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Cor et Vasa

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Cor et Vasa

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Cor et Vasa, the journal of the Czech Society of Cardiology and Czech Society for Cardiovascular Surgery, publishes 6 times a year and covers all aspects cardiology, angiology, cardiovascular surgery, cardiovascular imaging, pediatric cardiology, hypertension, cardiovascular prevention and some aspects of interventional radiology.

It features editorial, original articles, review articles, as well as short communications from clinical and experimental cardiology. Beginning 2012, *Cor et Vasa* has also been publishing summaries (5 000 words) of the European Society of Cardiology guidelines, developed by leading Czech experts in the field.

Its supplement, *Cor et Vasa* Kardio offers book reviews, abstracts from elected congresses and conferences, elections and discussions, polemics, commentaries, information from the Czech Society of Cardiology, Czech Society of Cardiovascular Surgery and European Society of Cardiology as well as topical international news items.

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Cor et Vasa

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Vienna House Hotel, Prague, November 4–5, 2024

PRESENTATIONS – DOCTORS

GENETIC BASIS FOR CARDIOMYOPATHY IN A REPRESENTATIVE COHORT IN THE CZECH REPUBLIC

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Topic: Heart failure

Aim: Inherited cardiomyopathies are an important cause of heart failure in patients < 50 years. Our study aims to assess the genetic basis of inherited forms of cardiac failure in the Czech population. Thanks to a shared database and communication we intend to increase the quality and reliability of molecular genetic analysis.
Sample and methodology: The cardiogenetic group within the Czech Genetic Society (SLG ČSL JEP) initiated a shared pseudoanonymized cardiogenetic DNA variant database project. Six accredited diagnostic molecular genetic laboratories perform cardiogenetic studies using next-generation sequencing approaches. 99 genes were analysed in all patients irrespective of the method used in a particular laboratory.
Results: Pseudoanonymized data of 3578 patients (2392 males/1186 females) with cardiomyopathies (CMP): HCM (1585), DCM (1344), ACM (316), LVNC (122), RCM (27), and uncategorized CMP (184) were collected until now. ACMG. net class 4 and 5 variants were identified in 29 % cases. The most frequently identified genes harbouring the pathogenic DNA variant are *MYBPC3* (25 %), *TTN* (24 %), *MYH7* (14 %), and *PKP2* (5 %). Most found variants are unique to the probands, but *MYBPC3* gene harbours several frequently identified variants in our population.
Conclusion: We show data from the very first national registry of genetic causes of cardiomyopathies in the Czech Republic. Affected individuals are predominantly males. The genetic yield does not significantly differ from the reported ones in other national registries, but the genetic architecture differs from other reported cohorts and could show the special properties of our genetic background. Further analysis may allow us to identify population-specific pathogenic variants, and the inter-laboratory communication contributes to a better quality of genetic service.

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HIF-1α AND MITOCHONDRIA IN CARDIOPROTECTION INDUCED BY ADAPTATION TO CHRONIC HYPOXIA

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Topic: Myocardial and pericardial diseases

Transcriptional factor HIF-1α is known to contribute to cardioprotection against ischemia/reperfusion injury. Adaptation to chronic hypoxia (CH) is a cardioprotective phenomenon associated with HIF-1α stabilization. Nevertheless, its precise role in protective changes induced by CH remains incompletely understood. This study aimed to elucidate whether partial Hif1a deficiency would nullify the cardioprotective benefits of CH, while also investigating its impact on mitochondrial function and dynamics. Adult male wild type and heterozygous Hif1a knockout mice were adapted to CH or maintained under normoxic conditions. Physiological responses to CH were evaluated, and myocardial infarction was induced in isolated perfused hearts. Expression analyses, mitochondrial respiration measurements, and electron microscopy were conducted to assess mitochondrial characteristics. We revealed a reduction in infarct size in chronically hypoxic wild-type mice in comparison to their normoxic counterparts. In contrast, this protective effect of CH was absent in mice displaying partial Hif1a deficiency. Additionally, diminished mitochondrial respiration and altered mitochondrial ultrastructure were observed exclusively in chronically hypoxic wild-type mice compared to their normoxic counterparts. We monitored autophagy in the presence and absence of lysosomal protease inhibitor leupeptin. Remarkably, augmented autophagosome formation appeared solely in chronically hypoxic wild type mice. These collective findings indicate the pivotal role of HIF-1α-regulated mitochondrial processes within cardiac myocytes during adaptation to CH, and importantly, they highlight its significance in CH-induced myocardial protection against ischemia/reperfusion injury through promotion of mitophagy.

