is an approach of downgrading selected patients from CRT-D to CRT-P safe? Results with a mean follow-up of 3 years**

S. Frey, M. Kühne, C. Sticherling, A. Madaffari, S. Osswald, B. Schär

Cardiology, University Hospital Basel, Basel, Switzerland

**Introduction:** In some patients with primary prevention, CRT can lead to “super-response” (i.e. improved left ventricular ejection fraction (LVEF) ≥ 50%). At the time of battery depletion, the question might come up whether downgrading from a CRT-D to a CRT pacemaker should be offered to such patients. Advantages include extended device longevity, lower costs and no risk of inappropriate shocks. Its obvious disadvantage might be the risk of occurrence of malignant arrhythmias despite normal LVEF. Few data exist on the outcome of patients in whom a downgrading was performed.

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**Disclosure:** Travel expenses by Biosense Webster

**Pre-procedural burden of ventricular ectopy does not predict the outcome in patients with catheter ablation of idiopathic premature ventricular complexes**

B. Asevanyan1, L. Bourquin2, J. Seiler1, S. Baldinger1, A. Madaffari2, S. Knecht2, H. Servatius1, F. Spies2, F. Noti1, M. Kühne2, H. Tanner1, S. Osswald1, L. Roten1, C. Sticherling2, T. Reichlin1

1Department of Cardiology, Inselspital, Bern University Hospital, University of Bern, Bern, 2Department of Cardiology, University Hospital Basel, University of Basel, Basel, Switzerland

**Introduction:** Radiofrequency catheter ablation of idiopathic premature ventricular complexes (PVCs) is an effective method for eliminating symptoms and preventing or reversing arrhythmia-induced cardiomyopathy. However, a non-negligible proportion of patients experiences a recurrence after ablation. We aimed to study the predictive potential of pre-procedural PVC burden on 24-hour Holter ECG for sustained ablation success of idiopathic PVCs.

**Methods:** Patients with no evidence of structural heart disease undergoing catheter ablation of frequent and/or symptomatic PVCs were included in this retrospective observational multicenter study. All ablations were performed using a 3D-electroanatomical mapping system (CARTO 3, Biosense Webster). In all patients, Holter monitoring was performed before and 3-months after the procedure to determine the 24-hour PVC burden. Sustained ablation success was defined as a ≥ 80% reduction of the PVC burden. Patients undergoing ablation of either idiopathic sustained VT or PVCs in the context of PVC-induced VF were excluded because no reliable pre-ablation PVC burden is available in those.

**Disclosure:** Nothing to disclose

**Results:** Overall, 214 patients were included. The median age was 53 years (IQR 41-65) and 46% of the patients were male. The median pre-ablation PVC burden was 20% (IQR 10-30), which was reduced to a post-ablation PVC burden of 0.3% (IQR 0-3.8%) as assessed after a median of 86 days post-ablation. Sustained ablation success was achieved in 71%. Pre-ablation PVC burden did not differ between patients with sustained ablation success and recurrence during follow-up (median 20% vs 20%, p = 0.89). When assessed according to pre-ablation PVC-burden categories of <5%, 5-10%, 10-20%, 20-30% and ≥30%, sustained ablation success was 63%, 70%, 75%, 76% and 68% (p>0.05). No differences in this association between PVCs originating from the right ventricle or the left ventricle were found.

**Conclusion:** Pre-procedural PVC burden is not predictive for sustained success after catheter ablation of idiopathic PVCs.

**Disclosure:** Nothing to disclose
Activation mapping of the left atrial posterior wall - first in human experience using a novel esophageal mapping system

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Introduction: Supraventricular arrhythmias are challenging to diagnose in surface electrocardiograms (ECGs). Esophageal ECGs offer a high atrial signal quality and might provide useful information in the diagnostic workup of supraventricular heart rhythm disorders. The aim of the study was to test the feasibility of a novel semi-invasive esophageal mapping system to reconstruct the electrical activation sequence on the left atrial posterior wall (LAPW).

Methods: A total of 46 patients undergoing an electrophysiological study and/or ablation procedure were prospectively enrolled from 12/2017 to 11/2018. Signals resulting from dedicated intracardiac pacing maneuvers were recorded using a newly developed esophageal ECG catheter (Figure 1D) with 3-dimensional electrode arrangement. Subsequently, an inverse model based algorithm was employed to reconstruct the activation sequence on the LAPW.

Results: Recording of esophageal ECGs was possible in all cases without complication. Non-invasive reconstruction of the LAPW activation sequence was successful in 64% of patients. An exemplary activation map from a 65 year old male undergoing pulmonary vein (PV) isolation for atrial fibrillation is shown in Figure 1A. The map represents a posterior-anterior view of the LAPW and depicts the activation sequence of a single beat during sinus rhythm. The gray line in the center symbolizes the esophageal ECG catheter while the arrows indicate the estimated propagation direction. The corresponding intracardiac activation map (CARTO, Biosense Webster, CA) is shown in Figure 1B. In the same patient, pacing from the PV ostia (stars) changed the propagation direction on the LAPW as shown in Figure 1C (median of 8 beats per location). The arrow length is proportional to the estimated conduction velocity (median [interquartile range] of all beats = 0.96 [0.92-1.15] m/s).

Conclusion: Semi-invasive reconstruction of the activation sequence on the LAPW from esophageal ECG recordings is feasible. Further studies are required to test the validity and reliability of the results.

Disclosure: Nothing to disclose
Results: All (4/4) 2D-gels exposed to sera from BrS patients demonstrated specific Abs to four proteins, confirmed by MS to be α-cardiac actin, α-skeletal actin, keratin, and connexin-43, versus 0/32 additional controls. ELISA optical densities for all Abs were elevated in all BrS subjects compared to controls. ELISA optical densities for all Abs were elevated in all BrS subjects compared to controls. In myocardium obtained from BrS subjects, each of the same Abs, confirmed by Western blots, versus 0/32 additional controls. No autoantibodies are present in control subjects.

Conclusion: A biomarker profile of autoantibodies to four cardiac proteins is highly sensitive and specific for the detection of BrS, irrespective of genetic cause. The four involved proteins, α-cardiac actin, α-skeletal actin, keratin, and connexin-43, along with the SCN5A-encoded Na,1.5 alpha subunit are expressed abnormally in the myocardium of patients with BrS.

Disclosure: Nothing to disclose

SCN5A overlap syndromes: moving from theory to practice
A.P. Porretta1, E. Davoine1, A. Superti-Furga1, Z. Bhuiyan1, G. Domenichini1, C. Herrera Siklody1, C. Haddad1, P. Pascale1, E. Pruvot1, A.P. Porretta1, E. Davoine1, A. Superti-Furga1, Z. Bhuiyan1, G. Sacco, Milan, Italy, 8Universitätsklinikum Hamburg-Eppendorf, Hamburg, Germany, 9Aritmologia e Elettrofisiologia Clinica, Università Politecnica delle Marche, Ancona, Italy, 10Cardiology, Lund University, Lund, Sweden

Introduction: New evidences for overlapping mixed phenotypes among hereditary arrhythmic syndromes associated with SCN5A mutations have recently led to coin the novel clinical entity of “SCN5A Overlap Syndromes” (SOS). We investigated prevalence and phenotypic expression of SOS among patients (pts) carrying SCN5A mutations diagnosed at our center.

Methods: From January 2005 to December 2019, we identified SCN5A mutations in 14 pts who underwent genetic testing at our center. Six pts were tested due to congenital long QT syndrome (LQTS) suspicion, while the remaining ones after diagnosing Brugada syndrome (BS).

Results: We detected SOS in 9 (64%) SCN5A mutation carriers (MCs). Five (36%) pts presented with BS coupled with cardiac conduction defects (CCD) including: first degree atrio-ventricular block (AVB) in all of them and associated right bundle branch block in 2 pts. One patient (7%) expressed type 3 LQTS coupled with CCD. Two (14%) pts, from the same family and harboring the same SCN5A mutation, expressed a variable phenotype. The first one developed BS and severe sinus node dysfunction (SNd) associated with CCD and atrial fibrillation (AF) in the context of a probable atrial myopathy. The second pt presented BS associated with CCD. Finally, two (14%) pts, belonging to the same family and segregating the same SCN5A mutation, expressed a heterogeneous phenotype with QT prolongation (type 3 LQTS) associated with BS. Table 1.

Conclusions: SOS represents an undeniably novel clinical entity among SCN5A MCs. We found a high SOS prevalence (64%) in our patients segregating SCN5A mutations. The most frequent overlapping phenotype associates BS with CCD. Further mixed expressions may include type 3 LQTS associated with BS and CCD, BS coupled with severe SND, CCD and AF. Of note, variable phenotypes may affect pts harboring the same SCN5A mutation in the same family.

<table>
<thead>
<tr>
<th>Number of patients</th>
<th>Sex</th>
<th>Cardiac Conduction Defects</th>
<th>Brugada Syndrome</th>
<th>Other Syndrome</th>
<th>Mutation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>M, M</td>
<td>I° atrioventricular block + right bundle branch block</td>
<td>Yes</td>
<td>No</td>
<td>c.5447_5448insGCCAC- TTTGCGGA; c.4222G&gt;A</td>
</tr>
<tr>
<td>3</td>
<td>M, M, M</td>
<td>I° atrioventricular block</td>
<td>Yes</td>
<td>No</td>
<td>c.1603C&gt;T; c.664C&gt;T; c.4437+5G&gt;A</td>
</tr>
<tr>
<td>1</td>
<td>M</td>
<td>I° atrioventricular block</td>
<td>No</td>
<td>Type 3 Long QT Syndrome</td>
<td>C.5350G&gt;A</td>
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<tr>
<td>1</td>
<td>F</td>
<td>I° atrioventricular block + infra-nodal conduction delay</td>
<td>Yes</td>
<td>Sinus node dysfunction and atrial fibrillation</td>
<td>c.4222G&gt;A</td>
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<tr>
<td>2</td>
<td>F, F</td>
<td>No</td>
<td>Yes</td>
<td>Type 3 Long QT Syndrome</td>
<td>c.5467TT&gt;C</td>
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<tr>
<td>3</td>
<td>F, M, F</td>
<td>No</td>
<td>No</td>
<td>Type 3 Long QT Syndrome</td>
<td>p.Y1767C; c.1231G&gt;A; C.5350G&gt;A</td>
</tr>
<tr>
<td>2</td>
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<td>No</td>
<td>Yes</td>
<td>No</td>
<td>c.3840+1G&gt;A; c.844C&gt;G</td>
</tr>
</tbody>
</table>

[Patients’ clinical phenotypes]

Disclosure: Nothing to disclose

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First-in-world assessment of outcomes of catheter ablation for atrial arrhythmias in arrhythmogenic right ventricular cardiomyopathy
A. Gasperetti1, C. James2, L. Chen3, S. Costa1, D. Akdis1, C. Brunckhorst1, H. Jensen4, M. Casella5, C. Tondo5, N. Schenker6, M. Shibu6, S. Willems6, G.B. Forleo7, S. Kany8, C. Meyer8, A. Dello Russo9, P. Platanov10, H. Calkins2, F. Duru1, A.M. Saguner1

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Introduction: Arrhythmogenic right ventricular cardiomyopathy (ARVC) is a genetically inherited disease characterized by fibro-fatty infiltrations...
(FFI). FFI in ARVC patients usually originates in the ventricles, but recent imaging studies showed FFI at the atrial level as well. Effectiveness of catheter ablation (CA) for atrial arrhythmias (AA) in this subset of patients is currently unknown. Aim of our study is to describe acute and long-term effectiveness of CA for AA in ARVC patients.

Methods: Nine ARVC registries from Europe, US, and China were retrospectively searched for ARVC patients undergoing CA for AA (namely: atrial fibrillation (AF), atrial tachycardia (AT), and cavo-tricuspid dependent atrial flutter (CTI-FL)). Baseline, procedural, and long-term outcome data were collected.

Results: Thirty-five pts (86% male, median CHA2DS2 -VASc 1 [1 -2], HAS-BLED 1 [0-2], and EHRA scores 2 [2-3]) were enrolled, in which a total of 45 CA procedures for AA were performed (left atrial CA: n = 19 AF, n = 10 AT; right atrial CA: n = 16 CTI). Mean age at AA CA was 48.2±14.8 y.o. At baseline, 63% of pts were on oral anticoagulants (OAC) (n = 9 warfarin; n = 13 NOAC). Catheter ablation was successful and sinus rhythm obtained at the end of the procedure in all patients, with 2 (6%) AF patients requiring electrical cardioversion. Over a median follow-up of 36 [14-74] months, 12 (27%) pts experienced arrhythmia recurrence (left atrial group: n = 6 AF recurrences, n = 3 AT recurrences; CTI-FL group: n = 1 CTI-FL recurrence; n = 1 new AF with previous CTI-dependent flutter ablation), with a 1-year follow-up resulting comparable to what has been reported in the literature for the general population. [Figure 1 and 2]. 61% pts were on OAC at last follow-up.

Conclusion: Age at the time of CA for AA is about 10 years younger in patients with ARVC as compared to the general population. CA for AA in ARVC pts is safe and effective; surprisingly, long-term CA outcomes for AF and left AT result comparable to those reported in the general population, whereas recurrence rates of CTI-dependent flutter seem to be higher.

Disclosure: Authors declare no relevant disclosure to the present abstract.

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Analysis of the pulmonary veins activity to identify their contribution to the mechanism of persistent atrial fibrillation

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Introduction: Pulmonary vein isolation (PVI) is the cornerstone interventional treatment for AF. While this strategy is effective in pts with paroxysmal AF, the success rate of this approach is more limited in pts with persistent AF (PsAF). The challenge however still remains to discriminate pts in whom PV play a major role in AF maintenance from those who may require an extended ablation strategy to target substrate alterations. We hypothesized that the analysis of the electrical activity recorded within the PV may provide the key to discriminate passive PV from PV playing an active role.

Methods: Two subgroups of consecutive pts who underwent first-time “stepwise” ablation for PsAF were considered: 1) pts with a mechanism of AF mainly related to PV, based on procedural AF termination during PVI (the “PV-dep” group) 2) pts with a suspected “substrate-based” mechanism based on both failure to terminate AF by ablation and failure to control arrhythmia on the long term (the “Subst-dep” group). Electri-
Predictors of left atrial fibrosis in patients with atrial fibrillation referred for catheter ablation

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Introduction: Left atrial (LA) fibrosis in patients with atrial fibrillation (AF) is associated with an increased risk of AF recurrence after catheter ablation. Therefore, we searched for clinical risk factors that confer an increased risk of LA fibrosis and may influence treatment strategy.

Methods: We prospectively included 100 AF-patients undergoing electroanatomical voltage mapping-guided catheter ablation. LA low-voltage areas were measured with the CARTO3-mapping system and corrected for LA volumes by computed tomography. Blood tests including NT-proBNP and echocardiographic parameters of left ventricular function were analyzed. The H2-FPEF and HFA-PEFF scores as indicators of heart failure with preserved ejection fraction were integrated in our prediction model.

Results: Patients were 62±11 years old; 29% were female, 32% had persistent AF. LA fibrosis was present in 67%, with 41% having a bi-rotic area of >5% (≥Utah-Stage1). Mean LVEF was 55.4±11.2. Patients with LA fibrosis had higher NT-proBNP values (1022±1290 vs 492±639 ng/l, p = 0.014), larger LA volumes (BSA-corrected 63.6±20.3 vs 44.3±13.9 ml/m², p = 0.001), higher H2-FPEF and HFA-PEFF scores, and 3.5±1.5 vs 4.5±1.3, p = 0.001, respectively. Females had higher NT-proBNP values (1231±1290 vs 1022±1290 ng/l, p = 0.05), and echocardiographic measures of diastolic dysfunction (E/e' 15.1±8 vs 11±7.9, p = 0.05).

LA fibrosis was significantly associated with female gender, older age, persistent AF, increased LA volumes, hypertension, stroke, statin therapy, higher NT-proBNP values, E/e', CHA2DS2-VASc and HFA-PEFF scores. In multivariable analyses, only higher NT-proBNP values, larger LA volumes and higher HFA-PEFF score remained as independent predictors of LA fibrosis.

Conclusions: Higher NT-proBNP levels, larger LA volumes and higher HFA-PEFF scores predict LA fibrosis in AF-patients, suggesting increased left-sided filling pressures as an important driver of LA fibrosis.

Disclosure: Nothing to disclose
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Sutureless aortic bioprosthesis: is it a true benefit for the patient?

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Introduction: Sutureless aortic valves are meant to provide clinical benefit in high surgical risk patients because are associated to shorter aortic cross clamp time. This study reviews our experience with sutureless aortic valve compared to standard valves in terms of clinical outcome and tries to assess if the benefit is due to better hemodynamic or quicker surgical procedure.

Methods: From July 2016 to July 2018, 30 patients have been enrolled for isolated on pump aortic valve replacement for aortic stenosis. Half received stentless biological aortic valve (SAVR) and half received Perceval sutureless aortic valve (PAVR). Patients were homogeneous for demography and clinical indications. We collected among other parameters, aortic cross-clamp time, pre and post operative hemodynamic parameters using transesophageal echocardiography, hospital stay and 30days mortality.

Results: STS score was 2.2% (IQR, 1.3-4.9%) and 3.5% (IQR 2.6-4.3%) in group SAVR and PAVR respectively. Mean aortic cross clamp time was 55min in SAVR (range 47-68min) vs 30min in PAVR (range 25-43min) with P = <0.001. Mortality rate was 0% in both groups. The Effective Orifice Area of the prosthetic aortic valve was 1.3±0.3cm² vs 1.3±0.1cm² respectively in SAVR and PAVR (P = 0.88) calculated day 5 post intervention. Percutaneous implantation was necessary in 1 patient PAVR group. Trivial paravalvular leak was 13% in SAVR vs 20% in PAVR. Post operative intubation time was 92 min in PAVR (IQR 0-756min) vs 220min in SAVR (IQR 0-320min).

Conclusions: Perceval allows a shorter cross-clamp time to replacing the aortic valve and represents a real advantage for the surgeon making the surgical procedure easier and faster. However, this study has failed to show differences in clinical outcome according to the type of valve implanted. The true benefit for the patient remain unproved.

Disclosure: Nothing to disclose

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Meta-analysis of echocardiographic parameters predicting right ventricular failure after left ventricular assist device implant

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Introduction: Ten to 40% of patients who receive Left Ventricular Assist Device (LVAD) suffer of right ventricular failure (RVF). Patients with post-LVAD RVF tend to have poor outcomes when the right circulatory support is belated. There are several scores predicting the occurrence of RVF after LVAD implantation (The Michigan Score and the CRITT Score), but their reliability is low. We have searched for non-invasive variables to be correlated to the function of the right ventricle focusing on echo-cardiographic parameters of the right ventricle.

Material and Methods: We selected 3 parameters: tricuspid annular plane systolic excursion (TAPSE), RV fractional area change (FAC) and right ventricular global strain (GLS). TAPSE indicates RV longitudinal systolic function, while GLS is well correlated to the function of the left ventricle and could possibly be a good predictor of RVF. We searched across the literature and pooled relevant studies in a meta-analysis using a simple scoring system to identify HCM.

Results: We retain 13 studies for a total of 944 patients. 290 of these patients developed post-LVAD RVF (30.7%). Data are shown in Forrest plots. We have found a pooled standardized mean difference (SMD) of 0.6 mm for TAPSE with lower and upper tails going to -0.1 to 0.4 mm. Concerning RV FAC, summary SMD was equal to 2.70 and lower and upper extremities to 0.89 and 4.51. Finally, regarding the GLS, SMD was equal to 2.17 with incertitude of value between 0.094 and 4.24. Neither publications bias nor lack of homogeneity were observed.

Conclusions: TAPSE is not reliable in RVF prediction, particularly in severe RVF. RV FAC gives a sensible evaluation of the systolic function of RV with cut-off value of 35% associate to post LVAD dysfunction. GLS seems to be a strong predictor of RVF after LVAD but cut-off values displayed in literature do not apply to the specific pre-implantation population therefore further prospective studies are necessary to confirm them.

Disclosure: Nothing to disclose

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Hypertrophic cardiomyopathy and other forms of left ventricular hypertrophy - the P wave can make the difference

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Introduction: Structural disarray of hypertrophied myocytes and interstitial fibrosis characterize hypertrophic cardiomyopathy (HCM). These morphological changes also affect atrial myocytes and, together with hemodynamic alterations because of HCM, may lead to atrial cardiomyopathy.

The study investigates the incremental value of P-wave parameters to differentiate left ventricular hypertrophy (LVH) because of HCM from LVH in hypertensive heart disease (HHD) and athletes heart.

Methods: In a prospective study, we compared electrocardiographic (including signal-averaged ECG of the P wave) and echocardiographic data of patients with HCM, HHD and athletes heart. We developed a predictive model with a simple scoring system to identify HCM.

Table 1: Results of the investigated parameters after univariate and multivariate (*analysis)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>HCM</th>
<th>HHD</th>
<th>Athletes*</th>
<th>p-value</th>
<th>HCM vs HHD</th>
<th>95% CI</th>
<th>P-value</th>
<th>HCM vs Athletes*</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-wave duration (ms)</td>
<td>144.1± 16.5</td>
<td>133.5± 14.2</td>
<td>149.0± 16.3</td>
<td>&lt;0.001</td>
<td>-18.9</td>
<td>-29.5 to -8.2</td>
<td>&lt;0.001</td>
<td>-18.5</td>
<td>-27.7 to -9.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>P-wave integral [μV]</td>
<td>574.5± 25.9</td>
<td>622.9± 77.3</td>
<td>473.8± 220.9</td>
<td>&lt;0.001</td>
<td>-103.6</td>
<td>-220.5 to -76.8</td>
<td>0.002</td>
<td>-68.2</td>
<td>-109.7 to -32.5</td>
<td>0.187</td>
</tr>
<tr>
<td>QRS [ms]</td>
<td>110.7± 37.3</td>
<td>106.9± 91.4</td>
<td>85.6± 31.4</td>
<td>0.001</td>
<td>-16.4</td>
<td>-24.4 to -8.5</td>
<td>&lt;0.010</td>
<td>-10.9</td>
<td>-20.4 to 5.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>QTc [ms]</td>
<td>497.5± 48.5</td>
<td>432.8± 34.6</td>
<td>445.2± 25.9</td>
<td>0.001</td>
<td>-51.8</td>
<td>-92.7 to -11.0</td>
<td>&lt;0.001</td>
<td>-50.0</td>
<td>-90.3 to -9.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>LV/NMM</td>
<td>133.5± 50.3</td>
<td>133.3± 50.3</td>
<td>88.0± 18.7</td>
<td>&lt;0.001</td>
<td>-15.3</td>
<td>-29.7 to -0.9</td>
<td>0.038</td>
<td>-56.1</td>
<td>-67.3 to -46.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>IVS [mm]</td>
<td>18.5± 4.2</td>
<td>18.1± 3.7</td>
<td>18.5± 3.6</td>
<td>0.001</td>
<td>0.2</td>
<td>3.9 to 4.1</td>
<td>&lt;0.001</td>
<td>-6.4</td>
<td>-7.3 to -5.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>LAVI [mL/m²]</td>
<td>41.2± 13.9</td>
<td>30.5± 9.5</td>
<td>33.6± 9.5</td>
<td>&lt;0.001</td>
<td>-14.6</td>
<td>-25.0 to -4.2</td>
<td>&lt;0.001</td>
<td>-12.2</td>
<td>-16.6 to 7.9</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

The table shows the study result after univariate and multivariate (*), adjusting for age and sex analysis.

Figure 1 shows the allocation based on the score for the differentiation between HCM and the other forms of LVH.

Results: We compared data of 27 patients with HCM (70% males, 49.8±14.5 years), 324 patients with HHD (52% males, 74.8±5.5 years), and 215 subjects with athletes heart (72% males, 42.3±7.5). The table...
Vessel fractional flow reserve in heart transplant recipients with and without graft vasculopathy

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Introduction: To assess the usefulness of vessel fractional flow reserve (vFFR) derived from coronary angiography to detect cardiac allograft vasculopathy (CAV) in heart transplant recipients.

Methods: This retrospective study was performed in patients who underwent heart transplant between January 1987 and December 2018. In heart transplant patients referred for annual check-up, undergoing surveillance coronary angiography, the extent of CAV was graded according to the criteria proposed by the International society of heart and lung transplantation (ISHLT). In those patients, three-dimensional coronary geometries were constructed from the latest coronary angiography and pressure losses were calculated using CASS vFFR. vFFR values were obtained for each major native coronary vessel. The most distal value was used for the analysis and vFFR values ≤ 0.80 were considered as significant disease. For the patient-level analysis, the lowest vFFR value of the 3 major epicardial vessels was selected.

Results: In 65 heart transplant patients with a mean age of 53.7 ± 10.1 years, 8/5 years (IQR 1.90, 15.2) years post heart transplantation, a total number of 173 vessels (59 LAD, 61 LCX, 53 RCA) were analysed. Most donors (76.9%) and recipients (67.7%) were male. Mean donor and recipient age were 35.7 and 53.7 years, respectively. The most frequent indication for heart transplantation was ischemic cardiomyopathy. Mean vFFR was 0.84 ± 0.15, median 0.88 (IQR 0.79, 0.94). A vFFR ≤ 0.80 was present in 24 patients (46 vessels). Heart transplant patients with previous history of ischemic cardiomyopathy (ICMP) had lower vFFR as compared to those with non-ICMP (0.70 ± 0.22 vs. 0.79 ± 0.13, p = 0.06). When categorizing functional vessel characteristics by CAV classification, a significant lower vFFR (p = 0.009) and a higher percent diameter stenosis (p < 0.001) was observed in patients with higher CAV grade. Use of vFFR reclassified 31.9% of patients compared to the anatomical ISHLT criteria. Despite a CAV score of 0, a pathological vFFR ≤ 0.90 was detected in 8 patients (34.8%).

Conclusion: The impairment of coronary flow assessed by vFFR in a subgroup of patients without CAV according to standard ISHLT criteria, suggests the presence of a diffuse vasculopathy undetectable by conventional coronary angiography. Therefore, we speculate that vFFR may be a helpful tool in risk stratification post heart transplant.

Disclosure: Nothing to disclose

Type A aortic dissection mainly occurs in small aneurysms: is it time to review the guidelines on surgical treatment of ascending aorta aneurysm?

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Introduction: Current guidelines recommend prophylactic replacement of the ascending aorta at an aneurysm diameter of >55mm to prevent acute type A aortic dissection (TAAAD) (class I, level C), in non-Marfan patients. This recommendation is based on a single study of a heterogeneous cohort of only 54 patients published in 1997. Several publications have recently questioned the threshold of 55mm, suggesting that surgery should be performed in smaller aneurysms to prevent this devastating disease. We reviewed our experience to clarify the role of aortic size in the development of TAAAD.

Methods: Single centre, retrospective analysis including all patients admitted to our emergency department from 1st January 2014 to 31st October 2019 for TAAAD and received at least the replacement of the ascending aorta. Patients with Marfan syndrome or others major collagen diseases were excluded from the study. The diameter of the dissected aorta was measured on pre operative CT scan with contrast medium at the level of the pulmonary bifurcation. We estimated the aortic diameter at the level of dissection being 20% smaller than the measured dissected aorta.

Results: 117 patients underwent surgical replacement of the ascending aorta. 15 patients were excluded from the study: 8 were Marfan patients and in 7 the CT scan could not be found because done in other hospitals. Data on 102 patients were analysed: 67 were male (60%) and 35 female (40 %), mean age was 65±13 years old. 60 % were treated for hypertension. The mean height was 173 ±23 cm, for a mean weight of 80± 27 kg. Mean diameter of the dissected aorta after the 20% correction was 39.7mm (range 31.2mm-59.2mm). In men the mean diameter was 39.6 mm whilst in female was 39.9 mm (p = 0.1). 30 days mortality rate was 19.6% (20/102).

Discussion: Type A aortic dissection occurred at an aortic diameter of <40mm in 90% of our patients without Marfan syndrome. No significant difference in aortic diameters with respect to sex. The current aortic diameter threshold of 55mm excludes approximately 95% of patients with

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an acute type A aortic dissection from prophylactic replacement of the ascending aorta, therefore the diameter of 56mm should not be considered the right indication for prophylactic surgery and deserves reappraisal.

Disclosure: Nothing to disclose

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Sex and gender differences in TAVI patients: from clinical presentation to procedural outcomes

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Background: The epidemiological impact of aortic stenosis has recently grown, and indications to valvular treatment have changed substantially with the implementation in clinical practice of TAVI procedures. Significant differences according to patients’ sex are likely to be related to different biological features, but the underlying mechanisms haven’t been verified yet.

Aims and Methods: We collected from the SwissTAVI Registry the available data about 373 subjects who where consecutively treated in Cardiocentro Ticino with a TAVI procedure over the last 10 years. We compared two subgroups of female (n = 161, age 83.5±4.4 yrs) and male (n = 212, age 82.3±5.9 yrs) patients in terms of severity indices of the disease (residual valve area and transvalvular gradients). The same parameters were measured after the procedure with a quantitative estimation of eventual post-procedural paravalvular leaks.

Results: As previously reported, female patients showed significantly higher transvalvular mean gradients at baseline (48.0±16.0 vs. 42.9±14.8 mmHg; P = 0.004) on smaller residual valve areas (0.66±0.18 vs. 0.77±0.19 cm²; P <0.001). TAVI procedures were equally efficient in both sex, restoring similar valve areas and gradients, but paravalvulax leaks were more frequent and significant in females (F vs. M no leak 44.5 vs. 55.3%, mild 47.7 vs. 42.7%, moderate 6.5 vs. 1.5%, severe 1.3 vs. 0.5%; overall P = 0.037).

Conclusions: Sex-related differences are only partially described and their substrate is not clear. Female patients are known to be more prone to bleedings and cerebrovascular accidents, but our data show that also paravalvulax leaks could be more common and significant in comparison to males. A detailed analysis of the anatomy of the aortic outflow and of the valvular deterioration in aortic stenosis is required and is the aim of the second phase of this study. Understanding sex-related characteristics underlying these discrepancies can potentially improve TAVI technologies towards a further customization of prosthetic devices.

Disclosure: Nothing to disclose

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Midterm outcomes of minimally invasive combined mitral and tricuspid valve surgery

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Introduction: We use minimally invasive valve surgery through a right lateral thoracotomy (MIVS) as our standard approach. Our aim was to examine the outcomes of combined minimally invasive mitral and tricuspid valve surgery.

Methods: Baseline characteristics, in-hospital and follow-up information were collected between July 1st 2013 and October 31st 2019.

Results: We identified 270 consecutive MIVS patients out of which 25 were combined mitral/tricuspid cases (9.3%). Mean age was 72.3±7 years, Euroscore II 3±1.6, CPB time 202±8 minutes and aortic cross clamp time 133±2 minutes. In 17 patients (68%) the mitral valve was repaired using a ring with resection or artificial chordae and 8 patients (32%) received a planned replacement (bioprosthesis). All tricuspid valves were repaired with an incomplete ring. There was no operative mortality, no stroke and no rethoracotomy. Successful mitral repair rate was 100%. In-hospital mortality was 4% (n = 1, cerebral hypoxia). Median in-hospital and ICU stay was 12(9-32) and 1(1-32) days respectively. Follow up was complete in 100% for a median of 535(32-2027) days. Three patients died during follow up (one due to cardiac arrest and two due to unknown causes). All repaired tricuspid and mitral valves (except for two mitral, 8%) were competent with less than grade 2 of regurgitation. Two patients with mitral valve repair had to be reoperated (8%): one due to failed Alfieri stich with heavily calcified annulus and one due to late endocarditis.

Conclusion: Our data suggest that combined minimally invasive mitral and tricuspid valve surgery in a standard setting is safe and durable with a high rate of successful mitral repair and with good mid-term competent valves, which could serve as benchmark for future interventional procedures.

Disclosure: Nothing to disclose

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Added clinical value of soluble ST2 in addition to NTproBNP in an all-comer population of a cardiac outpatient clinic

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Objectives: The soluble form of suppression of tumorigenicity 2 (sST2), a recently introduced biomarker, is a strong and NTproBNP-independent predictor of outcome in heart failure patients. We sought to evaluate the clinical value of sST2 in addition to NT-proBNP in a heterogeneous cardiac outpatient population.

Methods: 297 all-comer patients visiting the outpatient clinic of Heart Clinic Zürich, Switzerland, from January to December 2018 were included. Patients were divided into four groups depending on their sST2 and NT-proBNP levels. Differences between groups and Spearman’s correlations, linear and multiple regression analysis for sST2 were calculated.

Results: The median patient age was 74±19 years, 41.8% were women. Figure 1 reports sST2 and NTproBNP levels of four different groups, with respective clinical and laboratory findings in table 1. 13.8% of patients had elevated sST2 levels in the presence of normal NTproBNP levels (group 2). Compared to group 1 (low-risk patients in good condition), group 2 showed significantly higher rates of coronary artery disease, peripheral vascular disease and renal dysfunction. When comparing group 3 to group 4 (both groups with elevated NTproBNP), the presence of sST2 was mainly associated with clinical signs of heart failure, higher EuroScore II and worse left ventricular ejection fraction (LVET group 3: 58.0% vs group 4: 53.3%, p = 0.022). Despite similarly elevated sST2 levels in groups 2 and 4, patients in group 4 were significantly sicker (all clinical, laboratory and echo findings worse). Correlation of sST2 was weaker than of NTproBNP with most clinical variables. sST2 significantly correlated with Euroscore II (R = .280), kidney function (R = .259), CRP (R = .248), left atrial volume (R = .199) and right ventricular function (R = .213; all p < 0.001). Dependency for sST2 was found with kidney function, left atrial size and Euroscore II (all p < 0.008). In multiple regression analysis, left atrial volume was the strongest independent predictor of sST2 elevation (p = .022).

Disclosure: Nothing to disclose

[Median sST2 and NTproBNP levels in four different biomarker groups]
ABSTRACTS OF THE CANCELLED ANNUAL MEETING OF THE SWISS SOCIETY OF CARDIOLOGY, 2020

Maximal ascending aortic diameter as a criterion for surgery indication in ascending aortic aneurysms: should it be abandoned?

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Introduction: The maximal ascending aortic diameter is the main criterion for surgery indication in patients with ascending aortic aneurysms. However, recent data suggest that indexing the ascending aortic diameter to body surface area (aortic size index - ASI) or height (aortic height index - AHII) may be superior for predicting complications rates. Aim of this study is to assess if the aortic diameter can still be used as a criterion for surgery indication in ascending aortic aneurysms.

Methods: We performed a retrospective analysis of the data of 216 patients with ascending aortic aneurysms (maximal ascending aortic diameter ≥45mm) undergoing replacement of the ascending aorta in the period 01/2013-01/2020. Excluded were patients with isolated aortic root aneurysms, thoracic aortic dissections and intramural hematomas. ASIs and AHII were calculated and used to classify the patients as having an aortic root aneurysm, thoracic aortic dissections and intramural hematomas. ASIs and AHII were also calculated. The primary endpoint was a composite of all-cause mortality and hospitalization for heart failure.

Results: The maximal ascending aortic diameter was 45-49mm in 75 (34.7%) patients, 50-54mm in 73 (33.8%) patients, 55-59mm in 44 (20.4%) patients, 60-64mm in 13 (6.0%) patients and ≥65mm in 11 (5.1%) patients. Based on the calculated ASIs, 3 (1.4%) of the patients had a low, 167 (77.3%) an intermediate, 43 (19.9%) a high and 3 (1.4%) a severe average yearly risk of complications at the time of surgery. Based on the calculated AHII, 1 (0.5%) of the patients had a low, 154 (71.3%) an intermediate, 57 (26.4%) a high and 4 (1.9%) a severe average yearly risk of complications at the time of surgery.

Conclusion: Almost all patients had an at least intermediate average yearly risk of complications, based on their calculated indexes, thus retrospectively justifying the decision for surgery. The ascending aortic diameter seems sufficient for surgery indication, although using the more informative aortic indexes should be preferred.

Disclosure: Nothing to disclose

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Pre-procedural left ventricular stroke work determines prognosis in patients undergoing transcatheter aortic valve implantation

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Background: Left-ventricular stroke work (SW) is the amount of energy the left ventricle generates with each heartbeat. Previous translational research has indicated that pre-procedural SW predicts improvement of symptoms after transcatheter aortic valve implantation (TAVI). However, it is unknown if SW also affects the prognosis after TAVI.

Methods: SW in Joules (J) was calculated using pre-procedural echocardiographic and noninvasive blood pressure measurements in patients with severe aortic stenosis undergoing TAVI. Valvuloarterial impedance (Zva) and resistive arterial load (indexed systemic vascular resistance, SVRI) were also calculated. The primary endpoint was a composite of all-cause mortality and hospitalization for heart failure.

Results: A total of 101 patients with a mean age of 82 years (53% female) were analyzed. Median follow-up was 67±57 months and the primary endpoint occurred in 47(46.5%) patients. Mean SW before TAVI was 1.57±0.51 J in patients without a primary endpoint, and 1.1±0.31 J in patients with a primary endpoint (p < 0.0001). ROC-curve shows good discriminatory ability of pre-TAVI SW: AUC 0.80 (95%CI 0.72-0.89) and indicates an optimal cut-off value of 1.30 J. Patients with a SW above this cut-off had very favorable outcomes (Figure), mainly driven by a lower incidence of hospitalization for heart failure. Patients with high pre-procedural SW had higher mean aortic valve gradients (50±14 vs. 36±15mmHg, p < 0.0001), lower Zva (4.3±1.1 vs. 5.8±1.6 mmHg*mL⁻¹*m², p < 0.0001), and lower SVRI (2250±871 vs. 3304±1292 dynes*sec/cm²/m², p < 0.0001), compared to patients with low SW.

Conclusion: Despite the low number of patients in this study, there was a significant association of pre-procedural stroke work and outcomes in patients undergoing TAVI. These findings suggest that pre-procedural SW identifies patients with a healthier myocardium that is able to operate with a higher performance despite higher aortic valve gradients, lower Zva and lower SVRI.

Disclosure: Nothing to disclose
Myocardial extracellular volume by CMR T1 mapping and arrhythmia burden in mitral valve prolapse with mitral annulus disjunction

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Background: In patients with mitral valve prolapse (MVP), mitral annular disjunction (MAD) has been associated with the presence of late gadolinium enhancement (LGE) and increased risk of sudden cardiac death. The relation between myocardial interstitial fibrosis, MAD and arrhythmia is currently unknown.

Methods: 30 patients (pts) with MVP and MAD (MVP-MAD) underwent Cardiovascular Magnetic Resonance imaging (CMR). The control group included 14 pts with mitral regurgitation and no MAD (MR-NoMAD) and 10 pts with normal CMR (NoMR-NoMAD). CMR included measurement of MAD distance, assessment of LGE, pre-contrast myocardial T1 relaxation time (T1) and extracellular volume (ECV) of the basal segments. Ventricular arrhythmia burden was evaluated by a 24h Holter in a subset of 17 pts of the MVP-MAD group.

Results: T1 was significantly higher in MVP-MAD compared to MR-NoMAD (1067±45ms vs 1029±37ms) and to NoMR-NoMAD (1032±26ms, p <0.05). ECV was significantly higher in MVP-MAD compared to NoMR-NoMAD (1067±45ms vs 1029±37ms, p <0.05) and to NoMR-MAD-MAD (1032±26ms) (Fig 1). MAD distance was associated with ECV (rho = 0.65, p = 0.0001) but not T1 (rho = 0.35, p = 0.06) or LGE extent (rho = 0.21, p = 0.25). MVP-MAD patients with ECV>31% had significantly higher PVC burden (6011 [1245-12171] vs 749 [17-2168], p <0.001). Every increase in delta mPAWP-LVEDP by 1 mmHg was associated with a 10% higher risk of death (hazard ratio 1.10 (95% confidence interval 1.05-1.15); p <0.001). The mPAWP (hazard ratio 1.07 (95% confidence interval 1.03-1.11); p = 0.001) but not LVEDP was also a predictor of mortality. The area under the receiver operator characteristics curve for the prediction of death was numerically larger for delta mPAWP-LVEDP vs for mPAWP (0.71 vs. 0.68).

Conclusions: Delta mPAWP-LVEDP>0 characterizes patients with more severe AS, more advanced cardiac dysfunction, a worse hemodynamic profile, and worse long-term prognosis after valve replacement. Thus, the relationship between MVP-MAD and LVEDP is clinically meaningful in severe AS.

Disclosure: Nothing to disclose

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Importance of the relationship between mean pulmonary artery wedge pressure and left ventricular end-diastolic pressure in severe aortic stenosis

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Introduction: There is increasing evidence that the mean pulmonary artery wedge pressure (mPAWP) and the left ventricular end-diastolic pressure (LVEDP) are not interchangeable but may differ substantially, and that this may be clinically relevant. We assessed the difference between mPAWP and LVEDP (delta mPAWP-LVEDP) in patients with aortic stenosis (AS), its clinical determinants, and its prognostic impact.

Methods: We studied 335 patients with severe AS (indexed aortic valve area 0.42±0.13 cm²/m², left ventricular ejection fraction (LVEF) 57±12%) undergoing left and right heart catheterization prior to valve replacement. The clinical endpoint was all-cause mortality.

Results: Overall mPAWP was lower than LVEDP (16.8±3.1 mmHg vs 21.8±3.1 mmHg; p <0.001; mean delta mPAWP-LVEDP 5±7 mmHg). In 88 patients, mPAWP was higher than or equal to LVEDP (delta mPAWP-LVEDP >0), whereas in 247 patients, mPAWP was lower than LVEDP (delta mPAWP-LVEDP <0). Patients with delta mPAWP-LVEDP>0 had smaller indexed aortic valve area, lower LVEF, larger left atrial area, higher prevalence of moderate or severe mitral regurgitation, higher mean pulmonary artery pressure, mPAWP, and pulmonary vascular resistance, lower LVEDP and stroke volume index (Table), and higher prevalence of atrial fibrillation. After a median follow-up of 1484 (1064-1944) days, mortality was higher in patients with delta mPAWP-LVEDP <0 (Figure; log rank p = 0.001). Every increase in delta mPAWP-LVEDP by 1 mmHg was associated with a 10% higher risk of death (hazard ratio 1.10 (95% confidence interval 1.05-1.15); p <0.001). The mPAWP (hazard ratio 1.07 (95% confidence interval 1.03-1.11); p = 0.001) but not LVEDP was also a predictor of mortality. The area under the receiver operator characteristics curve for the prediction of death was numerically larger for delta mPAWP-LVEDP vs for mPAWP (0.71 vs. 0.68).

Conclusions: Delta mPAWP-LVEDP>0 characterizes patients with more severe AS, more advanced cardiac dysfunction, a worse hemodynamic profile, and worse long-term prognosis after valve replacement. Thus, the relationship between MVP-MAD and LVEDP is clinically meaningful in severe AS.

Disclosure: Nothing to disclose

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Short-term changes of body composition and physical capacity following corticosteroid weaning after heart transplantation

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Introduction: Maximal exercise capacity remains limited to the 50-70% level of age-group predicted values in most heart transplant (HTx) recipients. Corticosteroid treatment, an indispensable part of the immunosuppression within the first year after HTx, is known to promote sarcopenia. This pilot study investigated body composition (BC) and maximal aerobic capacity (peak VO2) at 1 and 2 years after HTx.

Method: BC was assessed by Dual-Energy X-Ray Absorptiometry for measurement of Fat Mass Index (FMI), Visceral Adipose Tissue (VAT), and Appendicular Lean Mass Index (ALMI), a surrogate for appendicular skeletal muscle mass. Peak VO2 was determined by standard cardiopulmonary exercise testing.

Results: Table 1 contains patient characteristics (n = 12). Overall, FMI was 9.48±1.72 at 1 year, corresponding to an excess of fat (FMI >9

[Table]
kg/m²). An 11% reduction of FMI (p = 0.002) and VAT (p = 0.02) were observed at 2 years (figure 1, table 2), while ALMI increased marginally (6.13±1.07 to 6.24±1.08 kg/m²; p = 0.56) to remain in the sarcopenic range for males (ALMI < 7.23 kg/m²). In the subgroup of females, ALMI also indicated sarcopenia (< 5.67 kg/m²) without significant improvement at 2 years (5.20±0.56 to 5.25±0.52; p = 0.66), but FMI was in the normal range (5-9 kg/m²) and did not decrease significantly (8.72±1.50 to 8.08±1.23; p = 0.27). Of note, females were younger (43.6±12.7 vs 56.2±15.2 years; p = 0.04), with lower BMI at 1 year compared to males (22.2±2.3 vs 26.6±3.8 kg/m²; p = 0.04). Peak VO₂ were always reduced to 8.08±1.23; p = 0.27). Of note, females were younger (43.6±12.7 vs 57.1±9.1 years; p = 0.04), with lower BMI at 1 year compared to males (22.2±2.3 vs 26.6±3.8 kg/m²; p = 0.04). Peak VO₂ were always reduced and did not improve significantly (14.7±0.6 to 15.6±3.5 ml/kg/min; p = 0.12). In the subgroup of females, ALMI indicated sarcopenia (<5.67 kg/m²) without significant improvement at 2 years (5.20±0.09; p = 0.004) were observed, without significant change of peak VO₂ (14.7±3.4 to 16.0±5.1 ml/kg/min; p = 0.66). The role of sarcopenia in these patients warrants further exploration.

**Conclusions:** This pilot study shows persistence of sarcopenia in Htx recipients at 2 years after Htx despite of early weaning of corticosteroid treatment. The role of sarcopenia in these patients warrants further exploration.

**Disclosure:** Nothing to disclose

### Table 1

<table>
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<th>Age at Htx [years]</th>
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</tr>
<tr>
<td>Weight at Htx [kg]</td>
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</tr>
<tr>
<td>BMI at Htx [kg/m²]</td>
<td>23.5±2.7</td>
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<tr>
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</tr>
<tr>
<td>Diabetes [%]</td>
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</tr>
<tr>
<td>Dyslipidemia [%]</td>
<td>42</td>
</tr>
<tr>
<td>Donor age [years]</td>
<td>54.4±15.5</td>
</tr>
<tr>
<td>Donor sex [% male]</td>
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</tr>
<tr>
<td>Ischemic time [min]</td>
<td>16±4</td>
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</table>

### Table 2

<table>
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<tr>
<th>Heart rate [% of predicted]</th>
<th>68.4±9.1</th>
<th>72.6±12.3</th>
<th>4.2</th>
<th>-2.5 to 11.0</th>
<th>0.188</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaerobic Threshold [% of predicted pVO₂]</td>
<td>30±6.7</td>
<td>32.2±11.1</td>
<td>3.1</td>
<td>-4.2 to 10.5</td>
<td>0.388</td>
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**Conclusion:** To balloon or not to balloon in ECMO dependent low cardiac output - effects of intra-aortic balloon-pump on coronary blood flow

**Methods:** The in-vitro setup includes a silicon model of the main systemic circulation, connected to a pulsatile pump that replicates the left ventricular (LV) cardiac output (CO). The circuit is filled with glycerol/water to reproduce blood rheology. Progressive heart failure (HF) is simulated through decreasing pump output (CO) from 5->2L/min while keeping overall flow stable at 5l/min by compensating with increasing continuous ECMO flows from 0->3L/min. A pressure driven semi-automatic IABP is added to study changes in coronary flow during each flow scenario and at a heart rate (HR) of 60 and 100 b/min. A novel coronary artery model with synchronized varying resistance simulates the effect of LV contraction and the flow waveform is measured with transonic sensors.

**Results:** Coronary mean flow at baseline condition (CO 5L/min), for intermediate (CO 3L/min) and severe (CO 2L/min) LV failure level is presented in Fig.1 at an HR of 60/min. IABP increased coronary flow in these three conditions by 16%, 7.5% and 3.4% respectively. When increasing HR to 100/min, IABP increased coronary flow by 6%, 4.5% and 2.5% respectively.

**Conclusions:** ECMO support remains of key importance in acute cardiogenic shock patients. Clinically added IABP remains matter of debate. Our results show important insights to the contribution of IABP when combined with ECMO impacting coronary flow, depending on the HR and degree of ECMO support in a high fidelity in-vitro model.

**Disclosure:** Nothing to disclose

**Fig 1.** Mean coronary flow for different cardiac outputs of 5, 3 and 2L/min for an heart rate of 60/min. * represents the change of coronary mean flow
Mid-term results after aortic valve replacement using autologous pericardium

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Introduction: Long-term data from a single centre showed the safety and durability of aortic valve replacement/neoucuspization using autologous pericardium (OZAKI technique). Since validation data from other centres are missing, aim of this study was to analyse the mid-term follow-up data of our first patients that were operated with the OZAKI technique.

Methods: Between September 2015 and May 2017, 35 patients (24 males, median (IQR) age 72.0 (59.0, 76.0) years) suffering from aortic stenosis (AS; n = 10), aortic regurgitation (AR; n = 13) or a combination of both (AS/AR; n = 12), were assigned for an OZAKI procedure. Echocardiographic mid-term follow-up was performed using a standardized examination protocol.

Results: Clinical follow-up was completed in 97% of the patients. Median (IQR) follow-up time was 645 (430, 813) days. Mortality rate was 9% (n = 1: aspiration pneumonia; n = 1: unknown; n = 1: anaphylactic shock; Figure 1), and the reoperation rate was 3% (n = 1: endocarditis; Figure 2). No pacemaker implantation was necessary after isolated OZAKI procedures. Echocardiographic follow-up was performed in 83% of the patients (n = 29; median (IQR) time 684 (496, 815) days). Median (IQR) mean and peak gradients were 6 (5.9) mmHg and 12 (8.25, 17) mmHg. Moderate aortic regurgitation was seen in 2 patients (7%). No severe aortic regurgitation or moderate or severe aortic stenosis occurred within the follow-up period.

Conclusion: The OZAKI technique is reliable and reoperation due to structural valve deterioration nil within a mid-term follow-up period. The low rate of moderate aortic regurgitation will be surveilled very closely. Further studies are required to evaluate the significance of this procedure in aortic valve surgery.

Disclosure: Nothing to disclose

Outcome of transapical and direct transaortic transcatheter aortic valve implantation in high-risk patients

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Objective: Transcatheter aortic valve implantation (TAVI) through alternative surgical access sites is indicated in high-risk patients with aortic valve stenosis and concomitant vascular disease or small vascular diameters. We analysed the clinical outcome of 126 consecutive patients who underwent transapical (TA) and direct transaortic (TAO) TAVI procedures.

Methods: From March 2012 to January 2020, 64 transapical (TA-group) and 62 transaortic (TAO-group) TAVI procedures were performed by an hospital Heart-Teams with balloon-expanding and self-expanding transcatheter valve prosthesis. Clinical data from the two groups were prospectively collected and retrospectively analysed.

Results: Mean age was 80.33±6.37 and 82.18±6.81 years, in the TA and TAO-group, respectively. Female gender was more represented in the TAO-group: 61% vs 33% (p <0.001) while TA-group showed higher prevalence of previous vascular surgery (17% vs 3%, p <0.001), coronary disease (76% vs 88%, p <0.001), previous cardiac surgery (47% vs 3%, p <0.001), previous CABG (39% vs 3%, p <0.001), kidney failure (42% vs 30%) and porcelain aorta (23% vs 3%; p <0.001). EuroSCORE II was 9.3±9 (TA) and 6±6.8 (TAO). Mean LVEF was 48±15 (TA) and 53±13 (TAO). More patients in the TA group had pulmonary hypertension (45% vs 37%). In total, 95 (75%) Sapien, 28 (22.5%) CoreValve and 3 (2.5%) Accute valves were implanted. Procedural time was shorter in TA-group (97±27 vs 119±46 minutes) while bailout valve-in-valve for malpositioning was performed in TA-group only (3 cases). 63% of patients were extubated in the hybrid room. Hospital mortality: 6 TA (9%) and 4 TAO (6%). Rethoracotomy for bleeding: 2 TA (3%) and 5 TAO (8%). Stroke was never detected. New pacemakers were 5 (8%) in TA- and 4 TAO (6%). Rethoracotomy for bleeding: 2 TA (3%) and 5 TAO (8%). Stroke was never detected. New pacemakers were 5 (8%) in TA- and 4 TAO (6%). Rethoracotomy for bleeding: 2 TA (3%) and 5 TAO (8%). Stroke was never detected. New pacemakers were 5 (8%) in TA- and 4 TAO (6%). Rethoracotomy for bleeding: 2 TA (3%) and 5 TAO (8%). Stroke was never detected. New pacemakers were 5 (8%) in TA- and 4 TAO (6%). Rethoracotomy for bleeding: 2 TA (3%) and 5 TAO (8%). Stroke was never detected. New pacemakers were 5 (8%) in TA- and 4 TAO (6%). Rethoracotomy for bleeding: 2 TA (3%) and 5 TAO (8%). Stroke was never detected. New pacemakers were 5 (8%) in TA- and 4 TAO (6%).

Conclusions: In our study, TA and TAO-TAVI presented different risk profiles and hospital mortality was correctly predicted by EuroSCORE. Transapical procedures were performed faster with a higher incidence of moderate paravalvular leak.

Disclosure: Nothing to disclose

Prognostic value of health-related quality of life in patients with acute dyspnea

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Background: Previous studies have shown the prognostic value of health-related quality of life (HRQL) in stable chronic heart failure patients. However, it is unknown whether HRQL can predict all-cause mortality in patients presenting to the emergency department (ED) after acute onset of symptoms. In order to address this unmet need, the aim of this study was to assess the prognostic value of HRQL in patients...
with acute dyspnea caused by acute heart failure (AHF) and other dyspnea aetiologies for 360-day mortality.

Methods: Basics in Acute Shortness of Breath Evaluation (BASEL V) is a prospective, multicenter, diagnostic study enrolling adult patients presenting with acute dyspnea to the ED. For this analysis, only patients with a complete set of variables necessary for calculation of EQ-SD (range 0-10) and EQ VAS (range 0-100) at baseline were included. The endpoint was the prognostic value of EQ-SD and EQ VAS at 360 days of follow-up regarding all-cause death. Prognostic accuracy was calculated using c-statistics. In a cox regression analysis EQ-SD was treated as both, a continuous and categorical variable. Adjustments were made for clinically relevant covariates (age, sex, orthopnoea, edema, level of N-terminal pro-B-type natriuretic peptide (NT-proBNP) at presentation, history of coronary artery disease and chronic obstructive pulmonary disease, diuretics, β-blockers and ACE-inhibitors at discharge).

Results: Among 2605 patients enrolled, 1141 (43.8%) had a complete set of variables allowing the calculation of EQ-SD and EQ VAS. Of these patients 594 (52.1%) had an adjudicated final diagnosis of AHF. 211 (18.5%) patients died within 360 days of follow-up. Median EQ-SD was 3 (interquartile range (IQR) 1.5-5) and median EQ VAS was 50 (IQR 40-70). The prognostic accuracy for 360-day mortality was 0.65 (95% confidence interval (CI) 0.61-0.69) and 0.58 (95% CI 0.54-0.62) for EQ-SD and EQ VAS, respectively (p = 0.002). The prognostic accuracy of EQ-SD was comparable to that of NT-proBNP (c-statistics 0.69, p = 0.385). In an adjusted cox regression analysis the hazard ratio for patients with EQ-SD >4 was 2.2 (95% CI 1.7-2.9; p <0.001).

Conclusions: In patients presenting with acute dyspnea HRQL is a strong prognostic instrument. Independently of the aetiology of the dyspnea the prognostic value of the generic EQ-SD for 360-day mortality is comparable to NT-proBNP. Patients with an EQ-SD >4 are at significantly higher risk for mortality within 360 days.
Results: Clinical characteristics, conventional echocardiography, and strain analysis results are detailed in Figure 1 (A and B). Myocardial work index was significantly reduced in rEF-LVNC (1088 [138-1211 mm.Hg%]) and pEF-LVNC (1394 [1138-1501 mm.Hg%]) in comparison to control (1827 [1758-1981 mm.Hg%]), but there was no difference between the two LVNC groups. Global constructive work (GCW) was significantly lower in rEF-LVNC (1094 [947-1281 mm.Hg%]) than in pEF-LVNC (1730 [1368-1691 mm.Hg%]) (p = 0.001), while both LVNC groups were lower than control (2201 [1965-2406 mm.Hg%]) (pEF-LVNC p = 0.001, rEF-LVNC p <0.0001). Global wasted work (GWW) was significantly lower in rEF-LVNC (204 [181-231 mm.Hg%]) than in pEF-LVNC (154 [115-171 mm.Hg%], p <0.0001) and control (61 [45-98 mm.Hg%], p  <0.0001). Global work efficiency (GWE) was significantly lower in rEF-LVNC (18.3 [15.4-19.6 %], p = 0.001) than in pEF-LVNC and control. In both pEF-LVNC and rEF-LVNC, impaired GWE and GCS were the parameters most significantly associated with increased risk of cardiovascular events as detailed in Figure 2.

Conclusion: MWA is a promising parameter for risk assessment of LVNC patients especially because it is less load-dependent and, unlike LVEF, incorporates left ventricular haemodynamics.

Disclosure: Nothing to disclose

209 Direct Comparison of BNP and NT-proBNP for mortality prediction in patients with acute dyspnea

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Introduction: It is unclear whether BNP or NT-proBNP, their admission or discharge measurement or percentage change during hospitalization are preferable for mortality prediction in patients with acute dyspnea. We therefore, directly compared BNP and NT-proBNP regarding their potential in mortality prediction in patients with acute dyspnea and in patients with dyspnea due to acute heart failure (AHF).

Methods: In a prospective multicenter diagnostic study the presence of AHF was centrally adjudicated by two independent cardiologists among patients presenting with acute dyspnea. The levels of BNP and NT-proBNP were measured at presentation and discharge. Patients were stratified according to their natriuretic peptide response (responders vs. non-responders: natriuretic peptide decrease ≥25% vs. <25% before discharge). Prognostic accuracy for 720-day mortality was quantified using the area under the receiver-operating-characteristic curve (AUC). Cox proportional hazard models were constructed to identify significant predictors for 720-day mortality.

Results: Among 1156 patients presenting with acute dyspnea, 353 (30.5%) died within 720 days of follow-up. Prognostic accuracy for death at 720 days was significantly higher for discharge compared to admission measurements for BNP (AUC 0.750 vs. 0.711, p <0.001) and NT-proBNP (AUC 0.769 vs. 0.720, p <0.001). When directly comparing discharge measurements, NT-proBNP levels exhibited a significantly higher accuracy (p = 0.013). 632 (54.6%) and 600 (51.9%) patients were BNP and NT-proBNP non-responders, respectively. Among BNP and NT-proBNP non-responders 202 (32%) and 207 (34.5%) patients died within 720 days of follow-up. After adjusting for common covariates NT-proBNP response was the strongest predictor for 720-day mortality in a Cox regression model (Hazard ratio for NT-proBNP non-responders: 2.096 (95%CI 1.550-2.835), p <0.001). Results were confirmed in a sensitivity analysis of 687 (59.4%) patients with adjudicated AHF.

Conclusion: Percentage change of NT-proBNP during hospitalization seems to be the strongest predictor for long-term mortality in patients with acute dyspnea in general and in those with dyspnea due to AHF in particular.

Disclosure: Nothing to disclose
Lamin A/C cardiomyopathy: don’t miss it and grasp the nettle

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Introduction: Lamin A/C (LMNA) mutations have been associated with dilated cardiomyopathy (DCM) with variable arrhythmic expression. We investigated prevalence and phenotypic expression of LMNA mutations among patients (pts) with DCM with or without cardiac conduction disorders (CCD) as well as with isolated CCD and/or sinus node dysfunction (SND) referred to our center.

Methods: From January 2005 to December 2019, 14 pts with unexplained isolated DCM, 13 pts with DCM associated with CCD and 5 pts with unexplained isolated CCD and/or SND underwent genetic testing. Family screening was performed among mutation-carriers’ (MCs) family members.

Results: Four (31%) LMNA pathogenic mutations were detected in 13 pts with DCM associated with CCD, while no mutation was identified in the pts’ groups with pure DCM or isolated CCD/SND. Family screening allowed for diagnosing 3 additional LMNA-MCs. Genotype-phenotype correlation among the 7 LMNA-pts showed a mean age at diagnosis of 49 ±15 years and a mean left ventricle ejection fraction of 44 ±19%. All pts had CCD: 4 (57%) underwent first a pacemaker implantation due to high degree AV block (3 pts) and SND (1 pt) but a defibrillator (ICD) was finally implanted in all pts (100%). Two pts presented with episodes of non-sustained and sustained ventricular tachycardia respectively, while six pts (86%) developed atrial arrhythmias. One pt (14%) experienced aborted sudden death due to ventricular fibrillation, while two (29%) pts underwent heart transplantation. Table 1.

Conclusions: The association of DCM with CCD should strongly raise the suspicion for LMNA cardiomyopathy as confirmed by a 31% prevalence of LMNA mutations among our pts. Genotype-phenotype correlation in our population highlights the heavy clinical burden of LMNA-MCs leading to ICD implantation in all pts and to heart transplantation in 29% of cases. Due to the aggressive clinical course, early diagnosis and prompt therapeutic management are mandatory.