ANALYSIS OF IRON DEFICIENCY IN DIABETIC AND NON-DIABETIC PATIENTS WITH HEART FAILURE

Bakošová M[1], Krejčí J[2], Godava J[1], Honek T[1], Hude P[1], Ozábalová E[1], Poloczková H[2], Máchal J[3], Bedáňová H[4], Němec P[4]

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Topic: Heart failure

Introduction: Iron deficiency (ID) is a common comorbidity in patients with heart failure (HF) and has been associated with decreased performance status, frequent hospitalizations for heart failure decompensation and with a worse quality of life.
Aim: To compare the prevalence and parameters of ID between diabetic and nondiabetic patients, including those with LVAD implantation.
Sample and methodology: In our study 102 patients with advanced HF were conducted. Patients were stratified into diabetic and nondiabetic groups. ID was assessed using specific laboratory parameters: serum ferritin, transferrin saturation (TSAT), serum iron and soluble transferrin receptor (sTfR). Statistical analysis was performed to compare iron status across the groups.
Results: The prevalence of ID in all patients with advanced HF was 64%. The prevalence of ID did not differ significantly between diabetics and non-diabetics, with a prevalence of 62% among diabetics and 65% among non-diabetics ($p = 0.18$). However, if we consider the presence of LVAD, in the diabetic group with LVAD, 90% of patients had ID, whereas only 57% of non-diabetics had ID ($p = 0.05$). There were statistically significant differences in ID parameters between diabetic and non-diabetic patients with LVAD, namely T-sat ($p = 0.04$), ferritin ($p = 0.05$) and serum iron ($p = 0.04$).
Conclusion: There was no significant difference between diabetic and non-diabetic patients with heart failure. Among patients with LVAD, prevalence of ID in diabetics was significantly higher compared with non-diabetics, which may be due to chronic inflammation, poorer renal function, and acid-base imbalance.

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PRIMARY VERSUS SECONDARY TYPE OF TAKOTSUBO SYNDROME

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Topic: Acute conditions in cardiology

Aim: Takotsubo syndrome (TTS) often develops subsequently after initial hospitalization for serious non-cardiac disease. The incidence of such "secondary" TTS is rising due to closer interdisciplinary cooperation. The aim of the study is to compare patients it those TTS was the primary reason for admission with patients with secondary TTS.
Sample and methodology: Patients hospitalized with TTS in a large university hospital were identified and prospectively included in this monocentric study between 2013 and 2023. A total of 155 patients were diagnosed with TTS. All of them had to meet the international InterTAK diagnostic criteria. We divided the patients into two groups: Group A (primary TTS) included patients who were admitted with primarily acute cardiac involvement and the suspicion of TTS which we definitively concluded as TTS. Group B (secondary TTS) included patients admitted for non-cardiac severe disability, who were diagnosed with TTS based on new onset of symptoms after initial hospitalization.
Results: Group A (primary TTS) included 97 patients and there were 58 patients in the Group B (secondary TTS). We didn't recognize any differences in the baseline characteristics: 91% female in both groups with the same average age of 71 years. Ejection fraction in Group A and B was 36,1 ± 7,6% vs. 34,5 ± 6,6% ($p = 0.306$), respectively. The time from admission to development of diagnosed secondary TTS was 5.3 ± 5.4 days. Development of cardiogenic shock was seen in group A in 6.3% vs. 27.6% in group B ($p < 0.001$). The hospital mortality in group A was 6.2% vs. 15.5% in group B ($p = 0.057$).
Conclusion: More than one third of patients from our registry had secondary type of TTS induced by another primary non-cardiac disease. Even though primary and secondary type of TSS did not differ in age and ejection fraction, secondary type of TSS was associated with a worse prognosis.

MYOCARDIAL INFARCTION WITH MULTIVESSEL DISEASE. DOES PRESENCE OF CHRONIC TOTAL OCCLUSION MAKES A DIFFERENCE?