<table>
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<tr>
<th>Patient no</th>
<th>Sex</th>
<th>Left Ventricle Ejection Fraction (LVEF)</th>
<th>Cardiac Conduction Disorders</th>
<th>Supraventricular Arrhythmias</th>
<th>Ventricular Arrhythmias</th>
<th>Device</th>
<th>ICD indication</th>
<th>Heart transplantation</th>
<th>Mutation</th>
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<td>1</td>
<td>M</td>
<td>61 -&gt; 44</td>
<td>II° Mobitz I and III° atrioventricular block</td>
<td>Atrial fibrillation</td>
<td>Sustained ventricular tachycardia (SVT)</td>
<td>PM -&gt; CRT-D</td>
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<tr>
<td>2</td>
<td>F</td>
<td>50</td>
<td>II° and paroxystic III° atrioventricular block + sinus node dysfunction</td>
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<td>PM -&gt; ICD</td>
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<td>Multilevel atrioventricular block</td>
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<td>VF, LVEF</td>
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<td>Atrial fibrillation, atrial flutter</td>
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<td>ICD -&gt; CRT-D</td>
<td>male sex, non-missense mutation</td>
<td>No</td>
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[Patients’ clinical characteristics]

Disclosure: Nothing to disclose
Use of induction therapy in pediatric heart transplant recipients in Switzerland

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**Background:** Evaluation of induction therapy practice in a national pediatric heart transplant program.

**Methods:** Retrospective analysis of the Swiss Transplant Cohort Study (STCS). Ethical approval as well as approval by the STCS were granted.

**Results:** Between 05/2008 and 6/1/2018 347 heart transplantations were registered within the database. Out of these 32 transplants were done in 31 patients (11, <19ys of age in four centers. Twelve patients (38%) were bridge with a VAD to transplant. One patient received a re-transplant. There were no combined transplants with other organs.

Mean age at time of transplant was 7.6 years (±1.1). 11 patients were on a VAD prior to transplant. Primary diagnosis were: DCMP (22), CHD other than DCMP (4), other (5). All donors were brain dead donors. Mean ischemic time was 123 minutes (±13.8). Compared to adults where 4.1% of patients received no induction therapy it was given at a median of 4 days (1-63) in all patients of the study group (9 patients received IL2 alone).

4.1% of patients received no induction therapy. Median time to first treated rejection was 233 days (±SD 727) without significant difference if treated with IL2 or ATG (p:0.5).

**Conclusion:** Induction therapy is widely accepted in Switzerland. Negative long term effects especially PTLD were not reported.

**Disclosure:** Nothing to disclose

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**Effect of comprehensive vasodilation vs usual care on mortality and heart failure rehospitalization in women with acute heart failure**


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**Introduction:** Guidelines recommend evaluating the risk/benefit ratio of novel therapies individually in women and men, as the pathophysiology and the response to treatment may differ between women and men. Among patients with acute heart failure (AHF), a strategy of intensive vasodilation, compared with usual care, could provide comparable outcomes. We therefore, evaluated the effect of a strategy that emphasized early intensive and sustained vasodilation in women with AHF.

**Methods:** In a randomized, open-label blinded-end-point trial patients hospitalized for AHF were enrolled in 10 hospitals in Switzerland, Bulgaria, Kantonspital St. Gallen, St. Gallen, Switzerland; 1Universidade de Sao Paulo, Sao Paulo, Brazil; 2Kantonspital Luzern, Luzern, Switzerland; 3Universidade de Sao Paulo, Sao Paulo, Brazil; 4Heart Institute (INCCOR), University of Sao Paulo Medical School, Sao Paulo, Brazil; 5Department of Cardiology, Luzerner Kantonsspitale, Luzern, Switzerland; 6Department of Internal Medicine, University Hospital Basel, Basel, Switzerland; 7University Medical Center, Johannes Gutenberg University Mainz, Mainz, Germany

**Background:** Early initiation of high-dose intravenous nitrates improved outcomes in acute heart failure (AHF) with severe pulmonary edema. However, in a recent randomized controlled trial aggressive preload and afterload decrement in patients with AHF did not significantly improve all-cause mortality or AHF rehospitalisation. Beyond these classical endpoints, patient reported outcomes including symptoms that lead to physical and social limitations are of major importance. It is unknown, whether early aggressive vasodilatation may improve health-related quality of life (HRQL).

**Methods:** Goal-directed AfterLoad Reduction in Acute Congestive Cardiac Decompensation Study (GALACTIC) was a prospective, multicenter, randomized, interventional controlled trial enrolling adult patients presenting with AHF. HRQL was assessed after discharge by disease-specific Kansas City Cardiomyopathy Questionnaire (KCCQ) and generic EQ-5D. We focused on the development of KCCQ total symptom and overall score (KCCQ-tss; KCCQ-os) and of the 5 dichotomized dimensions of EQ-5D (no/any problems) over a period of 180 days. Changes were compared between the intervention and the standard care group using empirical bootstrap to estimate the variation of point estimates.

**Results:** Among 781 patients 171 (22%) and 269 (34%) had completed KCCQ and EQ-5D, respectively. In both analysed samples intensive vasodilatation and standard care groups were equally proportioned (33% and 52% of patients in intervention group) and had comparable baseline.
characteristics including HRQL. Among adverse events, dizziness, headache and hypotension were more frequent in the intervention group. After 180 days KCCQ-tss and KCCQ-os had improved similarly in both groups (median change of KCCQ-tss and KCCQ-os 24 (interquartile range (IQR) 7 - 47) vs 24 (IQR 8 - 45); p-value for comparison 0.740). The only dimension of EQ-5D which differed significantly was anxiety/depression. The standard care group had 11%patient less with anxiety/depression compared to baseline; in contrast, additional 11% patients in the intervention group had anxiety/depression after 180 days (p-value 0.045).

Conclusions: Among patients with AHF, a strategy of early intensive and sustained vasodilatation, compared with usual care, did not significantly improve HRQL measured by disease-specific and generic instruments at 180 days. Increased anxiety/depression after aggressive vasodilatation could be consequences of more frequent adverse events.

Disclosure: Dr Goudev reported receiving personal fees (speaking honoraria and advisory board membership) from Pfizer, Novartis, AstaZeneca, and Amgen. Dr Walter reported receiving grants from the Swiss Heart Foundation and the Swiss Academy of Medical Sciences. Dr Gualandro reported receiving personal fees from Servier. Dr Kobza reported receiving grants from Biosense Webster, Biotronik, Medtronic, Abbott, SIS Medical, and Boston Scientific. Dr Müñzel reported being the principal investigator of the OZHK (German Center for Cardiovascular Research) Partner Site Rhine-Main. Dr Mueller reported receiving grants from the Swiss National Science Foundation, the Swiss Heart Foundation, the Foundation for Cardiovascular Research Basel, and the Stanley Johnson Foundation; grants, personal fees, and nonfinancial support from Roche Diagnostics, Singulex, and Brahms; personal fees from Novartis, Cardiorentis, and Boehinger Ingelheim; and grants and nonfinancial support from Abbott. No other disclosures were reported.

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ARVC specific autoantibodies identify cardiac sarcoidosis and correlate with inflammation activity

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Introduction: Cardiac sarcoidosis (CS) is an inflammatory granulomatous disease of unknown origin. CS and arrhythmogenic right ventricular cardiomyopathy (ARVC) are overlapping syndromes. With both, patients are at increased risk of ventricular arrhythmias and sudden cardiac death. However, the diagnosis of CS is challenging, especially in patients with no extracardiac involvement, but correlative diagnosis has large therapeutic impact. Recently, a novel diagnostic autoantibody (anti-DSG2 Ab) was identified in ARVC. We sought to identify this antibody in CS patients and correlate its levels with inflammation activity using cardiac positron-emission-tomography (18-FDG-PET).

Methods: Recombinant human desmoglein-2 (DSG2) proteins on western blots were exposed to sera as well as purified IgG of 14 patients with CS (all confirmed by histology) and 6 controls (1 ARVC patient (positive control) and 5 healthy subjects (negative control)). Clinical patient characteristics were correlated to detected antibody intensity levels.

Results: Anti-DSG2 Abs were identified in 43% (6/14) and were detected faintly (below cut off level) in 21% (3/14) of all CS patients. Antibody was also present in the ARVC patient (1/1). Absence of antibody in all (5/5) control subjects. Myocardial inflammation was present on 18-FDG PET imaging in all CS patients with positive anti-DSG Abs, corresponding to an average SUVmax (standardized uptake value) of 8.1 ± 2.2. In patients with faint or no antibody, the SUVmax values were significantly lower with 1.2 ± 2.1 and 3.2 ± 4.0, respectively (P = 0.044, one-way ANOVA). The Pearson correlation coefficient (R) was 0.6 (P = 0.037) for SUV vs. higher antibody levels assessed by pixel count of the western blot bands for purified IgG.

Conclusions: Anti-DSG2 Abs are not only a specific biomarker for ARVC, but are also found in CS, suggesting a similar pathophysiological mechanism in these overlapping syndromes, both involving cardiac inflammation and myocyte cell death. Antibody levels seem to correlate with disease activity on cardiac PET imaging. Larger cohorts are necessary to confirm these findings.

Disclosure: Nothing to disclose

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Prognostic value of disease-specific health-related quality of life in patients with acute heart failure

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Background: Despite the striking progress made in the treatment of heart failure, rehospitalization rate and mortality remain a major unpredictable problem. Previous studies have shown the prognostic value of
Health-related quality of life (HRQL) in stable chronic heart failure patients. However, it is unknown, whether HRQL can predict all-cause mortality or rehospitalisation in acute heart failure (AHF). In order to address this unmet need, the aim of this study was to assess the prognostic value of HRQL in patients presenting with AHF. HRQL was assessed after admission by Kansas City Cardiomyopathy Questionnaire (KCCQ). We focused on the prognostic value of KCCQ overall score (KCCQ-os) and explored its association with all-cause mortality and AHF rehospitalisation at 180 days of follow-up. Patients were grouped according to their KCCQ-os: high-risk (0 to 25), moderate-to-high-risk (25 to 50), low-to-moderate-risk (>50 to 75) and low-risk group (>75-100). Cumulative incidences were displayed in Kaplan-Meier curves and groups were compared by log rank tests (figure 1). Adjustment was made using logistic regression models.

Results: Among 781 patients 367 (47%) had a complete set of variables to calculate KCCQ-os. Over 180 days out of 367 patients 45 (12%) died and 168 (46%) were hospitalised for any reason, 74 (20%) of which due to AHF. Median KCCQ-os was 41 (IQR 27-62), with 19% of patients attaining the high-risk group and 10% the low-risk group. Patients from the low-risk group had significantly less AHF rehospitalisation events compared to the other 3 quartiles (p-value for comparison between high- and low-risk group 0.023). After adjusting for common covariates the odds ratio (OR) of the low- and the high-risk group differed significantly (OR of low-risk group 0.172; 95% confidence interval 0.035-0.843; p = 0.030). In contrast, KCCQ-os did not allow to predict mortality or all-cause rehospitalisation.

Conclusions: Health status, measured by KCCQ among those patients with AHF, is strongly associated with rehospitalisation for heart failure, but not mortality or all-cause rehospitalisation. AHF patients with high KCCQ-os are unlikely to be readmitted for AHF in 180 days.
Results: One hundred and twenty-two patients received a Perceval S during the study period, of which 17 (16% women) had BAV, all of them Sievers type 1. Eleven patients (6%) required SCAP before implantation in order to ensure better anchoring of the Perceval-S. Only one (6%) implantation failed and required to change for a sutured valve. In-hospital mortality was zero. There was no stroke, only one AV-block (6%) during the study period, of which 17 (35% women) had BAV, all of them.

Conclusions: Perceval-S implantation in BAV Sievers type 1 is safe and feasible, but a SCAP is often helpful to ensure its anchoring. Larger studies and longer follow-up remain necessary in order to validate this practice.

Disclosure: The cardiac surgery department is supported by Livanova for the SURE-AVR registry.

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Novel echocardiographic methods for outcome prediction in patients with arrhythmogenic right ventricular cardiomyopathy

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Introduction: Echocardiography plays an important role in the diagnosis of Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC). It is not known whether tissue Doppler imaging (TDI) alone or in combination with other echocardiographic parameters is useful for predicting outcome in ARVC. In this study, we aimed at understanding the association of different functional echocardiographic parameters including TDI with outcome in ARVC.

Methods: We studied 63 ARVC patients, 54 patients (86%) with definite and 9 (14%) with borderline ARVC according to the 2010 task force criteria. Clinical and echocardiographic parameters including TDI and speckle tracking derived deformation analysis were collected over a median follow-up time of 1935 days.

The composite endpoints examined are described as first combined endpoints including cardiovascular mortality and heart transplantation (7 patients, 11 %) and second combined endpoint including all sustained ventricular arrhythmias (21 patients, 33 %).

Results: Cardiovascular Mortality was significantly associated with changes in right-sided chamber morphology and function such as right ventricular (RV) end diastolic area (EDA) (β = 1.14, p = 0.029), right atrial (RA) diameters (β = 4.17, p = 0.001), and tricuspid annulus plan systolic excursion (TAPSE) (β = 1.43, p = 0.001). A decline in left ventricular (LV) ejection fraction was associated as well (β = 1.08, p = 0.004). Furthermore, cardiovascular mortality was significantly associated with systolic RV and LV TDI-derived parameters such as tricuspid S' (β = 1.48, p = 0.029), septal S' (β = 2.13, p = 0.037) and lateral S' (β = 1.58, p = 0.029). Endocardial RV global longitudinal strain (GLS) also displayed association (β = 1.58, p = 0.001) with events. Similarly, sustained ventricular arrhythmias were significantly associated with RV EDA (β = 1.05, p = 0.014), FAC (β = 1.05, p = 0.015), and TAPSE (β = 1.11, p = 0.011). Furthermore, ventricular arrhythmias were associated with RV and LV systolic TDI-derived parameters such as tricuspid S' (β = 1.275, p = 0.015) and septal S' (β = 1.362, p = 0.023). RV GLS (β = 1.204, p = 0.007) also was associated with events.

Conclusion: TDI derived parameters were significantly associated with mortality and ventricular arrhythmias in ARVC patients. Hence, TDI is useful for outcome prediction in echocardiographic evaluation of ARVC. This is particularly interesting because TDI measurements are relatively easy to obtain, in particular in patients with difficult echocardiographic windows.

Disclosure: Nothing to disclose

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One shot Del Nido versus Buckberg cardioplegia for minimally invasive aortic valve replacement

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Introduction: Del Nido cardioplegia (DLC) is frequently used for myocardial protection during adult cardiac surgery with acceptable safety and efficacy. The advantage of single-dose cardioplegia is appreciated especially in minimally invasive surgery. We introduced DLC 3 years ago with promising outcomes and retrospectively assessed its potential impact to operative times, postoperative myocardial injury and early outcomes.

Methods: A total of 123 consecutive isolated minimally-invasive aortic valve replacement were analyzed. From August 2003 to June 2015 the prevalent approach was right anterior minithoracotomy and Buckberg cardioplegia (BC) (n = 56). From July 2015 to December 2019 the prevalent approach was upper ministernotomy and DLC (n = 66). Intraoperative and postoperative data were retrospectively reviewed and compared using t-test and chi-squared test.

Results: The two groups were comparable except for gender (p = 0.01). No difference in age, ejection fraction and Euroscore. No death in neither group. Mean operation- and CPB-times were statistically longer in BC group (p = 0.001). In the DNG group there was a statistically significant less need for defibrillation after cross-clamp release (p < 0.001). Patients in BC group received more blood transfusions during CPB (p < 0.001). The maximum Creatine Kinase-MB (CK-MB) at 6 hours postop, incidence of atrial fibrillation and postoperative length of stay were similar.

Disclosure: Nothing to disclose

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Impact of genetic reclassification on ARVC diagnosis based on the 2010 task force criteria

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Introduction: Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC) is an inherited condition, which is associated with potentially life-threatening ventricular arrhythmias in the young. Approximately 60% of

Disclosure: Nothing to disclose
patients carry a possibly disease-causing genetic variant. The aim of this study was to investigate the impact of the 2015 American College of Medical Genetics (ACMG) Criteria on ARVC diagnosis based on the 2010 Modified Task Force Criteria (TFC).

Methods: The study included 79 patients from the Swiss ARVC Registry who harbored a genetic variant at initial screening deemed to be associated with the disease, and classified them as definite, borderline or possible ARVC. Every variant found was re-classified on Varsome Genetics. Based on the 2015 ACMG Criteria. Clinical information was then assessed at last available follow-up of every patient and ARVC diagnosis was reclassified based on the newest genetic evidence available.

Results: In 42 out of 79 patients (53.2%), genetic variants were reclassified. Out of these, 33 variants (41.8%) were downgraded from pathogenic (P) / likely pathogenic (LP) to either variants of unknown significance (VUS) or benign (B) / likely benign (LB). Three patients (3.8%) were upgraded from LB / VUS / LP to P. Out of the 12 variants initially classified as VUS, 9 (75%) were reclassified as B or LB. Overall, 13 patients (16.5%) were downgraded from their initial diagnosis (11 from definite to borderline and 2 from borderline to possible).

Conclusion: A significant proportion of patients with an ARVC diagnosis based on the 2010 TFC were reclassified when the 2015 ACMG Criteria were taken into consideration. These findings may have clinical consequences, particularly for genetic cascade screening of family members of ARVC patients, and necessitate reassessment of genetic variants of index patients who were previously diagnosed with ARVC.

Disclosure: Nothing to disclose

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Our experience in sutureless aortic valve replacement Intuity™ vs Perceval™


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Introduction: Sutureless aortic valves are feasible to reduce cross clamping time and show good hemodynamic performance with elevated pacemaker rates. In literature some cases of thrombocytopenia are described after sutureless valve implantations. We investigated the Sorin™ Perceval Sutureless Valve and the Edwards™ Intuity Sutureless valve regarding postoperative outcome and the hemodynamic performance.

Methods: 79 patients underwent aortic valve replacement using a sutureless valve in a single center between 2015 - 2018. 37 patients received Sorin™ Perceval (Group A) and 42 Edwards™ Intuity (Group B). Combined surgery with myocardial revascularization was performed in 23 patients in Group A and 22 patients in Group B. We compared the groups regarding postoperative TEE, postoperative ECG, especially need for pacemaker implantation, postoperative platelet count and 30 day mortality.

Results: Only in Group B 2 patients had paravalvular leakage and 1 was reoperated within the same hospital stay. In Group A 9 patients suffered from postoperative atrial fibrillation, in Group B 16 patients. Upon discharge only 2 patients in Group A needed oral anticoagulation due to persistent atrial fibrillation, in Group B 9 patients which is statistically significant (G-square = 121.72, p <0.0001). Left bundle branch block (LBBB) was observed in 5 patients in Group A and 13 patients in Group B. 1 patient in Group A needed a definite pacemaker and 4 patients in Group B. Tachy-Brady Syndrome and LBBB were observed more frequently in Group B (Fisher-Freeman-Halton exact p = 0.0244) as well as ECG alterations in general (Fisher-Freeman-Halton exact p = 0.0244). Aortic valve mean gradient upon discharge was a 13±4,5mmHg in Group A and ±14,5 mmHg in Group B. One patient died within 30 days in Group A due to multiorgan failure. This patient was older and multimorbid compared to the average. Regarding platelet count we saw statistically significant decrease (95% CI, p <0.0001) in both groups (110x10^9/L Group A, 170x10^9/L Group B). There were no major bleeding complications or reoperations due to hemorrhage.

Conclusion: Our data shows that sutureless aortic valve replacement is associated with new postoperative ECG alterations which are self-limiting in most cases. Compared to literature pacemaker implantation rate in Group B is higher. In Group A pacemaker rate was lower, than in literature described. Regarding platelet counts further investigations are necessary.

Disclosure: Nothing to disclose

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Incidence and prognostic impact of positive hs-cTnT in hospitalized patients with influenza infection: the Myo-Flu pilot study

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Background and aim: estimate of cardiac involvement associated with seasonal influenza and pandemics is lacking. Our aim was to evaluate the prevalence of positive high-sensitivity cardiac T troponin in consecutive patients (pts) with laboratory-confirmed influenza infection as a marker of flu-related cardiac involvement.

Materials and methods: Multicentre prospective observational pilot study with regional enrollment (Ticino Canton). All hospitalized pts with laboratory-confirmed influenza infection were evaluated with hs-cTnT after exclusion of concomitant causes for troponin rise during 2018-2019 seasonal pandemic. Primary endpoint was the prevalence of pts with positive troponin (hs-cTnT >15 ng/L, TROP+) while in-hospital mortality was set as a secondary endpoint.

Results: From December 2018 to March 2019, 147 pts with a median age of 75 (66-84) years were enrolled in the study at 4 different sites. At admission 32 pts (63%) had TROP+ with median value of 34.5 ng/L (21-61). At baseline, TROP+ had a greater burden of hypertension, dyslipidemia and previous stroke/TIA, while comparable for other characteristics. Seven deaths occurred leading to an in-hospital mortality of 5%. All deaths occurred in TROP+ pts (8% vs 0%, p = 0.036). Eighteen (12%) patients required ICU hospitalization while in 3 (2,0%) diagnosis of myocarditis was effectively achieved, with 1 (0,6%) presenting acute heart failure requiring hemodynamic support. When stratified according
Conclusions: The incidence of early mitral valve reintervention was 1.5% (N = 4) or trivial mitral valve regurgitation in 98.5% of the patients whereas the overall 30-day mortality was 1.5% (4 patients). Echocardiographic follow-up surgery through right mini-thoracotomy with direct aortic cannulation is a feasible, safe and reproducible technique associated with low perioperative neurologic complications, mortality and morbidity.

Disclosure: Nothing to disclose

Perioperative outcomes of minimally invasive mitral valve surgery through right mini-thoracotomy: 7-year experience of a standardized technique

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Introduction: Minimally invasive mitral valve surgery (MIMVS) through right mini-thoracotomy is an established, standardized procedure at our institution. The aim of the current study was to evaluate our institutional early outcomes following MIMVS over the last 7 years.

Methods: We retrospectively analysed the preoperative variables, intraoperative data and postoperative results in a series of 275 consecutive patients who underwent MIMVS from January 2013 through December 2019 at our institution. All patients received a central aortic cannulation and a peripheral vein cannulation over the groin via Seldinger technique.

Results: Mean patients-age was 66 ± 13 years (29% = female; Mean EuroSCORE II = 2.49 ± 3.12%). Of the whole patient cohort 9 patients (3.3%) had already underwent a cardiac operation. The majority of our patients were presented with a severe mitral valve regurgitation based on fibroelastic deficiency (221 patients, 80.4%), 16 patients (5.8%) required an operation because of active mitral valve endocarditis, whereas 35 patients (12.7%) undergoing a mitral valve replacement. Associated procedures were tricuspid valve annuloplasty (21 patients, 7.6%) and MAZE procedure (56 patients, 20%). Mean cardio-pulmonary bypass and aortic cross-clamp time were 99 ± 32 and 71 ± 24 minutes, respectively. Two patients (0.7%) required conversion to median sternotomy and eight patients (2.9%) underwent postoperative re-exploration for bleeding. The incidence of perioperative neurologic complications was 2.2% (N = 6). Overall 30-day mortality was 1.5% (4 patients). Echocardiographic follow-up revealed that GCS <22.3% differentiated LVNC from control or LVHT. In this study, we aim to develop a diagnostic algorithm based on the circumferential deformation (CD) of LVNC, LVHT and controls; and find their associations with LVNC outcomes.

Conclusion: A diagnostic algorithm with GCS and aPCS (threshold value 18.4%) differentiates LVNC from LVHT and control with very high sensitivity and specificity independent of additional echocardiographic or clinical information. Circumferential strain derived parameters exhibit a strong association with outcomes independent of LVFE and NC:C ratio. Absence of CVE in LVHT provides further evidence on the distinct nature of LVNC and LVHT.

Disclosure: This study was supported by the Swiss Heart Foundation.
MitraClip for high risk patients with Barlow’s mitral valve disease

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Introduction: No data have been published to now about the outcomes of MitraClip in inoperable patients with Barlow’s Mitral Valve Disease. Despite the technical advantages of the new generation of MitraClips, the length and the thickness of the mitral leaflets and presence of flails with complete eversion and pseudo-cleft are challenging MitraClip procedure.

Methods: We retrospectively collected the cases of MR in Barlow’s disease treated with MitraClip in our institution from 2012 to 2018. The case were included in the analysis in presence of the following characteristics: bileaflet billowing or prolapse or both, excessive leaflet tissue, and annular dilatation with or without calcification.

Results: We included in this analysis 59 patients (mean age 78±8 years, STS mortality score 4±2.9%). Echo data at baseline showed normal left ventricle ejection fraction and diastolic volume and increased left atrial volume index. Half of the included patients had a chordal rupture (n = 27, 47%) and in 14 patients (23%) calcification of annulus and/or leaflet was diagnosed. The mean procedural time was 92±41min with a technical success (M-VARC) of 100% and more than 80% of patients requiring more than 1 clip. At 30 days follow-up the device success and the procedural success were respectively 59% and 56%. The mean diastolic mitral valve gradient was 3.1±1.5mmHg. At 30 days follow up, 91% of the patients were NYHA class II stable patients; no death and no hospitalization occurred. During a median follow-up time of 412 days (IQR: 209-992 days) death for any cause occurred in 23% of the patients (n = 14) and 16% of the patients (n = 10) died because of a cardiovascular cause; 10 patients were re-hospitalized for heart failure and 5% of the patients (n = 3) underwent an open-heart surgery at follow-up time. At univariate cox regression analysis the 1-Y composite end-point (death for any cause, HF re-hospitalization, MV surgery) was predicted by LV diastolic/diastolic volume and increased left atrial dimension and mortality rate. Left ventricle size and 30-day procedural success were independent variables. Secondary prevention ICD implantation was diagnosed. The mean procedural time was 92±41min with a technical success (M-VARC) of 100% and more than 80% of patients requiring more than 1 clip. At 30 days follow-up the device success and the procedural success were respectively 59% and 56%. The mean diastolic mitral valve gradient was 3.1±1.5mmHg. At 30 days follow up, 91% of the patients were NYHA class II stable patients; no death and no hospitalization occurred. During a median follow-up time of 412 days (IQR: 209-992 days) death for any cause occurred in 23% of the patients (n = 14) and 16% of the patients (n = 10) died because of a cardiovascular cause; 10 patients were re-hospitalized for heart failure and 5% of the patients (n = 3) underwent an open-heart surgery at follow-up time. At univariate cox regression analysis the 1-Y composite end-point (death for any cause, HF re-hospitalization, MV surgery) was predicted by LV dimensions and 30 days procedural success.

Conclusions: To our knowledge, this is the first analysis of outcomes of Barlow’s disease treated with MitraClip. Despite a high incidence of MR recurrence, we observed a good clinical response in term of NYHA class and mortality rate. Left ventricle size and 30-day procedural success predict outcomes.

Disclosure: F. Maisano is a consultant for Abbott Vascular, Medtronic, Edwards Lifesciences, Percutek, Xeltis, Transsphenal Solutions, Magenta and Cardiovalve, has received grant support from Abbott Vascular, Medtronic, Edwards Lifesciences, Biotronik, and Boston Scientific, has received royalties from Edwards Lifesciences and 4Tech, and is co-founder of Transsphenal Solutions, 4Tech, and SwissVortex. M. Taramasso reports consultancy fees from Abbott Vascular, Edwards Lifesciences, 4Tech, Boston Scientific, CoreMedic, Occlufit, and SwissVortex, outside the submitted work. M. Gavazzoni and M. Zuber are consultant for Abbott

Electrical storms in arrhythmogenic cardiomyopathy: incidence, triggers and prognosis

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Introduction: No data have been published to now about the outcomes of MitraClip in inoperable patients with Barlow’s Mitral Valve Disease. Despite the technical advantages of the new generation of MitraClips, the length and the thickness of the mitral leaflets and presence of flails with complete eversion and pseudo-cleft are challenging MitraClip procedure.

Methods: We retrospectively collected the cases of MR in Barlow’s disease treated with MitraClip in our institution from 2012 to 2018. The case were included in the analysis in presence of the following characteristics: bileaflet billowing or prolapse or both, excessive leaflet tissue, and annular dilatation with or without calcification.

Results: We included in this analysis 59 patients (mean age 78±8 years, STS mortality score 4±2.9%). Echo data at baseline showed normal left ventricle ejection fraction and diastolic volume and increased left atrial volume index. Half of the included patients had a chordal rupture (n = 27, 47%) and in 14 patients (23%) calcification of annulus and/or leaflet was diagnosed. The mean procedural time was 92±41min with a technical success (M-VARC) of 100% and more than 80% of patients requiring more than 1 clip. At 30 days follow-up the device success and the procedural success were respectively 59% and 56%. The mean diastolic mitral valve gradient was 3.1±1.5mmHg. At 30 days follow up, 91% of the patients were NYHA class II stable patients; no death and no hospitalization occurred. During a median follow-up time of 412 days (IQR: 209-992 days) death for any cause occurred in 23% of the patients (n = 14) and 16% of the patients (n = 10) died because of a cardiovascular cause; 10 patients were re-hospitalized for heart failure and 5% of the patients (n = 3) underwent an open-heart surgery at follow-up time. At univariate cox regression analysis the 1-Y composite end-point (death for any cause, HF re-hospitalization, MV surgery) was predicted by LV dimensions and 30 days procedural success.

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Electrical storms in arrhythmogenic cardiomyopathy: incidence, triggers and prognosis

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Introduction: Implantable cardiac defibrillators (ICD) can prevent arrhythmic death in arrhythmogenic cardiomyopathy (ACM). Electrical storms (ES) defined as more than 3 episodes of ventricular arrhythmias requiring ICD therapy within 24 hours, carry significant morbidity and psychosocial/health-economic impact.

Purpose: To describe the incidence, potential triggers and prognosis of ES in ACM patients with ICDs during long-term follow up.

Methods: We retrospectively analysed patients suffering from ACM in our ICD registry using every available device interrogation for data collection.

Results: 10 ES occurred in 7 of 40 patients (17.5%, baseline data in Table 1) during a median follow up of 9.8±6.5 years. Median time to first ES was 3.9 years (95% CI 2.0-9.9). In 9 out of 10 ES, ICD shocks were delivered and the median amount of shocks per ES was 5 (95% CI 0-15). 6 out of 10 ES occurred during winter (Winter 60%, Summer 30%, Autumn 10%, Spring 0%) and all of them during daytime. We identified at least one potential reversible trigger in all ES (7 hypokalaemia, 4 infections, 3 decompensated heart failure, 2 hypoxemia, 2 physical activity), while multiple triggers were present in 5 ES. Mean potassium in hypokalaemia-triggered ES was 3.2 mmol/l. All but one patients were hospitalized, 1 died, 2 required urgent heart transplantation for refractory heart failure and 5 patients arrhythmic therapy was escalated successfully. 2 out of 7 patients with ES suffered from serious complications during their hospital stay (stroke, mesenterial ischemia). All 3 patients who died or received a heart transplantation experienced an ES in the setting of worsening heart failure.

<table>
<thead>
<tr>
<th>Patients characteristics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age at ACM diagnosis</td>
<td>48.1</td>
</tr>
<tr>
<td>Male</td>
<td>86%</td>
</tr>
<tr>
<td>Definite ACM (diagnostic criteria 2010)</td>
<td>86%</td>
</tr>
<tr>
<td>Coronary heart disease</td>
<td>14%</td>
</tr>
<tr>
<td>Secondary prevention ICD implantation</td>
<td>86%</td>
</tr>
<tr>
<td>LVEF&lt;50% (ITIE)</td>
<td>43%</td>
</tr>
<tr>
<td>RV systolic function reduced (ITIE)</td>
<td>43%</td>
</tr>
<tr>
<td>Betablocker</td>
<td>86%</td>
</tr>
<tr>
<td>Amiodarone</td>
<td>86%</td>
</tr>
<tr>
<td>ACE-Inhibitor/Aldosterone-Antagonist</td>
<td>57%</td>
</tr>
</tbody>
</table>

Conclusion: Electrical storms are frequent in patients with ACM carrying ICDs during long-term follow-up with an increased incidence during daytime and in winter. Potential reversible triggers for ES are often present but heterogeneous. Prognosis of ES depends on the underlying condition, with worsening heart failure signalling a worse outcome. Physical activity, hypokalaemia, hypoxia and infections are potential targets to prevent ES in ACM patients.

Disclosure: Nothing to disclose
Right atrium and right ventricle echocardiographic deformation features in arrhythmogenic right ventricular cardiomyopathy, and their association with cardiovascular outcomes

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Introduction: Echocardiography plays an important role in the diagnosis of Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC). Deformation analysis have been promising in diagnosis and risk assessment of cardiomyopathies. In this study, we aimed at understanding the association of right atrial (RA) and ventricular (RV) echocardiographic deformation parameters with outcome in patients with definite or possible ARVC.

Methods: We analysed echocardiography studies of 55 patients with definite ARVC (D-ARVC) and 40 with possible ARVC (P-ARVC) who were diagnosed according to the 2010 Task Force Criteria, and compared them to 50 healthy matched control group. Strain analysis was performed using TomTec ImageArena (Version 4.6) targeting RA and RV. Over a median of 1655 days, we monitored outcomes of atrial/ventricular arrhythmias, and cardiovascular mortality/heart transplant.

Results: At baseline, there were no significant differences in clinical characteristics between the three groups. Results of conventional echocardiographic parameters are shown in Fig. 1-A. RV global longitudinal strain (RV-GLS) was significantly reduced in D-ARVC group (15.2 [11.7-20.8]%) in comparison to P-ARVC (24.5 [18.2-30.6]%), p = 0.004) or control (28.6 [17.2-33.4]%), p = 0.002) (Fig 1-B). Similarly, right atrial global longitudinal strain (RA-GLS) was significantly reduced in the D-ARVC (18.6 [15.1-22.5]%), in comparison to P-ARVC (24.5 [19.4-26.4]%, p = 0.003) or control (32.8 [29.7-39.2]%), p = 0.001) (Fig 1-C). In addition, the RV free wall longitudinal strain (RV-FWLS) and RA strain-based functional parameters (RA-SFP) have shown similar patterns between the 3 groups, as shown in Fig. 1-D and 1-E. As for association with outcomes: RA GLS, RA-SFP, and RV-FWLS were associated with increased risk of atrial flutter or fibrillation in D-ARVC and P-ARVC (Fig 2-A). Impaired RVEDA, and RV-FWLS were significantly associated with increased risk of ventricular tachycardias and fibrillation, appropriate defibrillator shocks, and resuscitation (Fig 2-B). Similar associations were found with risk of cardiovascular mortality / heart transplant (Fig 2-A).

Conclusions: According to our results, RA strain findings provides an additional evidence that cardiac involvement is not exclusive to RV in patients with ARVC. Moreover, RA and RV strain-derived parameters can help with risk assessment of major cardiovascular events in ARVC, as well as distinguishing possible from definite ARVC patients.

Disclosure: Nothing to disclose
Temporal trends in in-hospital complications of acute coronary syndromes: insights from the Nationwide AMIS Plus registry

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Introduction: Acute coronary syndrome (ACS)-related morbidity and mortality re- main substantial. Data on temporal trends in in-hospital complications of ACS pa- tients are scarce. This study sought to investigate whether the incidence of in- hospital complications of ACS patients changed over time.

Methods: Acute coronary syndrome patients prospectively enrolled in the National Registry of Acute Myocardial Infarction in Switzerland (AMIS Plus) between 2003 and 2018 and with available data on in-hos- pital complications were included in the analysis. Rates of in-hospital complications, including recurrent angina, recurrent myocardial infarc- tion, cerebrovascular events, cardiac shock, bleeding, acute renal failure, sepsis/systemic inflammatory response syndrome (SIRS)/multorgan dysfunction syndrome (MODS), AV block needing pacing and new-onset atrial fibrillation, were assessed for each 2-year pe- riod.

Results: Among 47'845 ACS patients, in-hospital complications signifi- cantly decreased from 22.0% in 2003/2004 to 18.9% in 2017/2018 (p for trend <0.001). An initial decline in rates of in-hospital complications to 15.7% in 2009/2010 (p for trend <0.001) was followed by a constant increase thereafter (p for trend = 0.002). While rates of recurrent angina, recurrent myocardial infarction, and cardiac shock decreased over time, rates of bleeding events, acute renal failure, sepsis/SIRS/MODS, and new-onset atrial fibrillation increased. Rates of in-hospital complica- tions were higher in women, mainly due to a constantly increased risk of bleeding and AV block needing pacing.

Conclusion: In-hospital complications of ACS significantly decreased over the 16-year period, with overall rates being higher in women. These findings emphasize that advanced strategies targeting non-ischemic complications are warranted to further improve quality of care of ACS patients.

Disclosure: The AMIS Plus registry is funded by unrestricted grants from the Swiss Heart Foundation and from Abbott Medical AG, Amgen AG, AstraZeneca AG, Bayer AG, Biotronik (all Switzerland) AG, Boston Scientific AG, B. Braun Medical AG, Cordis-Cardinal Health GmbH, Daichi Sankyo (Switzerland) AG, Medtronic (Switzerland) AG, Novartis Pharma Switzerland AG, Sanofi-Aventis (Switzerland) SA, Servier (Swit- zerland) SA, SIS Medical Distribution AG, Terumo Germany GmbH, Vascu- lar Medical GmbH, Swiss Working Group for Interventional Cardiology. The sponsors did not play any role in the design, data collection, analysis, or interpretation of the registry.

Radiation exposure in monoplane versus biplane percutaneous coronary interventions: the RAMBO trial

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Introduction: Interventional cardiologists are exposed to substantial oc- cupational ionizing radiation. Data on radiation exposure to interventional cardiologists are scarce, and randomized comparisons between biplane and monoplane imaging lacking. This study sought to investigate differ- ences in radiation exposure in biplane versus monoplane coronary angi- ography and percutaneous coronary intervention (PCI).

Methods: RAMBO (Radiation exposure in Monoplane versus Biplane Coronary interventions) was a prospective, randomized, two-arm, single-centre, open-label trial, enrolling a total of 430 patients undergoing cor- onary angiography for suspected coronary artery disease. Patients were randomly assigned to biplane or monoplane imaging. The primary effi- cacy measure was the operator radiation dose at the level of the left arm as measured by a wearable electronic dosimeter.

Results: Median age of the patients was 69.0 [61-76] years (37.6% women). Percutaneous coronary intervention was performed in 85 (21.9%) patients. In the per-protocol population, the primary efficacy measure was significantly higher in the biplane as compared with the monoplane group (4 [1-13] µSv versus 2 [0-6.8] µSv, p <0.001). While fluoroscopy time did not differ among groups (p = 0.68), the amount of contrast medium was lower with biplane as compared with monoplane imaging (p <0.001). The dose area product was 11955 [7095-18246] mGy*cm² and 8349 [5851-14159] mGy*cm² in the biplane and the mono- plane groups (p <0.001).

Conclusion: Biplane imaging for coronary angiography and PCI is related with an increased radiation exposure to the interventional cardiologist as compared with monoplane imaging. Monoplane imaging should be con- sidered for advanced radioprotection in cardiac catheterization, with bi- plane imaging used for selected patients.

Disclosure: Nothing to disclose

Functional assessment of myocardial ischemia by intracoronary electrocardiogram


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Introduction: In patients with chronic coronary syndrome (CCS), percu- taneous coronary intervention (PCI) targets hemodynamically significant stenoses, i.e., those thought to cause ischemia. The hemodynamic se- verity of a coronary stenosis increases with its tightness and with the myocardial mass of viable myocardium downstream of the stenosis. The goal of this study was to test the accuracy of intracoronary ECG (iECG) during pharmacologic inotropic stress to determine coronary lesion se- verity in comparison to established physiologic indices (fractional flow reserve, FFR; instantaneous wave-free ratio, iFR) as well as to quantita- tively determined percent diameter stenosis (%) using biplane coro- nary angiography.

Method: This was a prospective, open-label study in patients with CCS. The primary study end point was the maximal change in iECG ST-segment shift during pharmacologic inotropic stress induced by dobuta- mine plus atropine obtained within 1 minute after the point of maximal heart rate (estimated by the formula 220 - age). iECG was acquired by attaching an alligator clamp to the angioplasty guidewire positioned downstream of a stenosis. For the pressure-derived ratios, i.e. FFR and iFR, the coronary perfusion pressure downstream of a lesion as well as the aortic pressure were continuously recorded.

Results: One hundred patients were included in the study. Pearson-Cor- relation coefficient was significant between iECG and all three compar- ators (% S p <0.001, iFR p <0.001, FFR p <0.001). Using the FFR thresh- old of 0.80 defining coronary hemodynamic significance, ROC-analysis of the absolute iECG ST-segment shift showed an area under the curve (AUC) of 0.708 ± 0.055 (p = 0.0001, n = 100, FFR <0.80 n = 41). AUC for iFR was 0.919 ± 0.030 (p <0.0001), for percent diameter stenosis it was 0.867 ± 0.036 (p <0.0001).

Conclusions: During pharmacologic inotropic stress, intracoronary ECG ST-segment shift provides specific evidence for regional myocardial is- chemia irrespective of the etiology and thus, provides an additional (patho-)physiologic information for decision making in borderline coro- nary lesions.

Disclosure: Nothing to disclose
Resolution of a stenotic 4-artery coronary configuration by the multi-artery fractional flow reserve method
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Introduction: The hyperemic fractional flow reserve (FFR) method is superior to traditional angiographic stenosis severity assessment, as demonstrated in the famous FAME study. However, current FFR-oriented methods (hyperemic FFR, resting P_{aortic}, and wave-free iFR) do not take into account inter-arterial interactions that usually take place in multi-artery coronary configurations. The multi-artery FFR method does include the effect of these interactions in the resolution of stenotic multi-artery coronary configurations. In this work, the capability of the novel multi-artery FFR method to resolve complex 4-artery coronary configurations is demonstrated.

Methods: In cases of independent single stenotic artery (stand-alone position) the FFR treatment-decision criteria (FFR cut-off value and FFR ‘grey-range’) apply to its FFR value (denoted FFR^true). If however a stenotic artery is part of a multi-artery configuration, it is influenced by the other arteries and is no longer in an independent stand-alone position. Treatment decision criteria therefore do not apply to FFR^true in such cases, rather to its actual FFR (denoted FFR^real) which reflects its current configurations. In search of optimal resolution of a stenotic configuration, outcomes of optional revascularizations are predicted and evaluated by the multi-artery FFR method.

Results: The multi-artery FFR method is applied to the stenotic unprotected LMCA-LCx-LAD-D1 configuration in this work. In the numerical example the initial status of the configuration is:

- FFR^real(LMCA) = 0.83 FFR^real(LCx) = 0.80 FFR^real(LAD) = 0.78 FFR^real(D1) = 0.86
- FFR^real(LMCA) = 0.68 FFR^real(LCx) = 0.69 FFR^real(LAD) = 0.67 FFR^real(D1) = 0.57

After optimal resolution (by hyperemic FFR criteria), the final status of the configuration follows:

- FFR^real(LMCA) = 0.83 FFR^real(LCx) = 1.00 FFR^real(LAD) = 1.00 FFR^real(D1) = 1.00
- FFR^real(LMCA) = 0.83 FFR^real(LCx) = 0.83 FFR^real(LAD) = 0.83 FFR^real(D1) = 0.83

Conclusion: The multi-artery FFR method extends the current FFR-oriented single-artery methods to the multi-artery domain without altering their experimental techniques. From the numerical example in this work it is obvious that a percutaneous coronary intervention (PCI) practitioner can apply the formulas of the method to actual intracoronary pressure data in real time during the PCI procedure.

Disclosure: Nothing to disclose

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Hyperemic hemodynamic characteristics of serial coronary lesions assessed by Pressure Pullbacks Gradients (PPG) index
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Introduction: To describe the functional characteristics of angiography-defined serial coronary lesions using fractional flow reserve (FFR)-derived motorized pullback tracings, and to describe the Pullback Pressure Gradients (PPG) index - in these lesions.

Methods: Prospective, multicenter study with independent core laboratory analysis. Patients undergoing coronary angiography due to stable angina were enrolled. Serial lesions were defined angiographically as the presence of 2 or more narrowings with visual diameter stenosis >50% separated at least by 3 times the reference vessel diameter in the same coronary vessel. Continuous IV adenosine-FFR measurements were obtained using a motorized-pullback device at a speed of 1 mm/s. Pullback curves were assessed to determine the presence of focal step-ups (FFR >0.05 units over 20 mm). In addition, the PPGindex was computed for all vessels. PPGindex values close to 0 define functional diffuse disease whereas values close to 1 define focal disease.

Results: From a total of 159 vessels (117 patients), 25 vessels were adjudicated as presenting serial lesions (mean PPGindex 0.48 ± 0.17, range 0.26 - 0.87). Two focal pressure step-ups were observed in 40% of the cases (n = 10; mean PPGindex 0.59 ± 0.17), whereas 8% of the vessels presented a progressive pressure losses (n = 2; mean PPGindex 0.27 ± 0.01). In the remaining 52% of the cases, a single pressure step-up was recorded (n = 13; mean PPGindex 0.44 ± 0.12; ANOVA p-value = 0.01). The PPGindex independently predicted the presence of two focal pressure step ups.

Conclusion: Hyperemic FFR curves in tandem stenoses revealed high prevalence of functional diffuse CAD. Two pressure step-ups occurred in less than half of the vessels. High PPG-Index identified vessels with two focal pressure drops. FFR tracings and the PPGindex provide a more objective CAD evaluation, which can lead to changes in the therapeutic approach.

Disclosure: Nothing to disclose
External stenting for saphenous vein grafts in CABG: technical feasibility and safety

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Objectives: Progressive saphenous vein graft (SVG) disease is still the key limitation of the long-term clinical outcome of CABG. Randomized trials have shown that external stenting of vein grafts has the potential to reduce vein graft disease by mitigating intimal hyperplasia, reducing oscillatory shear stress and improving lumen uniformity up to 5 years after CABG. The objective of the study was to evaluate the technical success of external stent implantation and early safety.

Methods: 41 patients undergoing isolated CABG in a single center were included in this study retrospectively. All SVGs were harvested using endoscopic technique and 40 patients (97.5%) underwent off pump CABG. In all patients, BIMA-grafts were used for the left side vessels together with additional venous grafts. At each patient at least one vein graft, which was placed to the right coronary territory was supported with external stent (VEST, Vascular Graft Solutions, Tel Aviv, Israeil), while additional grafts remained non stented. CT angiography was performed at discharge and patients underwent clinical follow up at 3 months for Major Adverse Cardiac and Cerebrovascular Events (MACCE).

Results: A total of 41 patients (mean age 63.65 ± 9.41 years, 88% males) were admitted to our center with multi-vessel disease for isolated CABG, between Sep 2016 and Sep 2018. External stent application was successful in 100% of the grafts. During surgery, transient time flow measurements and pulsatility index of the externally stented vein grafts were 37.24±19.1 and 1.9±0.9. Post-operative CT angiography has been completed for 35 patients (85.3%). The total number of grafts evaluated with CT angiography was 107 of which 102 were patent (95.3%). There were 35 VEST supported and 10 not supported vein and 67 arterial grafts. Three of 35 VEST supported veins were closed due to failure of the distal anastomosis, without any doubt of participation or influence of the VEST. Those patients experienced PCI of the native right coronary artery before discharge. One patient had an urgent PCI of the native vessels soon after surgery because of the acute failure of both IMAs, while the supported vein remains open. All patients completed the 3 months clinical follow up. No MACCE was reported during the follow period.

Conclusion: VEST external stent of saphenous vein grafts is safe and easy to apply in off pump and multi arterial CABG. Short term clinical follow up demonstrated no device related adverse events.

Disclosure: Nothing to disclose.

Delay between symptom onset and hospital admission in patients with ST-elevation myocardial infarction: different trends in men and women

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Introduction: The aim of this study was to analyse whether prehospital delay in ST-elevation myocardial infarction (STEMI) has changed in men and women since 2002.

Methods: We used data from the AMIS Plus registry of patients who were admitted for STEMI between 2002 and 2019. Patients who were transferred from another hospital or were resuscitated before admission were excluded. Patient delay was defined as the difference between symptom onset and hospital admission time. Trends in delay according to gender were depicted by medians per year with a 95% confidence interval. Differences between men and women were tested using the Mann-Whitney test. To analyse the adjusted effect of gender on delay, multivariable quantile regression was applied including the interaction between gender and admission year as well as the covariates age, diabetes, pain at presentation and myocardial infarction (MI) history.

Results: Among the 15,154 patients included (74.5% men), the overall median (IQR) delay between 2002 and 2019 was 150 (84;345) minutes for men and 180 (100;415) for women. Women were older (71.3y vs. 62.8y, p = 0.001), had more often diabetes (20.0% vs. 16.9%, p = 0.001), but less often MI history (11.2% vs. 14.9%, p < 0.001) and less often pain at presentation (92.0% vs. 94.8%, p < 0.001). The unadjusted median delay decreased over the admission years. The decreasing trend was stronger in women than men: the unadjusted difference in delay between men and women decreased from 60 min in 2002 to 1.6 min for women in 2019. Additional independent predictors of longer delay were the covariates age (+1.6 min per additional year, p = 0.001) and diabetes (+27.1 min, p = 0.001). Conversely, pain at admission (-46.3 min, p < 0.001) and MI history (-32.9 min, p < 0.001) predicted a shorter delay.

Conclusion: The difference in delay between symptom onset and hospital admission in STEMI patients between men and women steadily diminished from 2002 to 2019. This might indicate that the public and health professionals’ awareness of STEMI in women has ameliorated over time.

Disclosure: Nothing to disclose.

Eight years trends and outcomes in TAVI performed in a high-volume center

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Introduction: Since the first transcatheter aortic valve implantation (TAVI) performed in 2002, remarkable changes in procedure features and patients’ profiles have been reported, making it a widespread treatment for severe aortic stenosis in all risk-class patients. The purpose of this study was to evaluate TAVI contemporary trends and outcomes in the last eight years.

Methods: Data of adult patients submitted to TAVI from April 2012 to April 2019 in a single high-volume center were obtained from the Swiss TAVI registry, a prospective national multidisciplinary database. Long-term outcomes indications were based on the institutional heart team evaluation. Patients were divided according to implant period in two groups: 1) TAVI performed from 2012 to 2016, and 2) from 2017 to 2019.

Results: Over a 9-year period, a total of 1485 TAVI procedures were performed, increasing from 95 in 2012 to 320 in 2018 (p < 0.001). A remarkable modification in patients’ profile and procedure characteristics can be seen in Table 1. Despite higher age and surgical risk, a significant decrease in 1-year mortality (6.8% vs. 3.2%; p < 0.001) was observed in
Complications consisted in acute renal failure (54.9%), cerebral ischemia (23.5%) and pneumonia (54.9%). Eight (15.7%) developed limb ischemia requiring fasciotomy. Multivariable analysis identified the association of preimplantation lactate serum level ≥ 8 mmol/L and an ECMO implantation time interval ≥ 30 minutes from ACS onset, as predictors of 30-day mortality (p = 0.02). No other factors resulted statistically significant for early and long-term mortality.

Conclusions: ECMO represents a valid option for hemodynamic support, allowing to perform emergency myocardial revascularization in ACS patients with refractory CS. ECMO instituted within 30 minutes from ACS onset, associated with a serum lactate level below 8 mmol/L can reduce mortality of 65%. Prompt ECMO implantation is an effective strategy in reducing the duration of end-organ ischemia and is the keystone in the management of this patient population.

Disclosure: Nothing to disclose

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Fowler score to identify patients at high-risk for surgical site infection after coronary surgery. A retrospective single centre study


Cardiac Surgery, Cardiocentro Ticino, Lugano, Switzerland

Introduction: Surgical Site Infections (SSI) after Coronary Artery Bypass Grafting (CABG) can compromise outcomes due to significant increase of morbidity, mortality and costs. Aim of this study was to explore if the Fowler Score (FS) among other variables would predict SSI in our setting.

Methods: From January 2016 to December 2018, 525 consecutive CABG procedures were performed. All MIDCAB (Minimally Invasive Direct Coronary Artery Bypass) procedures were excluded. The FS is a scoring system created to predict the risk of major infections after cardiac surgery. A FS higher than 13 points is considered an indicator for major infections. We reviewed the SSI at discharge time and the follow-up data of our patients registered by the Swiss National Center for Infection Prevention (Swissnos). Logistic regression analysis was performed to detect predictive factors of SSI occurrence.

Are there mortality risk predictors in myocardial infarction and cardiogenic shock treated by extracorporeal life support?

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Introduction: This retrospective study was designed to identify predictors of mortality, in patients with refractory cardiogenic shock (ICS) associated with acute coronary syndrome (ACS) necessitating veno-arterial-extracorporeal membrane oxygenation (VA-ECMO).

Methods: We retrospectively analyzed 51 patients treated at our centre for ACS complicated by ECMO requiring CS. Logistic regression analysis was performed to identify the association of potential predictors of perioperative mortality.

Results: Between January 2005 and December 2019, ECMO support was instituted in 51 patients. Mean age was 61.8 ± 11 years, 41 patients (80.4%) were male. The onset of out-of-hospital ACS occurred in 19 (37%). The median time to ECMO implantation for the whole cohort was 60 minutes, and the ECMO perfusion time averaged 4410 ± 5291 minutes. PCI was performed in 47 patients (92.1%) and isolated CABG in 5 (9.8%). One patient underwent both. Hospital mortality was 60.8% (31 patients). Seventeen patients (33%) were successfully weaned from ECMO. Twenty-two patients (43%) died while on ECMO support. One patient was bridged to heart transplantation, a second one received a single-ventricle assist device.

| Table 1. SSI in all CABG procedures (n = 525) |
|-----------------------------------------------|-----------------|-------------------------------|------------------|
| Odds ratio | p value | 95% Confidence | Interval |
| Age | 0.93 | 0.02 | 0.88 | 0.99 |
| Gender | 2.02 | 0.2 | 0.63 | 6.5 |
| BMI | 0.94 | 0.3 | 0.62 | 1.07 |
| Urgency Grade | 1.53 | 0.4 | 0.53 | 4.39 |
| Diabetes with insulin | 2.03 | 0.2 | 0.53 | 7.78 |
| NYHA | 0.66 | 0.2 | 0.3 | 1.42 |
| CPB time | 0.99 | 0.08 | 0.98 | 1 |
| Fowler score ≥ 13 | 13.91 | 0.003 | 2.47 | 78.33 |
| BIMA graft | 0.92 | 0.9 | 0.26 | 3.23 |

| Table 2. SSI in isolated CABG procedures (n = 411) |
|-----------------------------------------------|-----------------|-------------------------------|------------------|
| Odds ratio | p value | 95% Confidence | Interval |
| Age | 0.93 | 0.02 | 0.87 | 0.98 |
| Gender | 2.43 | 0.1 | 0.66 | 8.86 |
| BMI | 0.96 | 0.5 | 0.83 | 1.1 |
| Urgency Grade | 1.47 | 0.5 | 0.45 | 4.74 |
| Diabetes with insulin | 2.27 | 0.2 | 0.57 | 8.95 |
| NYHA | 0.51 | 0.1 | 0.19 | 1.34 |
| CPB time | 0.99 | 0.3 | 0.97 | 1 |
| Fowler score ≥ 13 | 10.83 | 1.01 | 1.61 | 72.72 |
| BIMA graft | 0.91 | 0.8 | 0.25 | 3.34 |

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Detection of future culprit lesions based on angiography-derived computational fractional flow reserve. The Future Culprit Study

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Introduction: Quantitative Flow Ratio (QFR) is a virtual calculation of FFR that allows hemodynamic assessment of coronary artery lesions using three-dimensional quantitative coronary angiography. This case-control study evaluates the performance of QFR to detect future culprit lesion (FCL) of myocardial infarction (MI).

Methods: We selected 81 patients admitted for PCI in the setting of MI (NSTEMI and STEMI) and in whom a previous angiogram had been performed within the previous 5 years. In each patient, we identified lesions on segments that progressed to acute occlusion (FCL), and analysable segments on main epicardial vessels that did not lead to MI, where “non-culprit lesions” (NCL) were detected using the QFR software.

Results: There were 81 FCL and 113 NCL in 81 patients. Median age was 62 years (IQR:55-75), 74% were male. Median time between the last angiography and the MI was 24 months (IQR:11-41). Overall, FCL were more severe (3D-diameter stenosis (DS) 38.6% (IQR:30,1-47,1) versus 29.8% (IQR:25,4-34,8), p <0.001), and had lower QFR values (0.94 (IQR:0.87-0.98) versus 0.98 (IQR:0.96-1.00), p <0.001). In lesions with delay <2 years between index angiography and MI, the difference in QFR was more pronounced compared to the group with longer delay (0.93 (IQR:0.86-0.98) versus 0.98 (IQR:0.96-1.00), p <0.001 for the short delay; 0.97 (IQR:0.87-0.99) versus 0.98 (IQR:0.96-1.00), p = 0.011 for the long delay, Figure 1). When dividing lesions in tertiles according to delay, a significant progression of lesions over time was observed in FCL (p = 0.034) but not in NCL (p = 0.832). In multivariate analysis including QFR, DS and lesion length, QFR was the only independent predictor of MI (OR = 1.11 (99CI 1.02-1.23), p <0.013 for 0.01 decrease of QFR).

Conclusion: Coronary segments that will eventually give rise to a myocardial infarction (i.e. future culprit lesions) exhibited lower QFR compared to lesions that will not. QFR might help to identify future culprit lesions.

Disclosure: Nothing to disclose
Outcome of thoracic endovascular aortic repair (TEVAR) after aortic dissection

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Introduction: Thoracic endovascular aortic repair (TEVAR) has become a recognized treatment for several thoracic aortic diseases. We evaluated the long-term outcomes of TEVAR after aortic dissection.

Methods: Between June 2002 and December 2019, a total of 114 patients were treated with TEVAR. Patients were divided according previous Type A and B dissection. Demographics, preoperative characteristics and intra and postoperative outcomes were evaluated. Survival and freedom from endoleak were determined using Kaplan-Meier methods. Log-rank test were used to compare groups.

Purpose of this study was to report the experience using CPD as a routine practice during TAVI procedures in a high-volume center.

Methods: Data of consecutive adult patients submitted to TAVI from October 2018 to April 2019 were obtained from an institutional database. Interventions were indicated based on the institutional heart team evaluation.

Results: During the studied period, CPD was used in 98 patients. Mean age and STS score were 79±7.4 years and 3.5±2.5%, respectively, and 58% were male. The most frequent associated comorbidities were arterial hypertension (87%), dyslipidemia (67%), coronary artery disease (41%), atrial fibrillation (25%), and diabetes mellitus (20%). Previous stroke was reported in 9%, and New York Heart Association functional class ≥III in 43%. Peak and mean aortic gradients were 65.5±26 mmHg and 40.3±15 mmHg. In all patients, CPD was inserted through the right radial artery. In a mean follow-up of 350±44 days, no case of cerebrovascular event, death, myocardial infarction, or repeat unplanned valvular intervention were reported. Access site complication, bleeding, and acute kidney injury according to the VARC II criteria were diagnosed in 1 (1%), 4 (4%), and 8(8%) patients, respectively.

Conclusion: The results presented here demonstrate an initial experience employing CPD as routine during TAVI procedures. An excellent safety profile was observed, besides a remarkably low rate of adverse events. Long-term follow-up and higher sample studies are needed to support these first observations.

Disclosure: Dr. Miura has been a consultant for Japan Lifeline. Dr. Tamassao has been a consultant for Abbott Vascular, Boston Scientific, CoreMedic, and 4Tech. Dr. Zuber is a consultant for Abbott and Edwards Lifesciences. Dr. Maisano has been a consultant for Abbott Vascular, Medtronic, Edwards Lifesciences, Percute, Xeltis, Transseptal Solutions, and Cardiovalve; has received grant support from Abbott Vascular, Medtronic, Edwards Lifesciences, Biotronik, and Boston Scientific; and has received royalties from Edwards Lifesciences and 4Tech. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

Table 1. Demographic characteristics in patients treated with TEVAR after type A and B aortic dissection.

<table>
<thead>
<tr>
<th></th>
<th>Type B n = 25</th>
<th>Type A n = 11</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean ± SD</td>
<td>68.9±10.9</td>
<td>66.2±8.7</td>
<td>0.503</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>7 (29%)</td>
<td>2 (20%)</td>
<td>0.692</td>
</tr>
<tr>
<td>Smoking, n (%)</td>
<td>10 (41%)</td>
<td>7 (70%)</td>
<td>0.259</td>
</tr>
<tr>
<td>Hypertension, n</td>
<td>25 (100%)</td>
<td>10 (100%)</td>
<td>-</td>
</tr>
<tr>
<td>Diabetes, n (%)</td>
<td>2 (8%)</td>
<td>1 (10%)</td>
<td>0.704</td>
</tr>
<tr>
<td>Hypercholesterolemia, n (%)</td>
<td>15 (62%)</td>
<td>5 (50%)</td>
<td>0.423</td>
</tr>
<tr>
<td>Lung disease ≥ Moderate, n (%)</td>
<td>2 (8%)</td>
<td>3 (30%)</td>
<td>0.296</td>
</tr>
<tr>
<td>Creatinine, mean ± SD</td>
<td>97.2±28</td>
<td>92.7±26</td>
<td>0.670</td>
</tr>
<tr>
<td>LV EF, mean ± SD</td>
<td>58.3±9</td>
<td>48.3±9</td>
<td>0.022</td>
</tr>
</tbody>
</table>

Conclusion: TEVAR is a safe and effective procedure with excellent inhospital results. However, overall long-term survival is reduced, particularly for patients with type A aortic dissection. Further study will be address the role of comorbidity, as reduced ejection fraction, in long-term survival.

Disclosure: Nothing to disclose
Quantifying coronary microvascular disease: assessing absolute microvascular resistance reserve (MRR) by continuous coronary thermodilution

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Background: Hyperemic absolute coronary blood flow (in mL/min) can be measured with intracoronary continuous thermodilution of saline at room temperature and at an infusion rate of 20 mL/min. This study aims at assessing whether continuous thermodilution can also measure resting flow and microvascular resistance.

Methods: In 87 coronary arteries (58 patients) with angiographic non-significant stenoses, absolute flow was assessed by continuous thermodilution of saline at infusion rates of 10 mL/min and 20 mL/min. Simultaneously, average peak velocity (APV) was measured (26 vessels). Microvascular resistance (Rµ), defined as the distal coronary pressure divided by the absolute flow, was calculated both at rest (Rµ-rest) and during hyperemia (Rµ-hyper). Microvascular Resistance Reserve (MRR) was calculated as the ratio of Rµ-rest and Rµ-hyper.

Results: No significant difference was found between Pd/Pa at baseline and during saline infusion at 10 mL/min (0.95±0.05 vs 0.94±0.05, p = 0.53) as well as in APV (22.2±8.4 vs 23.2±8.4 cm/s, p = 0.63), thus indicating presence of resting coronary blood flow during the infusion of 10 mL/min of saline. In contrast, an infusion rate of 20 mL/min induced significant decrease in Pd/Pa (0.85±0.09 vs 0.95±0.05, p <0.001) and a significant increase in APV (22.2±8.4 cm/s to 27.8±25.5 cm/s, p <0.001). The coronary flow reserve (CFR) calculated by thermodilution and by Doppler flow velocity correlated closely (2.7±0.8 vs 2.7±1.1, r = 0.87, 95% CI 0.72 - 0.94, p <0.001). Similarly, mean doppler- and thermodilution-derived MRR had a high level of agreement (3.32±1.5 vs 3.23±1.2, r = 0.91, 95% CI 0.81 - 0.96, p <0.001).

Conclusion: Absolute coronary blood flow can be measured by continuous thermodilution both at rest and during hyperemia. This allows for accurate, reproducible, and operator-independent direct volumetric calculation of CFR and MRR. The latter is a quantitative metric specific for microvascular function and independent from myocardial mass.

Disclosure: Nothing to disclose

Applicability of ISCHEMIA to the daily practice of a Swiss University Hospital

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Introduction: The ISCHEMIA trial found that an invasive strategy was not associated with a reduction in major adverse cardiovascular events when compared with optimal medical treatment (OMT) alone among patients with moderate/severe ischemia. However, given the extensive exclusion criteria of the study, we sought to investigate if these results would actually change our daily practice.

Methods: We performed a retrospective analysis of the last 1’000 consecutive PCIs undertaken in our university hospital in Switzerland. We applied the ISCHEMIA exclusion criteria to this population in order to estimate the proportion of patients that would have been excluded from the trial.

Results: Between October 2018 and November 2019, 1’000 PCIs were performed in a population with a mean age of 65.5 (IQR 51.0-76.0) years, of which 76.8% were men. Among these procedures, 603 (60.3%) were performed for an acute coronary syndrome (ACS) and 197 (19.7%) in the context of either an ACS within 2 months (n = 131), or a PCI/CABG within 12 months (n = 66) (Figure 1). A further 84 (8.4%) procedures were performed in patients with other high-risk features (ventricular arrhythmias, cardiac arrest, NYHA III-IV, eGFR <30 ml/min or LVEF <35%). Finally, 25 (2.5%) were performed in patients with unacceptable angina whilst on OMT, a cardiac transplant, a recent stroke, or another exclusion criterion. This left only 91 patients (9.1%) without any ISCHEMIA exclusion criteria. When considering only patients with SCAD (n = 320), 229 (71.6%) would have been excluded due to the presence of at least one exclusion criterion.

Conclusion: In this retrospective analysis of 1’000 consecutive PCIs, the vast majority were performed in patients with at least one ISCHEMIA exclusion criterion. These results suggest that the impact of ISCHEMIA on the real-world practice of a medium-sized PCI center like ours is likely to be limited.

Disclosure: Nothing to disclose

Correlation and agreement of invasive versus non-invasive cardiac output measurements using thoracic electrical bioimpedance

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Introduction: Right and left heart catheterization using the thermodilution (TD) and the Fick methods are the reference techniques for cardiac output measurement. Non-invasive CO estimation relies mostly on echocardiography. Continuous thoracic electrical bioimpedance (TEB) has recently emerged as an interesting option correlating volumetric expansion of the ascending aorta to the change of thoracic bioimpedance after aortic valve opening.
Methods: Eighty-three patients undergoing right and left heart catheterization for aortic stenosis (n = 50), pulmonary hypertension (n = 14) or other valvulopathy (n = 19) assessment at the University Hospitals of Geneva by the same operators (SN and MC) from April 2019 to January 2020 were included in the analysis. Patients had standard CO measurement by TD and indirect Fick methods with concomitant TEB analysis using the ICON cardiac monitor. TEB was measured both at the time of the TD and the Fick calculation.

Results: Mean age was 74.2±16.5 years old with a BMI of 26.1±5.5 kg/m². CO was 4.9±1.2, 4.8±1.2, 5.2±1.3 and 5.4±1.5L/min as measured respectively by TD, Fick, TEB during TD and during Fick. There was no significant difference between the mean of CO as measured by TD vs Fick (p = 0.35) and TEB vs TD (p = 0.16), whereas the mean of CO differed significantly between TEB and indirect Fick (p = 0.02). Overall, TEB showed a good and moderate correlation with TD (r = 0.70, p <0.001) and indirect Fick (r = 0.63, p <0.001). There was no systematic bias for CO measurements using TEB vs TD or indirect Fick according to the Bland-Altman scatter plot. When considering only aortic stenosis, correlation between TEB and TD or indirect Fick was poor (respectively r = 0.42, p = 0.004 and r = 0.38, p = 0.01) but differed widely between patients with low BMI <25 (respectively r = 0.79, p <0.001 and r = 0.76, p <0.001) and high BMI≥25 (respectively r = 0.34, p = 0.04 and r = 0.29, p = 0.08).

Conclusions: TEB showed good correlation and agreement with invasive CO measurement methods. Overweight seems to interfere significantly with TEB measurements.

Disclosure: Nothing to disclose

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External validation of the No Objective Testing rules

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Introduction: Although suspected acute coronary syndrome (ACS) is one of the leading causes for emergency admissions, the majority of patients is finally diagnosed with conditions other than ACS. A recent study questioned the general need of objective testing in a subgroup of low-risk patients with normal cardiac troponin I (cTnI) concentrations and a non-diagnostic electrocardiogram. We aimed to externally validate the No Objective Testing (NOT) rules that identify patients who may not require objective testing for coronary artery disease (CAD).

Methods: We enrolled patients presenting to the emergency department with symptoms suggestive of ACS within a large ongoing prospective international multicentre cohort. We applied the NOT rules using high-sensitivity cTnI. In brief, the first rule is a weighted score derived from independent predictors of ACS, the second and third were simplified and only include age, history of myocardial infarction (MI) or CAD, cardiac risk factors and nitrate use. Primary objective was the safety and efficacy of the rules for rule-out of MACE (defined as MI, unstable angina pectoris, urgent or emergency revascularisation or cardiovascular death) at 30-days of follow-up.

Results: Among 3188 enrolled patients, 2162 (68%) were eligible for analysis of the NOT rules. MACE at 30-days occurred in 302 (14%) patients. Of the three NOT rules, the second and third rule provided highest safety and efficacy for rule-out of MACE. Both identified 492 (23%) patients at low-risk, with a sensitivity of 99.7% (95%-CI 98.2%-99.9%), and a negative predictive value of 99.8% (95%-CI 98.6%-99.9%). One MACE was missed within 30-days.

Conclusions: The NOT rules should not be used for patients with an ACS or clear non-cardiac diagnosis. However, for patients with an unclear diagnosis the NOT rules prove to be a safe tool that identifies nearly one-fourth of patients at low risk for MACE who may not need objective testing.

Disclosure: The study was supported by research grants from the Swiss National Science Foundation, the Swiss Heart Foundation, the KTI, the European Union, the Stiftung für kardiovaskuläre Forschung Basel, the University of Basel, the University Hospital Basel, Abbott, Beckman Coulter, Biomerieux, Brahms, Bensen, Roche, Ortho Clinical Diagnostics, Siemens, and Singulex.

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Stent apposition in proximal optimisation technique: diagnostic accuracy with progression of contrast medium to Flow (POT Puff)

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Introduction: Percutaneous coronary intervention (PCI) involving bifurcations is accounted for about one third of cases. PCI of coronary bifurcations are largely finalized with a proximal optimization technique (POT) which consist of inflating a shorter and larger balloon adapted to the mother branch size. We sought that contrast progression during the POT could be a sign of stent apposition in the mother branch. To validate this simple angiographic sign called POT Puff as a stent apposition marker in the mother branch, we performed an observational study comparing POT Puff sign with optical coherence tomography (OCT) as gold standard of stent apposition.

Methods and results: In two centers, we performed contrast injection during the POT in stable patients who underwent PCI of any bifurcation lesion excluding left main, followed by an OCT. We named POT puff sign positive if contrast medium progressed through the inflated balloon and negative if it was completely stopped. The number of struts in the mother branch was counted and sorted as malapposition above 200µm at the intimal surface. We included 50 consecutive coronary bifurcations in 49 patients with POT Puff sign and OCT without complications. The prevalence of malapposition in the mother branch confirmed by OCT was 26% (14 cases). The POT puff sign was positive in 24% (12 cases). Sensitivity, specificity, positive predictive value and negative predictive value were respectively 69.23% (44.14-94.32, 95% confidence interval), 91.89% (83.10-100), 75% (60.59-99.5) and 89.47% (79.72-99.23). The area under the ROC curve was 0.906 (0.645-0.966).

Conclusions: Our study suggests that prevalence of stent malapposition in the mother branch is frequent and that POT Puff sign is effective to detect stent malapposition as compared with OCT. POT puff sign is simple, accurate and cost free. It should be used in every PCI of non-left main bifurcation finalized with a POT to assess mother branch stent apposition.

Disclosure: Nothing to disclose
Cardiac imaging to estimate the prevalence of type 1 myocardial infarction among patients with PMI following non-cardiac surgery

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Introduction: Patients with perioperative myocardial injury/infarction (PMI) after non-cardiac surgery have a high mortality, but there is still no consensus about PMI-management. The aim of this study is to describe the diagnostic approach to estimate the prevalence of type 1 myocardial infarction (MI) among patients with PMI following non-cardiac surgery.

Methods: Consecutive patients at increased cardiovascular risk undergoing non-cardiac surgery were enrolled into a prospective multicenter study. PMI was defined as an increase of more than the 99th percentile of the troponin assay above baseline. In case of a PMI further diagnostic and therapeutic steps were taken under the discretion of the attending cardiologist. PMI aetiology was centrally adjudicated by two independent experts on all information available. PMI were classified into extra-cardiac (e.g., severe sepsis, stroke, pulmonary embolism, cardiac trauma) or cardiac (e.g., tachyarrhythmia, heart failure, treated-as type 1 MI, possible type 2 MI). New regional wall motion abnormalities (WMA) in transthoracic echocardiography (TTE), scars and/or ischemia in myocardial perfusion-scintigraphy/positron-emission-tomography (MPS/PET) and evidence of plaque rupture or thrombus in angiography were considered as signs for a type 1.

Results: From October 2014 to December 2017 we identified 344 patients (43%, mean age 77 years, 42% female) with cardiac PMI receiving cardiac consultation after exclusion. In 24 (29%) patients WMA was found in TTE. In 10 (45%) patients ischemia and in 9 (41%) scarring was found in MPS/PET. In the total of 37 lesions, 9 (24%) Ambrose type II lesions (eccentric lesion associated with disrupted plaques), 3 (8%) thrombus and 11 (30%) ulcerations were found in angiography. 44 (13%) patients had at least one sign for a type 1 MI in the undertaken cardiac imaging.

Conclusion: Cardiac imaging in selected PMI patients yield a high probability for detection of ischemia and angiographic abnormalities indicating a perioperative acute coronary event.

Disclosure: Grant from the Swiss Academy of Medical Sciences and the Bangerter Foundation (YTCR 09/19).
Carotid atherosclerotic burden significantly improves risk prediction derived from PROCAM and SCORE in middle aged subjects  


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Introduction: There are few data about the predictive value of atherosclerosis imaging beyond traditional risk calculators in younger subjects.  

Methods: We compared PROCAM, SCORE and FRAM with carotid ultrasound (total plaque area, TPA) and arterial age (AA), which was calculated in German and Swiss subjects without known cardiovascular diseases. Follow-up was obtained by phone or mail.  

Results: In 2842 subjects (age 50±8, 38% women) 137 (4.8%) cardiovascular events occurred (ASCVD: 41 myocardial infarctions, 16 strokes or TIA, 17 CABG, 28 PTCA, 35 coronary artery disease defined by invasive angiography) during a mean follow-up time of 5.4 (1-12) years. PROCAM risk was 5±6%, SCORE risk 1.3±1.6% and FRAM 10±6%. Both for the primary outcome (AMI, STROKE/TIA, CABG) and the secondary outcome (adding CAD and PTCA) hazards increased significantly for TPA and AA groups between 1.1 (0.5-2.5) and 58.6 (8.1-425.3) after adjustment for risk factors, age, smoking, sex, systolic BP, lipids, BMI, medication in Model 1) and after adjustment for results from PROCAM, SCORE and FRAM (Model 2). Model performance was statistically improved regarding model fit and calibration in all models using TPA and AA. Net reclassification improvement (NRI) for PROCAM and SCORE using TPA tertiles or AA age groups increased significantly between 24% to 50%.  

Conclusion: TPA and AA added clinically relevant additional prognostic information to conventional risk testing, supporting the assessment of ASCVD risk with carotid ultrasound in younger subjects.  

Disclosure: Nothing to disclose  

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Cardioprotective effects of strength training vs. accelerometric activity at the population level  

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St. George’s University, True Blue, Grenada  

Introduction: Interventions suggest that resistance training has cardioprotective associations distinct from total activity, but recommendations either ignore activity type or focus on aerobic activity. We establish whether independent cardioprotective effects of resistance training persist at the population level.  

Methods: 6947 American adults (51% male) self-reported resistance training and simultaneously tracked total activity with an accelerometer. 5-level activity categories were treated as predictor of heart-disease risks (hypertension, dyslipidemia, overweight and diabetes) corrected for year, age, sex, ethnicity, and smoking; activity categories were collapsed if there was no clear trend across them. Mutually corrected models were run only if both activity types predicted a given outcome.  

Results: Average total activity was 20 minutes per day (SD 24). 29% of subjects resistance trained, averaging once per week (range 0-6). In corrected models, risk was lower for each increasing category of total activity for overweight (OR 0.66 for any resistance training, 0.53 for highest level of total activity) and diabetes (0.70 and 0.25) with all p-values <0.01.  

Conclusion: Both activity types appeared cardioprotective, with comparable effect sizes that were almost independent. These findings support a cardioprotective use for routine resistance training in general practice.  

Disclosure: Nothing to disclose  

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Achievement of low-density lipoprotein cholesterol targets in light of the 2019 ESC dyslipidaemia guidelines: Real world data from cardiovascular rehabilitation  

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University of Basel | Department of Cardiology | Cardiovascular Research Institute Basel, University Hospital Basel, Basel, Switzerland  

Introduction: In 2019 the European Society of Cardiology (ESC) lowered the target values for low-density lipoprotein cholesterol (LDL-C) from <1.8 mmol/L to <1.4 mmol/L for secondary prevention of cardiovascular disease (CVD). Knowing that a large proportion of patients already fail to reach the 2016 guideline LDL-C goals, the latest update represents an ambitious challenge for LDL-management in daily clinical practice. To date, the percentage of patients already achieving this new LDL-C target in real world secondary prevention programs remains unknown.  

Methods: To evaluate patient characteristics and LDL-C target achievement rates according the 2016 and 2019 ESC dyslipidaemia guidelines, we conducted a retrospective analysis of prospectively collected data in patients with Coronary Artery Disease (CAD), who completed the local ambulatory cardiovascular rehabilitation program (CR) in 2018.  

Results: In 176 eligible patients, median age was 61 years (IQR 55 -70) and sex was predominately male (n = 155; 88.1%). Acute coronary syndrome (ACS) was the leading diagnosis triggering CR (136 patients; 77.3%). Lipid lowering medication included statins (96.0%), high potent statins (90.9%), Ezetimbe (13.1%), PCSK9-inhibitors (1.1%) and Fibrates (0.6%). At the end of CR, the primary endpoint (LDL-C target <1.4 mmol/L) was reached by 79 patients (44.9%) and the secondary endpoint (LDL-C target <1.8 mmol/L) was reached by 134 patients (76.1%). Patients with LDL-C above the 2016 guideline recommendation (>1.8mmol/L) were more often female (p = 0.014), had less statin (p = 0.013) but more ezetimibe therapy (p = 0.014). If statins were used, they were less potent overall (p = 0.033) without significant differences in-between groups (p = 0.023).  

Conclusion: Almost half of patients participating in a comprehensive CR in 2019 achieve the 2019 recommended LDL-C goal of <1.4 mmol/L primarily by using high potent statins. Avoiding chronic undertreatment in women and increasing the use of combination therapies is crucial to further enhance the number of patients reaching the latest LDL-C target goals.  

Disclosure: Prof. Pfister reported receiving speaker honoraria from Novartis, Vifor Pharma, AstraZeneca, and MSD.  

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Short- and long-term effects of high intensity interval training vs. moderate intensity continuous exercise on left ventricular remodeling in patients early after ST-elevation myocardial infarction - the HIIT EARLY randomized controlled trial  

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Introduction: The effect of high intensity interval training (HIIT) on left ventricular (LV) remodeling in patients with acute ST-elevation myocardial infarction (STEMI) is poorly understood. We aimed to compare short- and long-term effects of HIIT vs. moderate-intensity continuous exercise (MICE) on LV remodeling in patients with a recent acute STEMI.  

Methods: Patients with an acute STEMI (<4 weeks) were recruited. After a 3-week run-in period with up-titration of medical therapy and
three weekly MICE, baseline assessment included echocardiography, cardiopulmonary exercise test, and blood testing. Patients were randomized to either HIIT or isocaloric MICE for 9 weeks (MICE: three weekly; HIIT: two HIIT and one MICE). Exercise training was tailored based on the ventilatory thresholds (VT), and appropriately up-titrated. Patients were re-assessed after 9-weeks and after 12 months. Mixed models were performed for LV end-diastolic volume relative to body surface area (LVEDVi), LV global longitudinal strain (LVGLS) and peak oxygen consumption (VO2) with group * time interaction effects.

Results: 73 male patients were included (Table 1). There was no group*time interaction for LVEDVi. LVEDVi increased overall by 5.04 ml/m² (95% CI 2.19 to 7.88 ml/m²) from baseline to 9 weeks and by 0.44 ml/m² (-2.57 to 3.45 ml/m²) from baseline to 1 year (Figure 1a). LVGLS improved in both groups from baseline to 9 weeks by -0.84% (-1.4 to -0.28%). However, there was a trend for group*time interaction (p = 0.052) with a worsening in LVGLS in the HiIT group by 1.30% (-0.01 to 2.61) compared to the MICE group at one year (Figure 1b). No further group*time interactions were found. Peak VO2 increased overall by 2.53 ml/kg/min (1.68-3.38 ml/kg/min) from baseline to 9 weeks and by 2.73 ml/kg/min (1.59-3.87 ml/kg/min) from baseline to 1 year (Figure 1c). HsTnT decreased by -0.54 pg/ml (-0.72 to -0.36 pg/ml) within 9 weeks and by -0.95 pg/ml (-2.57 to 3.45 pg/ml) from baseline to one year (Figure 1d).

Conclusion: In patients early after acute STEMI, HIIT was not different to isocaloric MICE with regard to short- and long-term effects on LVEDVi, biomarkers of myocardial damage and cardiorespiratory fitness.

The trend towards a worsening in LVGLS at 12 months in the HIIT group suggests that HIIT may induce an unfavorable LV remodeling in the phase of myocardial healing.

<table>
<thead>
<tr>
<th>Table 1 Baseline characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Male sex (n)</strong></td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>37 (100%)</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
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<tr>
<td><strong>Body mass index (kg/m2)</strong></td>
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<td><strong>Blood pressure (mm Hg)</strong></td>
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<td><strong>Anterior wall MI (n)</strong></td>
</tr>
<tr>
<td><strong>Ejection fraction (%)</strong></td>
</tr>
<tr>
<td><strong>ACE inhibitors/AT2 blockers</strong></td>
</tr>
<tr>
<td><strong>Beta blockers</strong></td>
</tr>
<tr>
<td><strong>Lipid lowering drugs</strong></td>
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</tbody>
</table>

Disclosure: Nothing to disclose

Cardioprotective associations of self-reported and objectively measured physical activity in a healthy population

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Introduction: Physical activity benefits health, but population-scale research is hampered by heterogeneity in assessment. Subjective assessments of activity (e.g. self-reports) are biased by recall and social desirability, while objective measures (e.g. accelerometer) are logistically complex and have their own biases. Choice of a measure is thus driven by issues of both clinical relevance and logistics. To inform this choice I compare both total levels, and cardioprotective associations, of total physical activity assessed both objectively and subjectively in the same population.

Methods: 7695 American adults (51% male) self-reported activity on a standardized questionnaire and wore an activity-tracking accelerometer for one week. Each activity measure was categorized into 5 levels for analysis, and we calculated associations with heart-disease risks (hypertension, dyslipidemia, overweight, and diabetes) first uncorrected and then corrected for confounders (age, ethnicity, gender and smoking.) If more than one activity measure predicted a given outcome, mutually corrected models were run.

Results: Subjectively and objectively measured total activity averaged 24.5 (SD 54) and 19.3 (SD 20) minutes per day. Both measures were (sometimes nonsignificantly) lower in females, tobacco smokers, older adults, and black Americans. After correction for confounding, both activity measures were significantly (p for trend <0.05) negatively associated with diabetes and overweight, but not dyslipidemia: subjective, but not objective, activity also predicted hypertension. For each significant association, risk of the outcome steadily decreased for all activity categories past the second-lowest. Compared to the lowest category of subjective activity, odds of hypertension for those in the highest category were 0.72 (p <0.05). Odds ratios (OR) for diabetes and overweight were 0.84 (p = 0.07) and 0.69 (p <0.05). For objective activity, the odds ratios for diabetes and overweight were 0.23 and 0.49 (both p <0.001). After mutual correction, estimated effects of objective activity did not change much (new ORs 0.23 and 0.52, both p <0.05) but effects of subjective activity lost significance, and its estimated effect on diabetes was no longer consistently protective.

Conclusions: If objective activity measures are not available, subjective reports adequately capture levels of physical activity as well as the direction, though not size, of many of its effects.

Disclosure: Nothing to disclose

Ideal cardiovascular health in suburban Switzerland - Results from the first phase of the Swiss Longitudinal Cohort Study (SWICOS)


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Introduction: Ideal Cardiovascular Health (ICH) is a concept defining cardiovascular health of individuals using seven health metrics. We assessed cardiovascular health among participants of the Swiss Longitudinal Cohort Study (SWICOS) using the ICH concept.

Method: This analysis of the SWICOS study included 466 participants without previous cardiovascular disease. The seven health metrics were blood pressure (BP), total cholesterol, blood glucose, smoking, body mass index (BMI), physical activity, and diet. Each of the seven metrics was divided into three categories (ideal, intermediate, and poor) using pre-defined cut-offs according to the ICH concept.

Results: Ideal BP was found in 145 (31.1%), ideal cholesterol in 192 (42.3%), ideal glucose in 341 (75.4%), non-smoking in 273 (58.6%), ideal BMI in 259 (55.6%), ideal physical activity in 37 (8.0%), and an ideal diet in 96 (22.9%) of the 466 participants (Figure 1). For BP, glucose, and BMI, significantly more female than male participants were in the ideal
Introduction: Several previous studies investigated white-coat hypertension and factors associated with it. To the best of the authors’ knowledge, no previous population-based study comprehensively assessed factors associated with white-coat hypertension in Switzerland.

Method: The population-based Swiss Longitudinal Cohort Study (SWICOS) assessed cardiovascular risk profiles in a Swiss community (Cama/Lostallo GR). Of 496 participants, 61 participants with elevated systolic blood pressure (SBP) or diastolic blood pressure (DBP) were assessed by 24-hour ambulatory blood pressure monitoring (ABPM). White-coat hypertension was defined as mean SBP or DBP ≥130/80 mmHg during ABPM.

Results: Of the 61 participants, who underwent ABPM, 20 (32.8%) had white-coat hypertension. Body mass index (BMI) was significantly lower (5.7 vs. 7.9 kg/m², p = 0.010), and depression was significantly more prevalent (35.0% vs. 9.8%, p = 0.030). There were, albeit statistically non-significant, trends towards more female participants among white-coat hypertensives (56.0% vs. 34.1%, p = 0.17), and more persons who were married (75.0% vs. 56.0%, p = 0.17). There were no differences with regard to age, education, prevalence of cardiovascular risk factors, or the use of antihypertensive drugs.

Conclusion: The prevalence of white-coat hypertension in the general population is high with approximately one in three persons having white-coat hypertension. In particular, lean female persons with depression should undergo 24-hour ABPM to rule out white-coat hypertension.

Disclosure: Nothing to disclose

<table>
<thead>
<tr>
<th>Population</th>
<th>N</th>
<th>SD of measured BP differences SBP (mmHg)</th>
<th>SD of measured BP differences DBP (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>16</td>
<td>7.1</td>
<td>2.9</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>10</td>
<td>6.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>8.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 65</td>
<td>7</td>
<td>4.0</td>
<td>2.3</td>
</tr>
<tr>
<td>&gt; 65</td>
<td>9</td>
<td>* 9.3</td>
<td>3.4</td>
</tr>
<tr>
<td>BMI (Kg/m²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 26</td>
<td>10</td>
<td>7.9</td>
<td>2.9</td>
</tr>
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<td>&gt; 26</td>
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<tr>
<td>3</td>
<td>3</td>
<td>4.5</td>
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</tr>
</tbody>
</table>

[Standard deviation (SD) of the measured BP differences across different subgroups. (*) Only subgroup with a SD larger than 8mmHg]
Conclusions: SBP and DBP values obtained by radial artery catheterization and those obtained from optical estimations at the wrist were compared. While for the overall population and most subgroups the new optical technique appears to be capable of replacing more traditional methods, in Switzerland, the SBP differences found for the subgroup of patients above 65 years old were larger. Additional studies are needed to confirm and expand these very encouraging results.

Disclosure: Nothing to disclose

Impact of self-reported alcohol consumption on in-hospital outcomes after acute coronary syndrome: an insight from the AMIS Plus registry

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Introduction: The association between alcohol consumption and the occurrence of coronary heart disease is well described in literature. Data regarding the impact of regular alcohol consumption on in-hospital outcomes in the setting of acute coronary syndrome (ACS) are lacking. We aimed to evaluate the impact of self-reported alcohol consumption on in-hospital outcomes in patients with ACS.

Methods: Data derived from patients enrolled between 2007 and 2019 in the Acute Myocardial Infarction in Switzerland (AMIS) Plus registry were retrospectively analyzed. The primary endpoint was all-cause in-hospital mortality, while secondary endpoints were set as incidence of major adverse cardiac and cerebrovascular events (MACCEs). Outcome comparisons according to quantity of daily alcohol intake were also performed.

Results: Records concerning alcohol consumption were available in 25707 patients; 5298 of them (21%) fulfilled the criteria of regular alcohol consumption. Daily alcohol intake was reported in 4059 (77%), of these patients (regular drinkers) with 2640 light drinkers (<2 drinks/day) and 1419 heavy drinkers (>2 drinks/day). Regular drinkers were predominantly male, younger, smokers, more comorbid and with a worse clinical presentation as compared to abstainers/occasional drinkers. In-hospital mortality and MACCEs of heavy drinkers were significantly higher compared to light drinkers (5.4% vs. 3.3% and 7.0% vs. 4.4%, both p = 0.001). When tested together with GRACE risk score parameters, heavy alcohol consumption was independently associated to in-hospital mortality (p = 0.004).

Conclusions: Heavy alcohol consumption is an additional independent predictor of in-hospital mortality in patients presenting with ACS.

Disclosure: Nothing to disclose

Use of evolocumab in patients at high cardiovascular risk: the Swiss multicenter prospective observational ECARA study

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Introduction: Maintenance of low LDL-C-levels and adherence to lipid lowering therapy (LLT) is essential to prevent recurrent CV events. However, in Switzerland, more than 60% of patients with acute coronary syndrome do not achieve guideline recommended LDL-C goals at one year. Practicable solutions to increase long-term adherence to LLT are thus needed.

Methods: ECARA1 enrolled adults ≥18 years with confirmed atherosclerotic cardiovascular disease (ASCVD) or at high risk of a CV event, and elevated LDL-C levels despite maximally tolerated statins. Patients must have initiated evolocumab 140mg every two weeks or 420mg monthly prior to enrollment; planned follow-up was 12 months. The web-based mHealthAlert system was used to support patient management and drug adherence. Primary outcome was cholesterol levels at initiation and after 3, 6 and 12 months of evolocumab therapy.

Results: All 100 enrolled patients completed 12 months follow-up. Baseline characteristics are shown in the Table. 81% had a history of CV events and 55% had ≥2 previous CV events; 3% had familial hypercholesterolemia. At enrollment, 71% had a history of statin-related muscle symptoms, 44% were receiving statins, 65% had received prior PCSK9i therapy and 35% were PCSK9i-naive; median LDL-C was 1.9 mmol/L. In PCSK9i-naive patients, median LDL-C at enrollment was 3.5 mmol/L and fell by a mean of 2.1 mmol/L within 3 months of evolocumab initiation; this reduction was maintained over time. In patients with prior PCSK9i therapy, LDL-C remained stable during evolocumab treatment (Figure).

Disclosure: This study was funded by Amgen Switzerland AG. David Carballo has received congress attendance support. Isabella Sudano has received consulting fees, travel grants and honoraria from Amgen,
Incremental Value of C-reactive protein to the MESSi acute heart failure risk score


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Introduction: The MESSi acute heart failure (AHF) risk score has high accuracy in the prediction of 30-day mortality in patients presenting with AHF and may be considered the current gold standard for this indication. However, the impact of C-reactive protein (CRP) on the model’s goodness of fit is unknown.

Methods: In a prospective multicenter diagnostic study the presence of AHF was centrally adjudicated by two independent cardiologists among patients presenting with acute dyspnea to the ED. The MESSi-AHF risk score was calculated using a recalibrated model containing 12 independent risk factors. The incremental value of CRP was examined by the use of a logistic regression analysis with an entry criterion of p < 0.01. Goodness of fit tests were performed to measure the model’s discrimination and calibration.

Results: Among 1572 patients with adjudicated AHF, 1208 patients had complete data allowing calculation of the MESSi score updated by CRP. Compared to the original MESSi model (c-statistic, 0.79 [95% CI, 0.75-0.83]) the addition of CRP (c-statistic, 0.83 [95% CI, 0.79-0.86]) significantly improved the model’s discrimination (p = 0.01). While assessing the cumulative mortality, the gradient in 30-day mortality over six predefined risk groups was increased by addition of CRP. 30-day mortality rates in the lowest and highest risk groups of the original model were 0.4% and 31.0% compared to 0.5% and 37.8% in the updated model. Both models showed good overall calibration (Hosmer-Lemeshow p = 0.22 [original model], p = 0.84 [model updated by CRP]). Findings were confirmed in a sensitivity analysis that used multiple imputation for missing values in the overall cohort of 1572 patients.

Conclusion: CRP has a significant incremental value to the MESSi score as indicated by the improved goodness of fit compared to the original model.

Disclosure: Nothing to disclose

Predictors for one-year outcomes after cardiac rehabilitation in elderly patients: the EU-CaRE multicenter cohort study

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Preventive Cardiology & Sports Medicine, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland

Background: Cardiac rehabilitation (CR) has been found to improve exercise capacity in patients with coronary artery disease (CAD) and valvular heart disease (VHD). However, elderly patients have largely been underrepresented in reported studies.

Aims: To identify predictors for 1-year outcomes after CR programs offered across seven European countries for elderly CAD and VHD patients.

Methods: CAD patients with or without revascularization and patients after valve intervention > 65 yrs who participated in comprehensive CR were included in the study. Peak oxygen uptake (VO2), BMI, resting systolic blood pressure (BPsys), and low-density lipoprotein-cholesterol (LDL-C) were assessed before start of CR, at termination of CR and 12 months after start of CR and predictors for changes were identified by multivariate regression models.

Results: Analyses were based on 1241 patients. The strongest predictor for improvement in peak VO2 was open chest surgery with a three-fold greater increase in surgery patients compared to patients with percutaneous or no interventions. Therefore, predictors for surgery and non-surgery patients were identified separately. In the 468 patients after surgery, age, female sex, diabetes mellitus and lag time from index event to start of CR were negative predictors for improvement in peak VO2. In the 773 patients without open chest surgery, age and previous acute coronary syndrome were negative predictors. Neither number of attended training sessions nor duration of CR were associated with change in peak VO2. Non-surgery patients were more likely to achieve targets in risk factors control (BPsys, LDL-C and body mass index) compared to surgery patients. LDL-C targets were better achieved by DM patients and CAD patients with statin therapy.

Conclusions: Factors other than CR characteristics (number of attended training sessions or duration of CR), namely time between index event and start of CR in open chest surgery and disease severity in non-surgery patients were the most important predictors for long-term improvement of exercise capacity after CR programmes. The greater improvement in surgery patients was highly related to the time between index event and start of CR, which probably reflected the contribution of spontaneous recovery.

Disclosure: Nothing to disclose

Cardiac rehabilitation in underrepresented groups: uptake and clinical outcomes from a tertiary referral center in Switzerland

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Introduction: Cardiac rehabilitation (CR) uptake remains consistently low across countries and time, especially for women, elderly patients, and migrants. In addition, factors associated with low uptake may be also associated with less clinical benefit from CR.

Objective: To evaluate the association of migration status, age and sex, with CR uptake and clinical outcomes of a hospital committed to treat- ment equity.

Methods: Longitudinal cohort study. We retrospectively included all consecutive records of patients who underwent PCI after acute or chronic coronary syndromes at the Bern University Hospital from 2006-
2017. We analysed CR uptake, and its clinical benefit in terms of gain in peak exercise capacity in metabolic equivalents (MET) and changes in cardiometabolic profile, including body mass index (BMI), blood pressure (BP), LDL-cholesterol and glycated hemoglobin (HbA1c) in patients with diabetes mellitus. To assess the associations of age, sex, and migratory status with CR uptake, a logistic adjusted regression model was performed. The effects on clinical benefits were evaluated by adjusted linear regression models.

**Results:** We included 2785 records. Overall CR uptake was 33.7% (43.2% among migrants, 25% among women). Of the 517 patients who enrolled in CR, 52% had an acute coronary syndrome. CR uptake significantly declined with increasing age (-47% per decade, p < 0.0001) and was smaller in single/divorced/widowed patients than patients living with partner (-34%, p = 0.001). After adjustment for age, there was no difference in CR uptake between sexes or patients with native/foreign origin. We observed statistically significant changes after CR in exercise capacity (+0.8 MET or 13%, p = <0.0001), improvement in LDL-cholesterol (median -0.3 mmol/L or -13%, p = <0.0001) and glycated hemoglobin in diabetic patients (median -0.4 mmol/mol or 5%, p = 0.0002). BMI and systolic BP did not change. The change in MET was independently associated with the number of attended sessions per week in patients younger than 65 yrs (0.4 MET per weekly session, p <0.0001). Increasing age was associated with a decrease in improvement of exercise capacity (-0.2 MET per decade, P <0.0001). Neither age, sex, migration status nor number of attended training sessions had an effect on changes in the evaluated parameters.

**Conclusion:** In a Swiss urban setting, older age was the only barrier to participate in CR and reduced the clinical benefit of CR.

**Disclosure:** Nothing to disclose

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Training intensity and associated improvements in exercise capacity in elderly patients undergoing European cardiac rehabilitation - The EU-CaRE study

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**Introduction:** Guidelines for exercise intensity prescription in Cardiac Rehabilitation (CR) are inconsistent and have recently been controversially discussed. We aimed 1) to compare training intensities between European CR centres and 2) to assess associations between training intensity and improvement in peak oxygen consumption (VO2) in elderly CR patients.

**Methods:** Peak VO2, heart rate (HR) and workload (Watt) at the first and second ventilatory thresholds were measured at start of CR. Training HR was measured during three sessions spread over the CR. Multivariate models were used to compare training characteristics between centres and to assess the effect of training intensity on change in peak VO2.

**Results:** Training intensity was measured in 1011 out of 1633 EU-CaRE patients in 7 of 8 centers and the first and secondary ventilatory thresholds were identified in 1166 and 817 patients respectively. The first and second ventilatory threshold was found at 44% (SD 16%) and 78% (SD 9%) of peak Watt and 78% (SD 9%) and 89% (SD 5%) of HR peak, respectively. Training intensity and session duration varied significantly between centres but change in peak VO2 over CR did not. Training above the first individual threshold (β 0.62, 95% confidence interval [0.25 - 1.02]) and increased training volume per hour (β 0.06, 95%CI [0.01 - 0.12]) was associated with a higher change in peak VO2 in the multivariate mixed model.

**Conclusions:** While training intensity and volume varied greatly amongst current European CR programs, changes in peak VO2 were similar and the effect of training characteristics on these changes were small.

**Disclosure:** Nothing to disclose

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Cascade genetic testing of familial hypercholesterolemia in Switzerland: design of the CATCH randomized controlled trial

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**Introduction:** Familial hypercholesterolemia (FH) is a frequent genetic disorder (1/200) associated with an increased risk of early-onset myocardial infarctions. To improve detection and treatment of patient with FH, cascade genetic testing into families is recommended. However, the implementation of a genetic cascade screening program for FH has never been tested in Switzerland.

**Methods:** We designed an ethical genetic cascade screening program for FH to be tested in Switzerland. Index cases with a monogenic mutation in one of the three genes causing FH will be included. A randomization procedure will allocate index cases and their family member into the intervention arm or the usual care arm. The primary outcome will be the difference in the yield of detection of familial hypercholesterolemia (FH) between arms. Secondary endpoints include the transmission rate of phenotype and genotype into families.

**Results:** The intervention will consist in three cycles of screening performed by a network of several cardiovascular and lipid clinics in Switzerland. The contact of relatives will be initiated by the index case and supported by a centralized service. The index case will be provided with a prepared email to be addressed to his first-degree relatives. The email will contain a request to provide contact information by using a link to a secured webpage. After agreement, the relatives will then be directly contacted by the nearest specialized clinic. We will include 28 families per arm to show a statistically significant difference of 20% in the consent rate between the control and interventional arm.

**Conclusions:** Based on previous studies, the Swiss legal environment, and the use of mobile information technology, we have designed a cascade screening program ethically acceptable. The contact procedure will allocate index cases and their family member into the intervention arm or the usual care arm. The primary outcome will be the difference in the yield of detection of familial hypercholesterolemia (FH) between arms. Secondary endpoints include the transmission rate of phenotype and genotype into families.

**Disclosure:** Nothing to disclose
Myocardial flow reserve from positron emission tomography adds prognostic value and modifies treatment response in patients with ischemic heart failure

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Introduction: Although myocardial flow reserve (MFR) is a strong predictor of cardiac risk in patients without heart failure, it is unknown whether MFR improves risk stratification and modifies treatment response in patients with ischemic heart failure. This study sought to investigate the prognostic and clinical value of MFR in this patient population.

Methods: The study included 254 patients referred for stress/rest myocardial perfusion imaging and viability testing using positron emission tomography (PET). Major adverse cardiac events (MACE) consisted of death, resuscitated sudden cardiac death (SCD), heart transplantation, acute coronary syndrome, hospitalization for heart failure, and late revascularization.

Results: MACE occurred in 170 patients (67%) during median follow-up of 3.3 years. Beyond age, symptom severity, diabetes mellitus, previous myocardial infarction/ revascularization, three-vessel disease, renal insufficiency, ejection fraction as well as presence and burden of ischemia, scar and hibernating myocardium, respectively, MFR was strongly associated with MACE (adjusted hazard ratio (HR) per increase in MFR by 1, 0.63 [95% confidence interval (CI), 0.45-0.91]). Compared to patients with a high MFR (>1.7), annualized MACE rate was increased in patients with an intermediate MFR (1.2-1.6; 22% vs. 14%, p = 0.033) and in patients with a low MFR (<1.2; 33% vs. 14%, p < 0.001). Incorporation of MFR into a risk assessment model incrementally improved prediction of MACE (likelihood ratio χ²(16) = 49.33 vs. χ²(15) = 36.95, p < 0.001). After adjusting for the clinical and imaging covariates, there was a significant interaction between MFR and treatment strategy (p = 0.004), indicating that, in patients with an MFR below 1.2, early coronary artery bypass graft surgery is associated with lower annualized MACE rates compared to percutaneous coronary intervention (8% vs. 40%, p = 0.035) or medical therapy alone (8% vs. 32%, p = 0.02).

Conclusions: PET-derived MFR improves risk stratification and modifies treatment response in patients with ischemic heart failure.

Disclosure: Nothing to disclose

Myocardial fibrosis assessed by extracellular volume quantification is a determinant of symptoms in aortic valve regurgitation with preserved ejection fraction

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Introduction: Current guidelines on aortic regurgitation (AR) recommend valve replacement in case of symptoms occurrence, systolic left ventricular (LV) dysfunction, and/or LV dilatation. Although the prognostic significance of several clinical and imaging parameters has been demonstrated, the determinants of symptoms in patients with AR and preserved LV ejection fraction (LVEF) are still unknown. The extracellular volume (ECV), calculated using the novel T1 mapping cardiac magnetic resonance (CMR) technique, allows the quantification of myocardial interstitial fibrosis with high spatial resolution. We hypothesized that interstitial fibrosis assessed by ECV quantification may be a determinant of symptoms in AR.

Methods: We retrospectively enrolled 34 consecutive patients with chronic, isolated, mild to severe AR who underwent a CMR at our institution. Exclusion criteria were the presence of any other heart condition that may induce myocardial fibrosis, ≤ mild associated valve disease, AR secondary to endocarditis, genetic, inflammatory or congenital disease except bicuspid aortic valve. T1 mapping of the basal segments was performed before and after contrast administration measuring native and post-contrast T1 relaxation time and ECV.

Handoc score, among 48 patients with non-beta-haemolytic streptococcal bacteremia, 32 (66.7%) were diagnosed with IE. A score ≤2 was associated with a NPV of 66.7% and a sensitivity of 75%, with an accuracy of 0.828 (95% CI 0.738-0.918). Misclassification of IE endocarditis cases (proven or probable) to ‘low risk’ occurred in four cases for VIRSTA score, three for DENOVA and eight for HANDOC.

Conclusions: Although studies suggest the potential utility of these scores to avoid urgent echocardiography in patients at low risk, in our study the sensitivity of these scores was not adequate to confirm this hypothesis. Hence, echocardiography should always be considered, even in the ‘low risk’ group.

Disclosure: Nothing to disclose

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The role of multivariate scores to determine priority for echocardiography in patients with bloodstream infections

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Introduction: Infective endocarditis (IE) is a life-threatening condition. Prompt diagnosis is essential for optimal patient management. Predictive scores have been developed (VIRSTA, HANDOC, DENOVA) to identify patients at low risk of IE for whom echocardiography appears less justified. The aim of the present study was to evaluate the use of these scores in clinical practice.

Methods: This prospective observational study included all patients with suspected IE hospitalized at Lausanne University Hospital during a 24-month period (January 2018 to December 2019). IE (proven and probable) was defined by modified Duke Criteria. The multivariate scores (VIRSTA, HANDOC, DENOVA) were evaluated.

Results: Among 515 patients with suspected IE; 148 patients had bacteremia due to Staphylococcus aureus from which 47 (32%) were diagnosed with IE. When VIRSTA score was evaluated, a score ≤2 was associated with a negative predictive value (NPV) of 88.2% and a sensitivity of 91.5%, with an accuracy of 0.63 (95% CI 0.692-0.861). HANDOC score, among 48 patients with non-beta-haemolytic streptococcal bacteremia, 32 (66.7%) were diagnosed with IE. A score ≤2 was associated with a NPV of 66.7% and a sensitivity of 75%, with an accuracy of 0.828 (95% CI 0.738-0.918). Misclassification of IE endocarditis cases (proven or probable) to ‘low risk’ occurred in four cases for VIRSTA score, three for DENOVA and eight for HANDOC.
Results: Mean age was 56±19 years, 26 patients (77%) were males, and symptoms were reported in 10 patients (29%). Mean LVEF was 57±9% and ≥50% in 27 patients (79%). Aortic valve regurgitation fraction (RF) was 25±13%, ECV 0.27±0.04%, indexed LV end-diastolic volume (LVEDVi) 99±33 ml/m² and end-systolic volume (LVESVi) 46±20 ml/m². LVEDVi (r = 0.35, p = 0.04), LVEF (r = -0.59, p = 0.0002) and ECV (r = 0.40, p = 0.02) were correlated with symptoms, whereas age (r = 0.28, p = 0.11), gender (r = -0.25, p = 0.15) and RF (r = 0.27, p = 0.11) were not. In the subgroup of patients with preserved LVEF (≥50%), after adjustment for LVEDVi and RF, only ECV remained independently associated with symptoms (p = 0.049).

Conclusion: myocardial fibrosis quantified by ECV calculation is a determinant of symptoms in AR with preserved LVEF. Further studies are warranted to determine the prognostic value of ECV that may justify earlier intervention.

Disclosure: Nothing to disclose

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Vector flow mapping analysis of left ventricular energetic performance in patients undergoing transcatheter aortic valve implantation (TAVI) for severe aortic stenosis (AS)

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Background: Vector flow mapping (VFM) is a novel flow visualization echocardiographic technology that uses both color-Doppler and speckle tracking images. The calculated velocity vectors are integrated according to a weight function. Energy loss reference values have been proposed for children and adults; no evidence still now exist about vorticity and energy parameters in patients with aortic stenosis undergoing TAVI.

Aim: the objective of this prospective study is to collect the pattern of VFM and Left ventricular Energy loss index (LV-ELI) of patients with severe AS candidate to TAVI.

Method: Transthoracic echocardiography (TTE) was performed using Prosound F75 Premier (Hitachi, Tokyo, Japan) with a 2.5 MHz sector probe. We included in this preliminary analysis the complete VFM of 5 normal subjects and 7 patients before and after TAVI procedure (total of 19 complete dataset).

Results: Regarding the qualitative evaluation of vorticity visual indexes, in patients with severe AS the diastolic small posterior vortex and the dimensions of the systolic vortex tended to be less pronounced than in normal subjects. Quantitation of LV-ELI in pre and post TAVI patients revealed prominent LV-ELI in diastolic phase rather than systolic (pre-TAVI systolic ELI/diastolic ELI: 10.9±6.1 m-W/m and 20.8±16.0 m-W/m). ELI systolic was not correlated with LVEF and LV dimensions, but significantly with the transaortic- pressure gradient (Gp), both peak-Gp and mean-Gp: r2: 0.798 and p 0.005 for peak-Gp, 0.727 and p 0.008 for mean Gp. No correlation with any dimensional and Doppler parameters was found for diastolic ELI. After TAVI we observed an increased LV-ELI for both systolic and diastolic phase (from 10 ± 6 to 20 ± 16 mW/m, p value ns for systolic phase; from 10 ± 8 to 33.7 ± 17.6 mW/m, p value 0.01 for diastolic phase). A negative significant correlation was found between reduction of gradients post-TAVI and increase of ELI (p value 0.02 for correlation between the variation of these 2 parameters).

Conclusions: The reduction of transvalvular systolic gradient after TAVI is related to an increase in Left ventricle energy loss index (LV-ELI) and changes in Vorticity parameters. Echocardiographic follow up will reveal if this hemodynamic positive effect of increase in ELI can lead to positive remodelling of LV after TAVI through less endocardial stress and myocardial oxygen consumption.

Disclosure: Maurizio Taramasso: consultant for Abbott Vascular, Boston Scientific, 4tech, CoreMedic. Speaker fees from Edwards Lifesciences. FM: consultant Abbott, Edwards Lifesciences, Medtronic, Peribea, Transseptal solutions, Xeltis, Cardiovalve; Grant receiver: Abbott, Medtronic, Edwards Lifesciences, Biotronik, BostonScientific; Royalties/receiver: EdwardsLifesciences,4Tech;MG:consultant for Biotronik. Mara Gavazzoni and Michel Zuber are Consultant for Abbott; F. Maisano reports grant and/or research support from Abbott, Medtronic, Edwards Lifesciences, Biotronik, Boston Scientific Corporation, NVT and Terumo; consulting fees and/or honoraria from Abbott, Medtronic, Edwards Lifesciences, Swissvortex, Peribea, Xeltis, Transseptal Solutions, Cardiovalve and Magenta; royalty income/IP rights from Edwards Lifesciences (FMR surgical annuloplasty); and is a shareholder of Cardiovalve, Magenta, Swissvortex, Transseptal Solutions, Occlufit, 4Tech and Peribea. The other authors have no conflicts of interest to declare.
CONGENITAL / PAEDIATRIC CARDIOLOGY

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2D cine vs. 3D free-breathing self-navigated whole heart for aortic root measurements in congenital heart disease
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Introduction: Cardiac magnetic resonance (CMR) is the method of choice for determination of aortic root diameters in congenital heart disease (CHD). Usually a 2D cine stack is acquired perpendicular to the vessel axis to determine the maximum diameter. However, this method requires several breath-holds and a precise planning of image planes which can be difficult in complex anatomy and for patients with dyspnea. An alternative is the use of a free-breathing high-resolution 3D self-navigating whole heart sequence (3D-SN) which allows retrospective reconstruction of the aortic root. This study aimed to compare these two techniques for determination of aortic root diameters.

Results: 64 patients (age 32±15 years, female 28%) with a variety of CHD were included. Measured aortic root diameters were larger on 3D-SN than on 2D cines (table). Intra- and interobserver variabilities were excellent for both techniques as shown for the largest diameters, with no differences between the 2D cine and 3D-SN techniques (bias (%) ± standard deviation [95% limits of agreement]): Intraobserver 2D cine -1.04±3.2 (-7.3; 5.2) vs. 3D-SN -1.7±3.3 (-8.2; 4.8), p = 0.3; interobserver cine 1.4±6 (-10.3; 13.2) vs. 3D-SN 5.5±2.3 (0.5; 10), p = 0.1.

Conclusions: Although 3D-SN provides slightly larger aortic root diameters than diameters measured on 2D cines, it is a valuable alternative to determine aortic root diameters.

Disclosure: Nothing to disclose

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Heart rate reserve but not right ventricular systolic function nor ntprobnp level predicts exercise capacity in patients after senning correction of TGA
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Introduction: Patients after Senning correction of TGA survive well into adulthood. Their quality of life is determined largely by exercise tolerance. Our aim was to compile a study of a set of routinely tested parameters easily accessible in daily clinical practice and examine their relation to maximal oxygen uptake.

Methods: 86 consecutive patients after Senning correction of TGA in childhood were subjected to clinical and echocardiographic examination, blood tests, MRI and exercise test. VO2max., NYHA, n-t-proBNP, right ventricular ejection fraction and heart rate reserve during exercise were tested. Analysis of relations among studied variables was performed using non-parametric statistical methods. P-values less than 5% were considered as statistically significant.

Results: Average age of patients was 23±3.5 years, average NYHA class 1.3±0.4. Echocardiographic and MRI right ventricular function respectively was normal in 60 (69.7%) and 50 (58.1%) patients, mildly decreased in 23 (26.7%) and 30 (34.8%) and moderately decreased in 3 and 6 (7.1%) patients. Average RVEF by MRI was 51.9±7.9%. Average ntproBNP was 124.3±23.59 ng/l. Average VO2 max was 31.7 ml/kg/min ± 6.5 ml/kg/min. Average heart rate reserve was 106±24/min. There was no statistically significant relationship of NYHA, n-t-proBNP and RVEF to VO2 max. HRR was the only parameter predicting VO2 max.

Discussion and conclusion: Long term results of follow up of patients after Senning correction of TGA are good. The most striking fact emerging from our study is that exercise capacity of our patients compared to literature is substantially, by 32%, higher than in other cohorts. Our patients reached 77.3% of norm for healthy subjects. Number of ntproBNP values exceeding threshold for cardiac insufficiency in our study was extremely low. More than a half of patients show that their systemic right ventricle systolic function is in normal range and it is severely impaired only in minority of patients. RVEF does not correlate with VO2 max. The reason is possibly considerably more complex etiopathogenesis of decreased exercise capacity in patients after atrial switch with intricate haemodynamics including limited flow through atrial baffles. Ability to increase heart rate during exercise is the only significant predictor of VO2x max in our study. This could possibly mean that it is not just the stroke volume but the overall heart output which influences the exercise capacity.

Disclosure: Nothing to disclose
Management of an aortic dissection in a 9-year old boy with Loes-Dietz syndrome

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Introduction: Loes-Dietz syndrome (LDS) is an autosomal-dominant connective tissue disorder characterized by aortic aneurysm, generalized arterial tortuosity, hypertelorism and split uvula or palate. The vascular lesions tend to be aggressive with a high incidence of aortic adverse events even at younger age, especially in LDS type 2. Early and extensive surgical strategy is occasionally needed to prolong the patient’s life expectancy.

Case: A 9-year old boy (26kg, 130cm) with known diagnosis of LDS 2 (TGFBR 2-mutation) and dilated aortic root (31mm, Z+4.4) on Losartan medication presented with acute back- and abdominal pain. The diagnosis of Stanford type B dissection was made by computed tomographic angiography (CTA) starting from A. subclavia sinistra with a distal reentry at the level of Truncus coeliacus. Lacking any end organ malperfusion an aggressive blood pressure lowering therapy was initiated. Frequent follow-up CTA revealed rapid dilatation of the abdominal aorta from 27x26 to 38x35mm within 8 days. Emergency surgical treatment was decided starting with a valve sparing aortic root replacement and additional arch replacement (frozen elephant-trunc technique); a thoracic-abdominal aortic replacement (Dacron 20mm) followed two days later (Figure 1). The patient was discharged after 6 weeks of hospitalisation with Libesartan, Atenolol and antiplatelet therapy. Unfortunately, 3 months later the boy presented with asymptomatic progressive aneurysm of both subclavian arteries and right-sided dissection (right subclavian artery: 12mm to 23mm; left subclavian artery: 14mm to 22mm). The right side was successfully addressed with resection and an interponat from Truncus bra-chiocephalicus to right subclavian artery; the left side is planned within the next weeks.

Conclusions: LDS 2 can present with severe vascular findings and dramatic deterioration even in younger age. In the presented case an early and aggressive surgical approach with replacement of the entire aorta has been successful. However, the underlying disease is not healed and may cause further vascular events and challenge future management.

Disclosure: Nothing to disclose

Outflow tract rotation: new option for repair of complex transposition of the great arteries

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Introduction: Correction of complex transposition of great arteries (TGA) with ventricular septum defect (VSD) and pulmonary stenosis (PS) is challenging. Usually surgeries like Rastelli, Nikaidoh or REV operation have a significant incidence of complications such as left ventricular outflow tract stenosis or right ventricular to pulmonary artery conduit degeneration. Outflow tract rotation, consisting of “en bloc” rotation of both outflow tracts is technically difficult but creates an autologous anatomical reconstruction and is a promising alternative. We aimed at analyzing the short-term outcomes of children having undergone outflow tract rotation at the CURCCCP.

Method: Retrospective chart review of all patients who had an outflow tract rotation procedure at the CURCCCP from 2016 to 2020.

Results: Nine patients underwent outflow tract rotation. Diagnosis was TGA/VSD/PS (n = 3), TGA/PS/VR (Double Outlet Right Ventricle) with (n = 4) or without PS (n = 1), TGA/PS/POST/P (post pulmonary artery banding) (n = 1). Median age at surgery was 5.4 years (IQR 2.7-9.2) for 6 patients referred from abroad through an humanitarian program and 17 days (IQR 11-39) for Swiss children. All patients were male and median weight at surgery was 9 kg (IQR 3.8-18). The median ECC time was 185 min (IQR 180-213), aortic cross-clamp was 150 min (IQR 150-155). The median PICU stay was 9 days (IQR 6-11) and the median hospital stay was 24 days (IQR 15-38). One patient (17 days old, 3.2kg) developed a chylothorax and another one needed a pacemaker (postoperative third-degree atrioventricular block). No patient needed post-operative ECMO, reoperation or reintervention. All patients survived at a median follow-up of 15.6 months.

Conclusion: Outflow tract rotation is a technically difficult procedure but it permits an anatomical repair without foreign material in children with complex transpositions with excellent short-term outcomes. Further follow-up of these patients will allow evaluation of medium and long-term outcomes.

Disclosure: Nothing to disclose

Advanced imaging and new cardiac biomarkers in long-term follow-up after childhood cancer

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Objectives: Pathological findings of ejection fraction (EF), shortening fraction (FS) and standard heart failure biomarkers (troponin T and NTproBNP) during follow-up after childhood cancer have been associated to irreversible cardiac damage, therefore more sensitive parameters for the detection of subclinical functional cardiac changes are needed. Aim of our investigation was to evaluate strain imaging values by echocardiography and new biomarkers for heart failure with preserved ejection fraction (HFpEF) in children, adolescents and young adults in follow-up after childhood cancer.

Methods: Prospective study in 50 childhood cancer survivors [median 16.2 years (IQR 14-18.5)], at median follow-up of 13 years (IQR 10-15). In addition to standard echo and laboratory parameters for heart failure, strain measurements and the following new biomarkers were obtained and compared to 50 healthy controls: myocardial inflammation (IL-6), extracellular matrix remodeling (CITP, T-c terminal telopeptide of type-I-collagen; PIINP: intact N-terminal propeptide of type III procollagen) and other heart failure biomarkers (galectin 3, sST2: solutable ST2, GDF 15: growth differentiation factor 15).

Results: No significant differences in EF, FS, troponin T and NTproBNP, IL-6 and sST2 were found between study and control group. Instead, advanced imaging parameters showed significant differences between both groups [global longitudinal strain (-15.9% vs -20.4%, p <0.0001), global circumferential strain (-14.3 vs -20.3%, p <0.0001), detecting 66% (GLS) and 76% (GCS) pathological values in contrast to 20% (EF) and 16% (FS) for standard parameters. Markers for disturbances of extracellular matrix remodeling (CITP, PIINP, each p <0.0001), galectin 3 (p 0.01) and GDF 15 (p <0.0001) were significantly different between the groups.

Conclusion: Standard echo and laboratory parameters used during cardiac evaluation in follow-up after childhood cancer seem to be less sensitive in detecting early remodeling processes in contrast to strain imaging and newer cardiac biomarkers used in HFpEF. Especially the detection of myocardial remodeling processes due to disturbed collagen turnover at an early stage might give the opportunity to begin heart failure treatment earlier with the potential to delay its negative influence on cardiac function.

Disclosure: Nothing to disclose
Long-term outcome of adult patients with total anomalous pulmonary venous connection: data from the SACHER registry and a French center

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Introduction: Total anomalous pulmonary venous connection is a rare cyanotic congenital heart disease, where all pulmonary veins abnormally connect to a systemic vein or the right atrium. The only curative treatment is surgery allowing the patients to reach adulthood. This study describes the long-term outcome of these individuals focusing on arrhythmias.

Methods: Clinical, surgical, imaging and invasive data were retrospectively reviewed from centers participating in the Swiss Adult Congenital Heart disease Registry (SACHER) and a French center.

Table 1. Patients characteristics

<table>
<thead>
<tr>
<th>Patients with total anomalous pulmonary venous connection (N=57)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female, N (%)</td>
</tr>
<tr>
<td>Type of TAVPC, N= 43</td>
</tr>
<tr>
<td>- Supra-cardiac</td>
</tr>
<tr>
<td>- Cardiac</td>
</tr>
<tr>
<td>- Infra-cardiac</td>
</tr>
<tr>
<td>- Unknown</td>
</tr>
<tr>
<td>Pulmonary venous obstruction pre-op</td>
</tr>
<tr>
<td>- Pulmonary hypertension</td>
</tr>
<tr>
<td>- Valvulopathy</td>
</tr>
<tr>
<td>- Arrhythmia</td>
</tr>
<tr>
<td>Age at correction, months (range)</td>
</tr>
<tr>
<td>Time since surgery, years</td>
</tr>
<tr>
<td>Age at latest follow-up, years</td>
</tr>
<tr>
<td>Symptomatic</td>
</tr>
<tr>
<td>- NYHA class II</td>
</tr>
<tr>
<td>- Palpitations</td>
</tr>
<tr>
<td>- Chest pain</td>
</tr>
<tr>
<td>Treatment</td>
</tr>
<tr>
<td>- Betablocker</td>
</tr>
<tr>
<td>- Calcium channel blocker</td>
</tr>
</tbody>
</table>

Data are mean ± standard deviation or n (%)

Table 2. Latest paramedical exams

<table>
<thead>
<tr>
<th>Patients with total anomalous pulmonary venous connection (N=57)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Echocardiography, N (%)</td>
</tr>
<tr>
<td>LVEF %</td>
</tr>
<tr>
<td>RV dilated</td>
</tr>
<tr>
<td>RV visual dysfunction</td>
</tr>
<tr>
<td>Shunt</td>
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<tr>
<td>S wave, cm/s</td>
</tr>
<tr>
<td>TAPSE, mm</td>
</tr>
<tr>
<td>Pulmonary artery pressure</td>
</tr>
<tr>
<td>Exercise testing, N (%)</td>
</tr>
<tr>
<td>VO2max (mL/kg/min) (9)</td>
</tr>
<tr>
<td>VE/VC02 slope (7)</td>
</tr>
<tr>
<td>VO2max, % (9)</td>
</tr>
<tr>
<td>BPM, % predicted (13)</td>
</tr>
<tr>
<td>MET, % predicted (12)</td>
</tr>
</tbody>
</table>

Results: A total of 57 patients were identified and analyzed 22 ± 8 years after surgery (see table 1 for characteristics). At last follow-up, 21% of patients presented cardiac symptoms, mainly palpitations. No patient had pulmonary hypertension (PH) or a relevant valvulopathy. Echocardiography revealed in five patients a dilated right ventricle and in 5 patients a diminished RV systolic function (table 2). Exercise capacity was normal.
Long-term outcome of adult patients with partial anomalous pulmonary venous connection treated surgically and conservatively: Data from the SACHER registry and a French center

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Introduction: Partial anomalous pulmonary venous connection (PAPVC) is a rare congenital heart disease, which is characterized by one or some but not all pulmonary veins anomalously connected to the right atrium or a systemic vein. PAPVC is either an isolated shunt lesion or associated with an atrial septal defect (ASD). The only curative treatment is surgery, however the indication for surgery can be challenging. This study compares the outcome of patients treated surgically with those clinically monitored.

Method: Clinical, surgical, imaging and invasive data were retrospectively reviewed from 7 centers from the Swiss Adult Congenital Heart Registry (SACHER) and a French center.

Results: A total of 168 patients with partial anomalous pulmonary venous connection were identified. The majority (77%) of patients underwent surgery and the remaining (23%) were treated conservatively with clinical monitoring. The operated group (OG) had a significantly higher proportion of associated ASD (N = 106, 82%) and a higher prevalence of anomalous pulmonary veins leading to a mean Qp:Qs at 2.5 ± 1.2 before surgery (table). Latest follow-up was 12 years after surgery. Mean age was 40 ± 17 years. Patients in the non-operated group (NOG) were significantly more dyspneic than the OG. However, the need for medical treatment did not differ between groups: 58% of the NOG and 48% in the OG (p = 0.203). Right ventricular (RV) ejection fraction did not differ between groups despite a significantly larger RV end-diastolic volume and a higher Qp:Qs on cardiac magnetic resonance (CMR) in the NOG (table). On echocardiography, the NOG showed a significantly better right ventricular myocardial function and a higher systolic pulmonary artery pressure than the OG (table). The prevalence of significant valvulopathies did not differ between groups (table). Both groups had normal exercise capacity and with no differences between groups (table).

Conclusion: PAPVC patients after surgical correction, show a favorable outcome in terms of imaging parameters and exercise capacity, however, a significant number presents with symptoms. PAPVC patients treated conservatively with small left to right shunting, have similar outcome justifying a conservative approach.

Disclosure: Nothing to disclose

Prevalence of arrhythmias on the long term of adult patients with partial anomalous pulmonary venous connection treated surgically and conservatively: data from the SACHER registry and a French center

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Introduction: Partial anomalous pulmonary venous connection (PAPVC) is a rare congenital heart disease, characterized by one or some but not all pulmonary veins anomalously connected to the right atrium or a systemic vein. PAPVC is either an isolated shunt lesion or associated with an atrial septal defect (ASD). The only curative treatment is surgery. This
study compares the arrhythmic outcome of patients treated surgically with those clinically monitored.

**Method:** Clinical, surgical, imaging and invasive data of PAPVC patients were retrospectively reviewed from 7 centers from the Swiss Adult Congenital HEart disease Registry (SACHER) and one French center.

**Results:** A total of 168 patients with PAPVC were identified. Most (77%) patients underwent surgery, while the remaining (23%) ones were treated conservatively with clinical monitoring. The operated group (OG) had a significantly higher number of associated ASD (N = 106, 82%) and a higher number of anomalous pulmonary veins leading to a mean Qp:Qs at 2.5 ± 1.2 before surgery (table 1). Moreover, the majority of patients in the OG had cardiac symptoms (N = 78, 60%) and were diagnosed at a significantly younger age (table 1). Age did not differ at latest follow-up. Right ventricular (RV) size was larger in the OG. Holter recordings revealed a higher prevalence of arrhythmia in the OG (p = 0.031), mainly of supraventricular tachyarrhythmias (table 2). The occurrence of ventricular non-sustained tachycardia and of bradyarrhythmia did not statistically differ between groups. Patients in the OG required more often medical treatment for arrhythmias: 12 (9%) needed electrophysiological study in the OG and none in the NOG (p = 0.057). The amount of patients requiring a pacemaker implantation in the OG (11%) was significantly higher than that of NOG (0%) (p = 0.039).

**Conclusion:** Patients after PAPVC repair present with a significant higher burden of arrhythmia than conservatively treated patients, either due to a larger shunt pre-operatively and/or as a late complication of the corrective surgery itself.

**Disclosure:** Nothing to disclose

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**271 Bioprosthetic valve endocarditis again and again - surviving a worst case scenario with 3 endocarditis episodes with 3 different bacteria within 11 years**

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**Introduction:** Bicuspid aortic valve (BAV) disease is common. Many patients develop aortic regurgitation or stenosis and have to undergo aortic valve replacement, rarely endocarditis or aortic dissection can occur. Mortality of bioprosthetic or mechanical valve endocarditis is still high, recurrent endocarditis can often be fatal.

**Patient history:** A male born with BAV underwent aortic valve replacement (AVR) at age of 48 years for severe aortic stenosis. Three weeks postoperatively severe staphylococcal aortic valve endocarditis with aortoventricular disconnection, abscess formation close to the ostium of the left main coronary artery, skeletal detachment of the anterior mitral valve leaflet, dissection right coronary artery and aneurysm of the ascending aorta was diagnosed. Repeat AVR was performed with a composite graft replacement of the aortic root (Shelhigh prosthesis), reimplantation of both coronary arteries, one coronary artery bypass as well as a modified cabrol shunt. Nine years later (age 57 years), the patient developed another prosthetic endocarditis of the aortic graft and the Shelhigh prosthesis (Cardiobacterium hominis) with torrential aortic regurgitation and cardiogenic shock. Rescue percutaneous aortic valve replacement was performed with 29 mm Core valve prosthesis and percutaneous closure of the repeat aortoventricular shunt with an Amplatzer ASD 10 mm occluder. Three days later, inhospital resuscitation for asystole had to be performed while being treated with amiodarone for paroxysmal atrial fibrillation. There remained a large pseudoaneurysm of the aortic root (Figure 1). Age 59 years, repeat endocarditis proven with PET CT (Figure 2) and positive blood cultures (S. bovis) developed with cerebral embolic infarctions (Figure 3). Repeat antibiotic treatment was started in April 2019. Until end of January 2020, the patient remains stable with continuous antibiotic treatment with Co Amoxyccillin 3 gr daily. His main complaint presently is aminoglycoside induced dizziness.

![Figure 1: Pseudaneurysm of the aortic root (CT-scan) and positive PET-CT-Scan](image1)

![Figure 2: Head CT scan with cerebral embolic infarction](image2)
Conclusion: Endocarditis of bioprosthetic valves remains a potentially fatal, severe complication, which can be survived in the current era thanks to modern cardiology options.

Disclosure: Nothing to disclose

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Medium to long-term outcome of patient implanted with a telemetric adjustable pulmonary artery banding device (FloWatch-PAB) in Switzerland

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Introduction: Pulmonary artery banding (PAB) is used to treat cardiopaties with excessive pulmonary blood that cannot undergo complete repair and to retrain the left ventricle in late presenting transposition of the great arteries (TGA). Traditionally a polytetrahydofluorane band is used but optimal tightening is difficult leading to multiple surgeries. A battery free, wireless telemetric PAB (FloWatch-PAB) allowing for noninvasive multiple adjustments by either tightening or opening the FloWatch-PAB was developed to overcome these complications. (fig 1) Our objective was to evaluate medium to long-term outcome of all children having benefitted from this technology in Switzerland

Method(s): Retrospective chart study of all patients implanted with a FloWatch-PAB in Switzerland from 2002 to 2016.

Results: FloWatch-PAB was implanted in 69 pts at the University Hospitals of Lausanne, Zurich and Geneva. Diagnosis were shunt lesions (n = 45), univentricular hearts (n = 6), late transpositions (n = 24). Median age at implantation was 30 days [IQR7, 113d], median weight at implantation was 3.7 kg [IQR3.2, 5.3 kg]. The median time before explantation was 161 days [IQR97.5, 306 d]. Average FloWatch adjustments was 4 +/-2 per patient. At explantation 58 pts (84%) did not require pulmonary artery reconstruction. 58 pts are alive at current date 10 of whom had late pulmonary artery stenosis needing angioplasties 10 pts died, all secondary to their severe congenital heart disease and not all at time of explantation. There was no direct FloWatch-PAB related death.

Conclusion: FloWatch-PAB is a unique device, which has the main advantage to allow for multiple band adjustments avoiding multiple surgeries in children with complex heart defects not amenable to immediate complete repair. Long-term complications and outcome in children having benefitted from FloWatch-PAB are mostly related to the severity of underlying heart disease.

Disclosure: Nothing to disclose

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Percutaneous lymphatic embolization to causally address two major manifestations of a failing Fontan circulation

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Introduction: Plastic bronchitis (PB) and protein loosing enteropathy (PLE) are rare but devastating complications of the Fontan physiology. PB occurs in about 4% of Fontan patients and is characterized by mucin-containing bronchial casts. It results from a combination of altered hemodynamics, bronchial mucosal inflammation, increased permeability and lymphatic vessel abnormalities. PLE occurs in about 10-20% of Fontan patients and is characterized by edema, hypoalbuminemia and increased α1-antitrypsin levels. The mortality is high: up to 50% and 20% in PB and PLE patients, respectively and medical therapy is limited. Therefore, novel interventional modalities such as lymphangiogram and lymphatic embolization are crucial novel strategy in this group of patients.

Method(s) and results: Between August 2019-February 2020, lymphatic embolization was performed in two PB patients and one PLE patient. All patients were male (range: age 5-18 years old, weight 13-52 kg, height 91-163 cm). PB appeared 2-4 years and PLE 4 years after total cavopulmonary anastomosis. Before the embolization, patients underwent cardiac catheterization for hemodynamic evaluation and exclusion of major right-to-left shunts. PB patients underwent bronchoscopy with cast removal. Lymphatic embolization was performed under general anesthesia. Intranodal lymphangiogram was followed by image-guided (fluoroscopy and CT) to delineate the thoracic ductus morphology. Once the source of leak targeted, the embolization (Lipiodol and Histoacryl) place decided, in these two patients at the distal part of the thoracic duct. For the PLE patient, a liver lymphatic ducts embolization was performed under US guidance, after obtaining a lymphangiogram with the same method. The procedure was technically successful and resulted in symptomatic improvement in all patients. There were no procedure-related complications. A PB patient needed post-procedure bronchoscopy and intensive respiratory physiotherapy for casts’ removal.

Conclusion: Percutaneous lymphatic embolization is a novel, safe and promising technique for the treatment of PB and PLE complicating a Fontan circulation

Disclosure: Nothing to disclose
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Pediatric orthotopic heart transplantation: single center Swiss 10 year experience
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Introduction: Pediatric orthotopic heart transplantation is the last alternative in terminal heart failure. It has been practiced since 1967 and 500 children worldwide benefit from it each year. We review our results over the past 10 years.

Methods: All consecutive pediatric heart transplants at our institution were included from 2009 to 2019.

Results: 13 patients were included during the study period. The study sample consisted of 6 boys (46%) and 7 girls (54%), with a median age of 13 years (min. 3 months; max. 18 years), mean weight 32.8kg (min. 6.6; max. 75). The diagnosis requiring transplantation was dilated cardiomyopathy (46%, N = 6), congenital heart diseases (36%, N = 5), arrhythmogenic ventricle dysplasia (N = 1, 8%) and anthracycline heart diseases (N = 1, 8%). All were first transplants. 7 patients required pre-transplant ECMO (54%), and 6 required ventricular assist device placement. The mean wait list time was 310±281 days. Mean graft ischemic time was 190±44 min. There was no operative or early mortality. The mean intensive care stay was 22±14.5 days with a mean of 5.8±6.4 days for invasive ventilation (median: 2 days). There were no early deaths. 1 patient required reoperation for stenosis of the SVC anastomosis, and 2 of the conduit might offer the possibility to preserve part of the native flow tract in patients with congenital heart disease (CHD). Contegra conduits calcify with times, mostly in small diameters. Harvesting the valve from the conduit might offer the possibility to preserve part of the native flow tract and to reduce turbulence.

Conclusion: Pediatric orthotopic heart transplantation can be done with excellent early and mid-term results, by a team with significant transplant and congenital cardiac surgery.

Disclosure: Nothing to disclose

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Contegra valve harvested from the contegra conduit: an option to replace the pulmonary valve with a low gradient profile valve
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Introduction: Congenital heart disease often requires reconstruction of the right ventricular outflow tract (RVOT). Homograft implantation was the method of choice for RVOT reconstruction, but the availability was limited. Contegra grafts (processed bovine jugular vein conduits) are now widely used for reconstructive surgery of the right ventricular outflow tract in patients with congenital heart disease (CHD). Contegra conduits calcify with times, mostly in small diameters. Harvesting the valve from the conduit might offer the possibility to preserve part of the native flow tract and to reduce turbulence.

Method: A 4 year-old boy, known for 2 attempts of Blalock-Taussig modified shunts was referred for a complete correction of a Tetralogy of Fallot (TOF). Both attempt failed and even lead to a severe infection with partial destruction of the right pulmonary artery. There were stenosis on both pulmonary arteries and multiple major aorto-pulmonary collaterals. A first attempt of correction was a failure, with elevated right ventricular pressure. The pulmonary valve was deemed unusable and was resected. The Ventricular septal defect was reopened and a trans annular patch implanted. On the 2nd attempt, the valve of a 14mm conduit was harvested and was then implanted at the base of the Main pulmonary artery (MPA). The opening in the infundibulum and the MPA was then closed with a patch.

Results: Postoperative echocardiography revealed a maximal pulmonary valve gradient of 13 mmHg on the RVOT without any leak. Intensive care unit and hospital stays were 4 and 9 days respectively.

Conclusion: In complicated TOF repair, avoiding a pulmonary insufficiency is better. If the native valve is unusable, a Contegra valve, harvested from the conduit, is a good option. It preserves the MPA and provide a pulmonary valve without stent with a low gradient profile.

Disclosure: Nothing to disclose

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Ductal systemic perfusion for aortic arch enlargement
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Introduction: Aortic coarctation comprises 6-8% of Congenital Heart Disease. Hypoplastic arch may be seen in 33-40%. Severe aortic arch anomalies require surgery in the neonatal period. Hypoplastic proximal arch usually needs cardiopulmonary bypass and inner curvature patch augmentation.

Method: A 5 days neonate of 3.67 kg, after an uncomplicated pregnancy presented a lower body malperfusion. Echocardiography revealed a coarctation with arch hypoplasia (proximal arch 4.2mm). Treatment with prostaglandin was initiated and he was adressed for surgery. After an extra pleural approach to the aorta through a left posterior thoracotomy in 4th intercostal space. The ductus arteriosus was patent during surgery and provided perfusion to the descending aorta while the aortic arch was enlarged with a patch in the outer curvature between the left common carotid artery and the left subclavian artery. Then the coarctation resection and end to end anastomosis.

Results: Extubation was performed after 24 hours. Postoperative course was uncomplicated. Intensive care unit and hospital stays were 4 and 7 days respectively. There was no residual gradient.

Conclusion: Using the ductus arteriosus for systemic perfusion while enlarging the aortic arch avoids neonatal cardiopulmonary bypass. Outer curvature aortic arch enlargement makes easier the coarctation repair and only an end-to-end repair is necessary. It may reduce the rate of residual obstruction. Long term results has to be investigated

Disclosure: Nothing to disclose
Acute chest pain in the era of digital watches
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A 38-year-old male smoker with serum LDL-cholesterol of 6.4 mmol/L and family history of coronary artery disease (father with acute myocardial infarction at the age of 45 years) developed acute chest pain irradiating to the jaw and both arms at 6:46 a.m. He immediately recorded a single-lead ECG (corresponding to ECG lead I) with his digital watch (Apple Watch® with photoplethysmography sensor), which showed sinus rhythm with significant ST-segment depression (Panel A). The patient took a nitro-glycerine pill and the pain resolved completely after a few minutes. A second single-lead ECG registered with his digital watch at 7:22 a.m. showed complete resolution of ST-segment depression (Panel B).

Both ECGs were sent by e-mail to his cardiologist, who organized immediate admission at the emergency department. 12-lead ECG was normal, whereas high-sensitive Troponin-T was slightly elevated with a value of 16 ng/L (cut-off <14 ng/L). Coronary angiogram documented a 50% stenosis of the right coronary artery and cardiac magnetic resonance imaging did not reveal any late gadolinium enhancement or signs of ischemia. The chest pain and the alterations on the single-lead ECG were most probably induced by vasospasm of the right coronary artery. Therefore, aspirin, high dose statins and a calcium channel blocker were initiated. Furthermore, the patient stopped smoking. During a follow up of three months, there were no further episodes of chest pain. Our case shows the potential role of digital watches in detecting transient acute transmural myocardial ischemia - in our case most probably due to coronary spasm.

Disclosure: Nothing to disclose

Spontaneous non-ischemic rupture of the papillary muscle
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Introduction: Papillary muscle rupture (PMR) is a rare and often life threatening complication which is subsequent to a myocardial infarction or an active endocarditis. Spontaneous papillary muscle rupture is due to a non ischemic origin and of unknown etiology.

Case report: A 77-year-old woman with no medical history of known coronary artery disease presented to the emergency department with acute chest pain. A 12-lead electrocardiogram showed no sign of ischemia. Laboratory investigation demonstrated a hemoglobin of 135 g/L, platelets count was normal, white blood cell count of 12 G/L. The troponine level was twice the normal value and the D-dimere was normal. In addition, cultures of urine, blood, and sputum were negative. She quickly showed hemodynamic instability spurring on intubation and admission in the Intensive Care Unit. A transhthoracic echocardiogram identified an anterior papillary muscle rupture with severe mitral regurgitation due to a flail anterior mitral valve leaflet. There was no sign of left ventricular dyskinesia. Transesophageal echocardiography confirmed the diagnosis of PMR. A cardiac catheterization was performed, demonstrating angiographically normal coronary arteries and severe mitral regurgitation. The patient was rapidly taken to the operating room and underwent a mitral valve replacement. Pathology excluded a hyperesinophilic syndrome of the PMR. Infectious investigations came negative and all cultures were sterile.

Discussion: Papillary muscle rupture is a life-threatening emergency that is highly associated with acute myocardial ischemia. PMR is responsible for approximately 5 % of death after myocardial. Spontaneous non-ischemic papillary muscle rupture is a much rarer cause and could be due to myocarditis, Ehler-Danlos syndrome, an infectious cause, Takotsubo cardiomyopathy, or mitral ring calcification, hyperesinophilic syndrome, and of traumatic origin. Once the necessary investigations are not conclusive of any mentioned etiologies, idiopathic spontaneous PMR should be considered. Pathology of the head stump is fundamental to annihilate an ischemic origin or a hyperesinophilic syndrome.

In our case, myocardial ischemia was discarded with a normal angiogram and the known mentioned non ischemic etiologies were all excluded. Hence, we concluded on an idiopathic rupture of the anterolateral PM. One possible explanation of the spontaneous rupture might be an excess of mechanical strain on the papillary muscle.

Disclosure: Nothing to disclose

Traumatic right coronary artery dissection during cardiopulmonary resuscitation with mechanical chest compression device
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Introduction: Mechanical chest compression (MCC) devices facilitate continuous delivery of cardiopulmonary resuscitation (CPR). Despite promising hemodynamic data, clinical outcomes are inconclusive and complications are described.

Method: A 61-year-old good healthy frail male (55kg/160cm), underwent a cardiac arrest in a pharmacy. Trained personnel initiated CPR immediately. At rescue team arrival, initial rhythm was ventricular fibrillation. External defibrillation permitted return to spontaneous circulation after 32 minutes of low flow. At admission, patient was hemodynamically stable with a profound metabolic acidosis (pH 6.9, lactate 11 mmol/L). An anterior STEMI was suspected according to electrocardiogram and echocardiography (antero-septo-apical hypokinesia). Despite vasopres-
sive therapy, patient developed a refractory cardiac arrest. CPR was ini-
tiated, a MCC device (Lucas®) was used. A femoral Extra-Corporeal Life 
Support (ECLS) was implanted permitting restoration of an adequate 
perfusion and a sinusual rhythm, after 30 minutes of mechanical com-
pressions.

Results: Coronarography confirmed an acute proximal left anterior 
descending artery occlusion, which was stented with success (KienzleSi-
era active stent, Biotronik®). Right coronary artery injection revealed a 
heterogeneous coronary coronary dissection associated with a diffuse intralu-
mal thrombosis. Right coronary artery perfusion was restored after 5 
stents implantation (Orsiro, Biotronik®). Post-operative course was no-
ticed at day-1 by development of a voluminous blood pericardial effusion 
without recurrence. ECLS was weaned with success after 4 days. Post-operative Left Ventricular Ejection Fraction was 40% and patient lefted hospital 14 days later.

Conclusion: Iatrogenic traumatic injuries due to CPR is a well-known 
complication. Chest wall and neighbouring organs are the main sites of 
traumatisms. It is particularly true in case of frail patients benefiting of 
MCC or device malposition. Traumatic coronary artery dissections are 
rare. A unique case of manual chest compression-related dissection was 
described. Based on its thoracic anatomic anterior position, we hypo-
thesize that the right coronary artery is more exposed to traumatic injuries, 
especially in case of calcified vessels.

Disclosure: Nothing to disclose

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Swan-Ganz catheter entrapment in the tricuspid valve: 
diagnosis and guided therapy by per-operative trans-
esophageal echocardiography
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Introduction: Since its introduction in the 1970s, the pulmonary artery 
catheter is still used as one preferred hemodynamic monitoring device for the anaesthetic management of cardiac surgery patients.

Method: A 56-year-old man was prepared for elective complete off-
pump coronary artery bypass graft (CABG) surgery. Pre-operative echo-
cardiography was normal. According to the hospital recommendations 
for continuous hemodynamic monitoring during off-pump CABG sur-
gery, a Swan-Ganz Catheter (SGC) was introduced. Per operative trans-
esophageal echocardiography (TOE) assessment revealed a new moderate tricuspid valve (TV) regurgitation due to SGC entrapment. 

Results: The SGC formed a knot around the tricuspid subvalvular appa-
ratus, leading to an anterior and septal leaflet restriction with intact pa-
pillary muscles. After a futile attempt to withdraw the SGC under echo 
control, the surgical strategy was changed to allow direct access to the 
TV via an Extra Corporeal Circulation. Remarkable at this point was that the SGC could not easily withdrawn even by the direct access, i.e. that it could not be untangled, because the knot had pulled extremely tight. The catheter had to be cut in several pieces before it could be removed successfully. Post-operative course was uneventful and 1-week echo-
cardiography control confirmed an intact TV without any residual regur-
gitation.

Conclusion: American Guidelines for myocardial revascularization 
(ACC/AHA 2011) recommend SGC monitoring during off-pump CABG, 
due to heart mobilization, which may lead to hemodynamic changes and 
reduced cardiac output. TOE may be a less invasive alternative, but vis-
ualization may be challenging while the heart is rotated. SGC entrapment 
around the TV is a rare but serious complication. The present case illus-
trated the inherent risk of damage to the subvalvular apparatus. Diagnosis 
and treatment can be challenging. Systematic SGC mobilization and 
echocardiography control prior to sternal closure can be helpful to rec-
ognize this complication.

Disclosure: Nothing to disclose

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A family with a novel variant in the SLC4A3 gene leading to 
short QT phenotype - the importance of whole-exome-
sequencing and cascade screening
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Introduction: Short QT syndrome (SQTS) is a rare genetic disease caus-
ing sudden arrhythmogenic death. Recently the gene SLC4A3 has been implicated in SQTS. A mutation in the encoded bicarbonate transporter can lead to increased intracellular pH and shortened action potential. We present a family with a short QT phenotype in whom a novel genetic variant was detected by whole exome sequencing (WES) and cascade screening (CS).

Methods: We performed a thorough work-up of the index patient includ-
ing echocardiography, stress testing, flecainide challenge and genetic 
testing. CS of all 1st and two 2nd relatives was performed.

Results: The ECG of the index patient showed a QTc of 340ms and characteristics compatible with a SQTS. Clinical work-up was unremark-
able. Genetic search with next generation sequencing focusing on chan-
nelopathy-associated genes detected a rare known heterozygous mis-
sense variant in the KCNH2 gene (Arg328Cys, frequency 0.067%), which was predicted to be pathogenic according to various prediction algorithms (Polyphen, SIFT, Mutation Taster, DANN score: 0.9994). ECG 
and CS in all asymptomatic first-degree family members ruled out this 
variant as the causative mutation. Reanalysis of WES data was performed 
and revealed a novel heterozygous missense variant p.(Arg370Cys) in the SLC4A3 gene. CS of the p.(Arg370Cys) mutation suggested that this was the causative variation in this family.

Conclusion: Predictive bioinformatic algorithms to assess the patho-
genicity of missense variants are of limited relevance, but genetic anal-
ysis of additional unaffected and affected family members may be in-
strumental to identify pathogenic DNA sequence variations.

Disclosure: Nothing to disclose

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Two cases of true aneurysm of freestyle bioprosthesis 5 
and 8 years after implantation
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Background: Freestyle bioprosthetic(Medtronic) was proved to be he-
modynamically superior and to have the best long-term results used for 
aortic root replacement. We report 2 cases of true aneurysmic dilata-
ion of Freestyle bioprosthesis.

Methods: Freestyle bioprosthesis had been used in our institution since 
2006 exclusively as full root replacement. Two patients A (male, 51) and B (female, 58), were previously operated in 2011 and 2015. The patient 
A was re-operated after failure of mechanical prosthesis, which was im-
planted in 1996 because of bicuspid aortic valve stenosis. The re-opera-
tion took place in December 2019, 8 years after initial operation because 
of true aneurysmic dilatation of 5.4cm of the Freestyle prosthesis, re-
vealed on the CT-scan. The patient B became initially Freestyle-prosthe-
sis because of bicuspid aortic stenosis and dilatation of sinus portion. 
The re-operation took place in January 2020, 5 years after initial opera-
tion, because of aneurysmic dilatation of Freestyle up to 5.1cm and severe 
regurgitation. Due to progression of CAD the patient B became concomitantly CABG as well.

Results: The prosthesis of patient A was dilated and had competent 
cusps. The one of patient B was also dilated, more asymmetrically in left 
coronary sinus. Additionally, there was also a detachment of commiss-
ures, which caused cusps prolapse and subsequent severe valve insuf-
iciency. Histological examinations of both prostheses have shown sim-
ilar findings with abnormal proportion between IgG4 and IgG, which was over 50%, which normally can be found in IgG4 associated vasculitis. 
Furthermore, there were found small-spot necrosis with surrounding
granulomatous reaction and the inflammatory infiltrate, which can be found in Takayasu arteritis. The postoperative course was uneventful. **Conclusion:** Late dilation of Composite Graft is a clinically important finding. Active or inactive inflammation could be related to valve or graft detachment, however, long term follow up is mandatory to determine the durability of Freestyle stentless valve. **Disclosure:** Nothing to disclose

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First two MRI guided stereotactic body radiation therapy of recurrent sustained ventricular tachycardia

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**Introduction:** Stereotactic body radiation therapy (SBRT) is emerging as a bail-out treatment in patients suffering from therapy resistant ventricular tachyarrhythmias (VT). We report the worldwide first cases of magnetic resonance image guided SBRT (MR-SBRT) in recurrent sustained VT due to dilated cardiomyopathy (DCM).

**Methods:** The patients were male, 71- (patient A) and 74-year-old (patient B) suffering from recurrent VT and electrical storms (ES) with ICD shocks, despite guideline-directed medical therapy. Patient A had two endocardial radiofrequency catheter ablation (RFA) and one epicardial surgical RFA and patient B had one endocardial RFA prior. An interdisciplinary decision was made to perform MR-SBRT in palliative intent to minimize repetitive ICD shocks.

**Results:** Areas of VT-substrate were identified to build a volumetric target using the performed EP studies as well as cardiac MRI and CT. A single fraction of 25 Gy at isodose 80% was delivered to a planned target volume of 115.1ml and 73ml in the anterior/anteroseptal basal regions in patients A and B, respectively on a dedicated MR linac using real-time MRI tracking. Patient A developed a prolonged ES interpreted as acute radiation-induced inflammation, which ceased after administration of high-dose dexamethasone. Patient B had no immediate adverse effects from the treatment. Left-ventricular ejection fraction remained stable in both patients at 25%. Both patients had significant improvement of their quality of life. Patient A died 222 days after MR-SBRT due to recurrent ES.

**Conclusion:** In these first two cases, we demonstrate feasibility, safety and short-term efficacy of MR-SBRT.

**Disclosure:** Steffel J: Consultant and/or speaker fees from Abbott, Angen, Astra-Zeneca, Bayer, Biosense Webster, Biotronik, Boehringer-Ingelheim, Boston Scientific, Bristol-Myers Squibb, Daichi Sankyo, Medscape, Medtronic, Merck/MSD, Novartis, Pfizer, Sanofi-Aventis, and WebMD. He reports ownership of CorXL. Dr. Steffel has received grant support through his institution from Abbott, Bayer Healthcare, Biosense Webster, Biotronik, Boston Scientific, Daich/Sanko, and Medtronic. Andratschke N: Advisory or speaker’s duty for AstraZeneca, Advisory duty for ViewRay and Debiopharm, Speaker’s duty and research support from Brainlab.

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Coronary steal: a greedy neighbour

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A 71-year-old patient, known for coronary artery disease, treated by a quadruple coronary artery bypass graft (CABG) in 2002 (left internal mammary artery (LIMA) diverted sequentially to the left anterior descending (LAD) coronary artery and to the first diagonal artery and two saphenous vein grafts, one to the first marginal artery and one to the intermediate artery). In 2011, he underwent percutaneous coronary intervention (PCI), with coronary angioplasty and multiple stenting in the right coronary artery (RCA).

He was hospitalized in March 2019 for unstable angina. Cardiac PET-CT showed moderate to severe ischemia (18% of the left ventricle (LV) in the territory of the distal LAD, moderate ischemia (12% of the LV in the territory of the proximal LAD (upstream of the anastomosis) and discrete ischemia (12% of LV) in the left circumflex artery (LCX) territory, without any necrosis. The PET-CT also demonstrated a coronary flow reserve below 1.0 in the territory of the LAD, which was related to a coronary stenosis. Coronary angiogram revealed a subtotal ostium stenosis of the saphenous bypass graft to the intermediate artery, treated by angioplasty with stenting, a complete permeability of de LIMA to the LAD and also a branch arising from a very proximal segment of the LIMA, which was not occluded during the surgery and supplying the whole lateral chest wall. 2 months later, due to severe chronic kidney disease, we performed a percutaneous occlusion of the side branch, via a left radial artery access, with one vascular plug (Reverse Medical MVP® Micro Vascular plug 18mm) and two coils (Terumo AZUR® Hydrocoil Pushable 18). A cardiac PET-CT was performed 3 months later, which showed a normalization of the coronary flow reserve, and a significant improvement of the ischemia in the LAD territory. Finally, the patient had a coronary angiogram a few months later, which demonstrated excellent results, with a complete occlusion of the side branch of the LIMA. Coronary steal due to an unligated side branch of the LIMA is known to be rare but as illustrated by this clinical case, it can be encountered during clinical practice. It should be known as a possible cause of ischemia after CABG, particularly when there is clear evidence of reversible ischemia on perfusion imaging. When LIMA side branch coronary steal is suspected, the management generally involves an interventional approach through use of coil embolization and vascular plugs, with very good results.

**Disclosure:** Nothing to disclose
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Right diaphragmatic palsy as a cause of QRS alternans
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Introduction: QRS alternans, defined as an alternating QRS axis or am-
plitude in any or all leads on an electrocardiogram (ECG), can result from
several cardiac or thoracic conditions. We report on a unique case of QRS
alternans caused by right diaphragmatic palsy.

Methods: A 67-year-old man was assessed for progressive exertional
dyspnea. On physical examination, dullness on percussion and de-
creased vesicular breath sounds at the right pulmonary base were ob-
served. A 12-lead ECG depicted normal sinus rhythm with the QRS
frontal axis alternating from 0° on expiration to 30° on inspiration [panel
A]. Transthoracic echocardiography was unremarkable. A chest radio-
graph revealed marked elevation of the right hemidiaphragm. Spirometry
revealed a restrictive ventilatory defect and a reduced maximal inspira-
tory pressure (55% of predicted). Computed tomography acquisitions on
inspiration and expiration with concomitant ECG recording demonstr-
ated the direct relation between the anatomical (center of mitral ori-
tice to apex) and electrical axes of the heart in the frontal plane (Panel
B). After neurological assessment, right diaphragmatic palsy was con-
firmed and attributed to degenerative compressive cervical radiculopa-
thy. The patient followed a pulmonary rehabilitation program, with sig-
nificant functional improvement.

Results: QRS alternans can result from cardiac motion or conduction
abnormalities, sometimes called “pseudo-electrical alternans”. Abnor-
mal cardiac motion with electrical alternans is classically described in the
setting of large pericardial effusion, but has also been reported in pneum-
othorax, gastric volvulus and left diaphragmatic rupture. QRS alternans
may also result from aberrant electrical conduction, generally as a result
of supraventricular tachycardia, ventricular tachycardia, atrioventricular
reentrant tachycardia or ventricular preexcitation.

Conclusion: In the present case, right diaphragmatic palsy was associ-
ated with an increased range of motion of the left hemidiaphragm, re-
sulting in clockwise or rightward rotation of the heart axis in the frontal
plane during inspiration, thereby confirming right diaphragmatic palsy as
the cause of QRS alternans.

Disclosure: Nothing to disclose

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Cerebral claudication as belated complication of Stanford type
A aortic dissection
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Objective: Perioperative cerebral injuries are serious complications for
patients operated on for Stanford type A aortic dissection, especially
when the supra aortic trunks are involved. Mid and long-term improve-
ment usually occurs. We present herein a challenging case of cerebral
claudication.

Methods: A 72-year-old woman with acute Stanford type A, De Bakey
type 1, aortic dissection and a spontaneously thrombosed false lumen
was operated at our institution. She underwent ascending aorta and he-
mi-arch replacement with aortic valve resuspension. The operation
was technically uneventful. On the third post-operative day (POD) she
presented weakness of the left upper limb which was blood pressure
dependent (symptoms improved as the blood pressure increased). CT-
Scan showed severe stenosis of the brachiocephalic trunk and right
common carotid artery true lumens due to static compression by the
false lumens. Doppler examination confirmed a functional near occlusion
of the right common carotid artery with blood flow substitute through
anterior and posterior cerebral communicant arteries. The patient under-
went ligation of the right common carotid artery and prosthetic bypass
with and 8mm Silver Graft (B.Braun Medical) between the aortic tube
and the right carotid bifurcation with a terminal anastomosis.

Results: Subsequently, the patient recovered completely without neu-
rologic sequelae. She was discharged to a recovery clinic on POD 20 and
remains asymptomatic with normal duplex findings at 3 months follow
up.

Conclusion: Sustained cerebral malperfusion following aortic dissection
type A repair may lead to severe neurological complication. Prompt di-
gnosis and aggressive surgical treatment even in the early post-opera-
tive period might be recommended.

Disclosure: Nothing to disclose

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“Cord-like” mobile left atrial mass related to a caseous
calcification of the mitral annulus
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Case report: A 68-year old woman with dyspnea NYHA II and atypical
chest pain was referred for echocardiographic evaluation. She has a
known history of curative treated breast cancer and was currently
treated for a dental infection without systemic symptoms. Transthoracic
(TTE) and transesophageal echocardiography (TEE) revealed a normal
left ventricular ejection fraction and a severe mitral regurgitation due to
a prolapse of the posterior leaflet. In addition the posterior mitral annulus
appeared locally heavily calcified and a cord-like, mobile, relatively eco-
dense structure was found in the left atrium originating from the poste-
rior mitral annulus (fig. 1a-d). Lab results including negative blood cul-
tures showed no signs of possible endocarditis. A cardiac computed to-
mography (CT) scan showed an inhomogeneous calcification of the pos-
terior mitral annulus with a caseous necrotic part in the P1-Segment,
which raised the suspicion of a complicated caseous calcification of the
mitral annulus (CCMA) (fig. 2). We especially thought of a calcified amorp-
hus tumor (CAT) related to the CCMA. An anticoagulation with
Enoxaparin to prevent thromboembolic events was started and a con-
trol-TTE was performed three weeks later. At that time the cord-like
mass could not be detected any more. Clinically there were no suspi-
cious symptoms of cerebral or peripheral embolization. To rule out cere-
bral embolization an MRI was performed, showing a non-specific cortical
barrier disturbance without clear embolic lesions otherwise. Due to un-
changed severe symptomatic mitral regurgitation the patient was re-
ferred for mitral valve reconstruction. Intraoperatively the CTA with a
partially ruptured fibrin cap was confirmed. Mitral valve prolapse was
reconstructed and anuloplasty performed with a good result. This case
shows a possible cardiac amorphous tumor with related CCTA. CAT are
benign tumors consisting of fibrin, calcium deposits and an amorphous
accumulation of degenerating blood elements and are very often related
to CCTA and renal dysfunction. It is suggested, that the degenerative
caseous material of CCTA can lead to a rupture of the fibrin cap of these
lesions and then develop a CTA. These can lead to embolic events and
case reports suggest, that anticoagulation may be beneficial, despite
CAT usually has to be treated surgically.
Mitral valve endocarditis due to an emerging uropathogen
Actinotignum schaalii

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Introduction: A. schaalii is a facultative anaerobic Gram-positive rod which is part of the urinary microbiota of healthy patients and sometimes an overlooked cause of UTIs because of its fastidious growth on usual media. There are only two cases of endocarditis reported as caused by A. schaalii. We present a 66 year-old male, with no previous medical history, who developed A. schaalii mitral valve endocarditis

Case: At the end of December, 2019 the patient was treated in an outpatient setting with Augmentin due to the possibility having bronchitis. Starting January 10th he reported developing low back pain, night sweats, body aches and occasional chills and papular rash on his left knee. By January 24, 2020 he developed symptoms related to fever including confusion and trouble speaking/finding words. He was referred to a regional hospital, through his family doctor, with a differential diagnosis of Endocarditis. His physical exam was remarkable for a 66 year-old male who appeared weak but awake and alert. His exam revealed that he had a loud systolic murmur, flanks tenderness on palpation and mucocutaneous lesions consistent with Osler nodes. The Echocardiography (Fig.2) showed a severe mitral valve regurgitation with a small vegetation. A computer tomography of his head (Fig.1) revealed a large temporal ischemic Infarct. The patient was started on Augmentin and Gentamycin after obtaining blood cultures. He was then transferred to the state hospital for mitral valve surgery. Four days after blood cultures showed positive for A. schaalii sensitive to Penicillin. Because of the high risk of cerebral bleeding the surgery was delayed for 2 weeks.

Conclusion: Infections caused by A. schaalii are rare. Early detection of UTIs caused by this fastidious growing bacteria should be performed to avoid devastating complications.

Disclosure: Nothing to disclose
Cardiac tamponade in a 22 y old woman - horrible holiday memories
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Case report: A 22-year-old female presented herself in a regional hospital with dyspnea, weight loss and fatigue after a syncope. She was tachypneic and tachycardic. A chest-X-ray showed bilateral pleural effusions and cardiomegaly (Figure 1-A). FAST (focused assessment with sonography for trauma) demonstrated pericardial effusion and ascites. While transferred to a stretcher she became asystole. Emergency pericardiocentesis under resuscitation yielded 100 mL brownish fluid. ROSC occurred after 7 min of CPR and was followed by a transport under massive adrenergic support to our tertiary hospital. In our emergency room, left ventricular ejection fraction (EF) was severely reduced (20%; Figure 1-B). No cardiac tamponade was present. Mechanical circulatory support (va-ECMO) was installed due to refractory cardiogenic shock. Computed tomography revealed pericardial and bilateral pleural effusions, as well as ascites and extended lesions in the left liver lobe (Figure 1-C). Because of a history of a 10 month trip to India, we suspected amebiasis with liver abscess. Broad anti-infective therapy was initiated. The clinical course was driven initially by severe left and right heart failure. Pericardial effusion was dynamic: repeated echo’s demonstrated a spectrum from minimal to relevant fluid collections. An explanation was given during puncture of the liver abscess: ultrasound contrast injected into the liver abscess filled up the pericardial space, unmasking the fistula between liver abscess and pericardium. A myocardial involvement was ruled out by MRI (Figure 1-D). Blood cultures and cultures of the abscess remained sterile. Microscopic examination of the abscess fluid showed the Trophozoites and confirmed the diagnosis. Later the serologic proof of entameba histolytica was obtained.

With specific anti-infective therapy, percutaneous drainages of the liver abscess, the ascites, the pericardial and the pleural effusions the patient rapidly improved. The ECMO could be removed on day four. A transfer from the ICU to the ward was possible on day 14 and to rehabilitation on day 21. The heart function measured by EF and two dimensional strain returned to normal.

Disclosure: Nothing to disclose

Endovascular management of an acute post-traumatic rupture of the right pulmonary artery
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Introduction: Pulmonary artery (PA) rupture is extremely rare and most of the time patients die before arriving to the hospital. Covered stent proved their capability to address iatrogenic PA injury or pseudoaneurysm, but usually PA rupture after blunt chest trauma required emergent surgical approach. We present here a case of a post-traumatic PA rupture, which was successfully treated by endovascular approach.

Case report: A 50-year-old man was admitted after a ski fall with a height of several hundred meters. At the admission, he was hemodynamically unstable and hypothermic at 29°C. Full body scan revealed multiple fractures, a pneumothorax, pulmonary contusions and a pseudoANEURYSM located in the middle of the right PA (Figure 1A,B,C), highly suggestive of PA rupture. After right PA angiography, PA rupture was confirmed (Figure 1D). A 48x22mm balloon expandable covered stent was implanted, which achieved the total exclusion of the pseudoaneurysm without complication (Figure 1E). The patient was extubated at day-5 and underwent several orthopedic operations before being discharged with acetylsalicylic acid therapy for 1 year.
Towards batteryless endocardial pacing - a miniaturized endocardial electromagnetic energy source for leadless pacemakers

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Introduction: Today, > 10% of pacemaker (PM) patients experience early complications after implantation, mostly related to the PM lead. To avoid leads, leadless PMs have been introduced (MICRA®/Medtronic) consuming about 4 microwatts under standard conditions. These devices are battery-powered and cannot be explanted after the battery’s capacity is exhausted. The aim of our study was to investigate the feasibility of powering an endocardial pacemaker by converting a minimal amount of the heart’s kinetic energy into electric energy, to overcome the need of replacing the PM once the battery becomes exhausted.

Methods: We developed an energy harvester prototype using a mass imbalance that drives an electromagnetic generator while moving. This principle is derived from Swiss wristwatches and was optimized for endocardial use by numerical simulations and bench tests. The prototype is suitable for catheter-based implantation and has the same size as a leadless pacemaker (Figure 1). We implanted the device at the apico-septal side of the interventricular septum of a porcine heart (Figure 2). The device’s harvested power was measured during sinus rhythm, atrial and right ventricular pacing.

Results: Implantation, anchoring and explantation at the target location was feasible without problems. During intrinsic sinus rhythm (at 89 beats per minute, bpm), the measured harvested power was 1.13 µW. During atrial pacing (120-160 bpm), median electric power was 2.43 µW (interquartile range 0.4-4.1 µW). During ventricular pacing (120-160 bpm), median harvested power was 3.26 µW (interquartile range 0.25-4.4 µW).

Conclusion: The prototype harvested a significant amount of power required to supply endocardial leadless pacemaker circuits. Ongoing research aims at further optimization of the device and integration into a fully functional lead- and batteryless pacemaker.

Disclosure: Nothing to disclose

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Complex open lead extraction with simultaneous reimplantation, PFO closure and SVC reconstruction

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Introduction: Lead removal is recommended in patients with life threatening arrhythmias secondary to retained leads according to ESC/EHRA guidelines. In case of circumstances like total venous occlusion and persistent foramen ovale preventing transvenous lead extraction and reimplantation, alternative approach should be implemented. This report describes a 39-year-old patient who underwent open lead extraction with simultaneous ICD reimplantation, PFO closure and venous reconstruction.

Case: A 39-year-old patient was admitted urgently to our institution with history of atrio-ventricular block and pacemaker implantation, consecutive system upgrade to 2-chamber-ICD for HCM, however with incomplete lead extraction. He presented several inadequate shocks, recurrent syncope and the high voltage lead fracture was diagnosed. He was scheduled for transvenous lead extraction and reimplantation. The perioperative echocardiography revealed a persistent foramen ovale so that the procedure was interrupted to avoid the risk of paradoxical embolization. Furthermore, the phlebography showed occlusion of both subclavian veins. We performed then open lead extraction with reimplantation of epicardial atrial electrode, transatrial high voltage lead, PFO closure and reconstruction of SVC. The clinical and radiological success was achieved without major complications.

Disclosure: Nothing to disclose

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Acute ischemic right heart failure in ascending aortic dissection treated successfully by temporary extracorporeal right ventricle assistance

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Introduction: Acute Stanford type A dissections (ATAAD) involving the coronary arteries result in higher risk of death. We present a case of myocardial infarction caused by right coronary artery (RCA) avulsion during an ATAAD, which was successfully treated by a Bentall procedure with a coronary bypass graft (CABG) and a temporary extracorporeal right ventricle assistance (eR-VAD).

Case report: A 55-year-old woman was admitted for an ATAAD that extended from the aortic root to the hemi-arch (Figure 1). Initial ECG showed nonspecific ST depression and pre-operative trans-esophageal echocardiography revealed a right ventricular (RV) dysfunction.

Disclosure: Nothing to disclose

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Inspection of the aortic root revealed a complete occlusion of the RCA due to the dissection (figure 1A). Cardiopulgia could initially only injected into left main trunk while a saphenous vein was harvested to bypass the RCA. Once the distal anastomosis was finished cardiopulgia was immediately injected into the graft. A Bentall procedure in combination with a
Atrial fibrillation and AVNRT at the same time - is this possible? A rare case of AVNRT with upper common pathway block

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We present the case of a 34-year-old man who was referred to our hospital for an electrophysiologic study (EPS) and catheter ablation due to recurrent symptomatic palpitations. The 12-lead surface ECG had previously confirmed a narrow complex tachycardia with stable QRS morphology at a heart rate of around 180 bpm (tachycardia cycle length, TCL 333ms) with slightly varying cycle lengths as the cause of the patient's symptoms (Figure 1A). This tachycardia had the same QRS morphology as during sinus rhythm and was terminated by the administration of 18mg adenosine IV (Figure 1B). Further work-up by echo excluded structural heart disease, lab values were unremarkable. EPS showed normal baseline intracardiac intervals (AH 112ms, HV 42ms, AVBCL baseline 360ms). Dual AV nodal physiology was present (AH jump). VA was dissociated during ventricular stimulation. Atrial burst stimulation induced a narrow complex tachycardia with TCL of around 380ms with slightly varying cycle lengths similar to the clinically documented tachycardia. During tachycardia, VA dissociation was noted (Figure 2A).

A short sequence of atrial fibrillation was induced by atrial burst stimulation and did not influence the ongoing narrow complex tachycardia (dual tachycardia, 2B), which could be terminated by atrial pacing. During tachycardia, His was leading V, which excluded ventricular tachycardia. TCL during right bundle branch block aberration did not change, left bundle branch block morphology during tachycardia was never observed. This made AVRT with VA dissociation using a nodofascicular/ventricular fiber as the antegrade limb or a nodoventricular fiber as the retrograde limb of the tachycardia circuit as well as bundle branch reentrant VT unlikely. Based on our observations, the most likely diagnosis was AVNRT with upper common pathway block. Therefore, we performed ablation of the slow pathway in loco typico with up to 36 Watts and up to 50°C. Junctional beats were noted during radiofrequency ablation. After ablation and a waiting period of 20 min., AH jump was abolished and no more tachycardia was inducible indicating successful ablation. Therefore, we concluded that the correct diagnosis was AVNRT with upper common pathway block. However, we cannot exclude the possibility of the presence of a nodofascicular fiber as the retrograde limb of the tachycardia circuit or an innocent bystander pathway, of which the treatment of choice is also ablation of the slow pathway in most cases.

Disclosure: Nothing to disclose

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Mitral valve clipping with MitraClip as therapeutic option in patients with symptomatic hypertrophic obstructive cardiomyopathy despite maximal pharmacological therapy

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Introduction: Hereditary hypertrophic obstructive cardiomyopathy (HOCM) affect 0.2-0.5% of adults. Left ventricular outflow tract (LVOT) obstruction is caused by LVOT area reduction by ventricular hypertrophy and systolic anterior movement (SAM) of the elongated anterior mitral valve apparatus. Anatomic mitral valve abnormalities and SAM may lead to a severe mitral valve regurgitation (MR). Typical symptoms are angina, syncope, exertional dyspnea, arrhythmias and sudden cardiac death.

Case description: We report the case of a 62-year-old male patient, known for HOCM, symptomatic for exertional dyspnea NYHA III despite maximal pharmacological therapy with beta-blocker and calcium-channel-blocker. Transthoracic echocardiography (TTE) showed asymmetric LV hypertrophy and elongated mitral valve leaflets with SAM, causing LVOT obstruction (gradient at rest 95 mmHg), severe MR (4+) and concomitant raised pulmonary systolic pressure of 60 mmHg. After heart team discussion, we proposed percutaneous mitral valve clipping using MitraClip, to address SAM, LVOT obstruction and MR. After placement of one MitraClip NTR, MR was reduced to grade 1 (figure1, A/B) and invasive measured LVOT gradient dropped from 68 mmHg to 5 mmHg.

Disclosure: Nothing to disclose
Assessment of familial arrhythmogenic right ventricular cardiomyopathy - the impact of different genetic screening strategies

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Introduction: Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC) is an inherited condition, with approximately 60% of patients carrying a possibly disease-causing genetic variant. Desmosomal genes account for about 50% of those variants. We report a family with ARVC where the disease-causing genetic variant of a known desmosomal gene was missed because of the initial genetic testing method.

Results: After the initial genetic testing method, the patient's family was tested with Next Generation Sequencing (NGS) (Illumina), a heterozygous missense variant in DSG2: c.152G>C was found. The still accessible DNA from the sister was reanalyzed and the same DSG2 variant was found, which current literature classifies as LP. The NGS data re-analysis revealed that the region of the mutation had low coverage (10x), therefore the DSG2 variant was not detected at initial screening.

Conclusion: The absence of an established pathogenic genetic variant questions the utility of WES (20000 genes) as the initial diagnostic step for ARVC. While WES represents a good tool in searching for novel genes in Trio Analysis, it has a low coverage (mean 10x) of known genes. We therefore propose using smaller panels, such as the dedicated cardiomyopathy panel (mean coverage 100-300x) as an initial genetic screening method.

Disclosure: Nothing to disclose

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Sutureless valve in bio root prosthesis: a surgical approach in endocarditis

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Introduction: 76-year old male patient with biological porcine aortic root replacement, ascending aortic and hemiarch replacement with dacron graft. Patient suffered from fever with shivering and weight loss one year after initial operation. Blood cultures were positive for Enterococcus faecalis. Transthoracic echo showed mild transvalvular aortic insufficiency and leaflets with >1.5cm vegetation on the leaflets floating into LVOT. No abscess was detected. EF was slight reduced with 50%.

Methods: Dual antibiotic therapy was established with gentamicine and amoxicillin upon admission. Seven days later biological aortic valve replacement using a sutureless valve was performed in slight hypothermia (34°C) without any complications. Bypass time 43min, cross-clamp time 31min. Ventilation time was 8h, ICU stay 24h.

Results: Postoperative ECG showed sinus rhythm. Transthoracic echo showed aortic valve prosthesis mean/ max gradient of 9/14mmHg and no paravalvular leak. Patient was discharged to rehabilitation one week after surgery. In Follow up until now no clinical signs of endocarditis and sufficient function of aortic valve prosthesis.

Conclusion: Our case shows that the procedure is feasible in endocarditis patients without annular aortic abscess. The postoperative course was similar to elective aortic valve replacement. Risk for atrioventricular-block is protected due to valve-in-valve implantation.

Disclosure: Nothing to disclose
were noticeable (figure 1). The electrocardiogram (ECG) and coronary angiogram were normal. Postoperative course after orthotopic HTx was complicated by primary graft failure with cardiac unresponsiveness to atriopulmonary venting why veno-arterial extracorporeal support was provided until post-operative day (POD) 10. During this period intracardiac conduction recovered but on POD 24 sudden cardiac arrest with complete atrioventricular block occurred. A right retro-aortic clot with local tamponade was treated by surgical extraction. External pacing wires were deployed, but without myocardial capture at maximal voltage pacing. Patient died despite of cardiopulmonary resuscitation. Autopsy revealed biventricular hypertrophy without macroscopic fibrosis while at the microscopic level multiple foci of positive Congo red coloration fibrosis indicated the presence of cardiac amyloidosis (Figure 2). Immunostaining for AL amyloidosis and transthyretin amyloidosis was negative, suggesting amyloidosis associated with chronic inflammation.

Conclusion: This rare case of amyloidosis in a donor heart illustrates that advanced echocardiographic measures should be systematically applied when potential cardiac donor are older. In fact, cardiac amyloidosis has been observed with a 15% prevalence in this age group when people present with heart failure and preserved ejection fraction.

Disclosure: Nothing to disclose

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Very long-term follow-up after double mitro-aortic valve replacement

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Introduction: Five decades ago, when facing cardiac valve replacement the only available material were primitive valve prostheses with mitigated hemodynamic performances, requiring strong anticoagulation. However long-term durability of those substitutes could be excellent.

Methods: A 65-year-old man named at our institution with signs right heart failure and cardiac cirrhosis. Forty-five years earlier, at the age of 20, he had undergone double mitral and aortic valve replacement for rheumatic disease. The implanted prostheses were Starr-Edwards valves no 3 and 9 respectively. Cine-valve examination showed good unrestricted motion of both siltastic balls. Echocardiographic findings included an aortic mean gradient of 23mm Hg, an elevated trans-mitral mean gradient of 13mm Hg together with moderate mitral regurgitation and severe tricuspid regurgitation. The patient benefited of a re-operation with replacement of the Starr prostheses by Edwards biological valves and tricuspid valve annuloplasty.

Results: Postoperative course was uneventful, the patient was discharged on postoperative day 17 to a recovery clinic. Three months echocardiographic follow-up confirmed a good result with normal mitral and aortic gradients and the absence of tricuspid regurgitation. The patient remains symptom free one year after the operation.

Conclusion: For best long term results after cardiac valve replacement, prosthesis durability should be tailored to the patient’s age and life expectancy. In this setting, modern mechanical valves certainly still have a role to play.

Disclosure: Nothing to disclose

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Early and late asystole after implantable loop recorder implantation: misdiagnoses and unexpected diagnostic opportunities

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Introduction: Implantable loop recorders (ILR) allow arrhythmia detection and ECG-symptoms correlation in case of inconclusive diagnostic investigations. However, correct data interpretation is crucial to avoid misdiagnosis.

Methods: We present two cases of a 84 and a 79-year-old patient (case 1 and 2, respectively) implanted with a Medtronic Reveal LINQ in a context of unexplained syncope of suspected arrhythmic origin.
Conclusions: The occurrence of both early and late asystole during ILR monitoring should be carefully interpreted in order to avoid misdiagnoses as well as missed diagnostic opportunities.

Disclosure: Nothing to disclose

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A reversible third degree atrioventricular block in a young patient
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Introduction: Cardiac sarcoidosis is an underdiagnosed cause of permanent 3rd degree atrioventricular (AV) block in patients <60 yo, but definitive diagnosis remains challenging for isolated form.

Methods: We report the case of a 58 yo man without medical history who experienced a symptomatic transient 3rd degree AV block. The standard exams were unremarkable: echocardiography, coronary angiography and biology. However, the ECG (Figure 1) after resumption of AV conduction showed a 1st degree AV block, complete right bundle block and left anterior hemiblock. A dual chamber pacemaker was implanted and additional exams were scheduled.

Results: The cardiac magnetic resonance imaging only described non-specific fibrosis. The immunologic and viral biological investigations were negative. The 18FDG-PET-CT, however, revealed an active left ventricular uptake suggestive of diffuse inflammation. Histopathology of myocardial biopsies remained non contributive. The electrophysiological study, performed 4 months after the episode, pointed out an abnormal infra-hisian conduction after delivery of atrial premature beats (Figure 2). The conduction disorder was attributed to the septal inflammation as highlighted by the PET-CT. The patient met the criteria for a chronic myocarditis, likely sarcoidosis, and immunosuppressive therapy was started thereafter.

Conclusion: Our case highlights the importance to perform additional investigations in young patients with unexplained high-grade AV block in order to exclude cardiac sarcoidosis, event after resumption of AV conduction. The follow-up will tell us whether immunosuppressive treatment may correct the intraventricular conduction defects.

Disclosure: Nothing to disclose

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Spontaneous recanalization of coronary thrombus in a patient with polycythemia vera
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Spontaneous recanalized coronary thrombi (SRCT) are old thrombus formations characterized by multiple communicating channels. We report the case of a 72-year-old female patient who presented with a SRCT in the context of polycythemia vera. Optical coherence tomography (OCT) is the diagnostic method of choice.

Case report: A 72-year old woman with a history of polycythemia vera (PV) was admitted for assessment of severe aortic stenosis. The patient was under Hydroxyurea treatment since 15 years with adequate control of red cells and platelets. Cardiovascular risk factors included arterial hypertension, dyslipidemia and smoking. Diagnostic coronary angiogram revealed a hazy lesion in the mid left anterior descending artery with TIMI flow 3 in the distal artery. The rest of the coronary arteries was free of significant disease. Optical coherence tomography (OCT) was performed depicting the classic appearance of chronic intracoronary thrombosis with multiple intra-luminal channels of high signal intensity described as “swiss cheese”-like appearance. In contrast to previous reports describing fibrous plaques as underlying cause for rupture, there was no evidence of coronary artery atherosclerosis on OCT. Ventriculogram revealed normal left ventricular systolic function. The lesion was successfully stented with a 3x24 mm drug eluting stent. Four weeks after PCI the patient underwent successful transcatheter aortic valve implantation and dual antiplatelet therapy with Aspirin and Prasugrel 10 mg was prescribed for 6 months. After exclusion of other thromboembolic sources and absence of coronary atherosclerosis, a spontaneous recanalized coronary thrombus (SRCT) in the context of PV was suspected in this patient. PV is a myeloproliferative neoplasm characterized by abnormal proliferation of hematopoietic stem cells. Coronary events are not uncommon during the course of PV. In cases with unclear angiographic findings, optical coherence tomography (OCT) can help to determine and treat adequately the underlying pathology.

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