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Topic: Interventional cardiology

Aim: To analyze clinical characteristics, presenting symptoms, and survival of patients with myocardial infarction (MI), multivessel disease (MVD), and the possible impact of chronic total occlusion (CTO) to 1-year mortality.
Methods: All MI patients with MVD (two or three vessel disease) hospitalized in our center from January 2020 to September 2022 (1309 patients) were selected. In cooperation with Institute of Health Information and Statistics we obtained 1-year mortality data. We conducted a propensity score matching (PSM) analysis based on age,

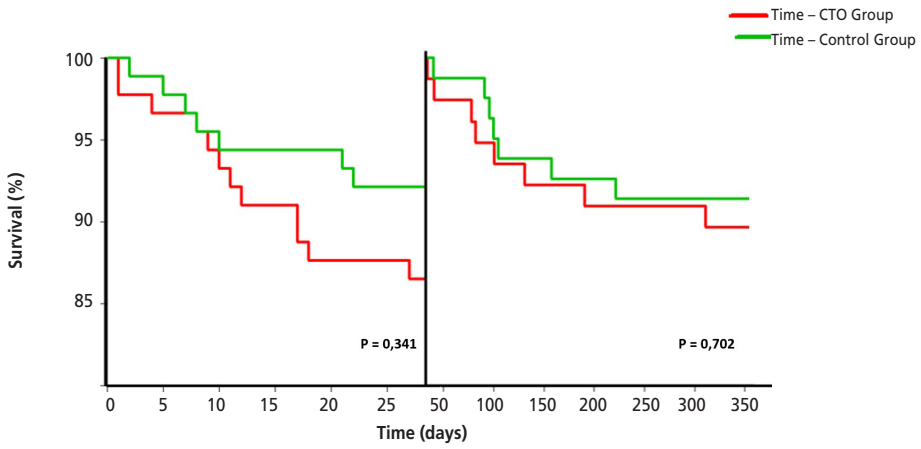

Fig. 1 – Landmark analysis with 30-day and 1-year mortality between the groups.

gender, and type of MI and compared patients with CTO (CTO group, n = 90) and without CTO (Control group, n = 90).
Results: There were no differences in presenting clinical symptoms and initial heart rhytm between the groups. Higher trend of 30-day mortality was observed in CTO group compared to the Control group (14.4% vs. 10.0%; n = 13 vs. n = 9; *p* = 0.36) with a mean survival (MS) of 27.2 days (95% confidence interval [CI] = 25.6–28.7) in the CTO group and 28.2 days (95% CI = 26.9– 29.5) in the Control group. 1-year follow-up shows all-cause mortality rate of 23.3% (n = 21) in the CTO group ([MS] = 292.1 days, 95% CI = 263.8–320.4) and 18.9% (n = 17) in the Control group ([MS] = 310.2 days, 95% CI = 285.3–335.2), *p* = 0.44. Landmark analysis emphasizes mortality distribution (**Fig. 1**). PCI alone was performed in 64.4% (n = 58) in both groups, CABG in 18.8% (n = 17) and 24.4% (CTO vs. Control group, respectively). Combination of both (PCI and CABG) occurred in 8.8% (n = 8) in both groups and conservative treatment was chosen for 7 CTO and 2 Control group.
Conclusion: We observed a higher 30-day mortality trend in patients with MI, MVD, and a CTO compared to a matched cohort with MI, MVD without CTO. Mortality after 30 days up to 1-year mortality in both groups is comparable. CABG treated patients had excellent survival, irrespective of CTO presence.

THE TIME-DEPENDENT YIELD OF INVASIVE VS. STANDARD RESUSCITATION STRATEGIES: A SECONDARY ANALYSIS OF THE PRAGUE OUT-OF-HOSPITAL CARDIAC ARREST STUDY

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Topic: Acute conditions in cardiology

Background: It is unclear how invasive resuscitative protocols may impact the time-dependent prognosis of out-of-hospital cardiac arrest (OHCA) resuscitations, or the relationship between intra-arrest transport and outcomes.
Methods: We performed a secondary analysis of the Prague OHCA Study, which randomized refractory OHCAs to "invasive" (intra-arrest transport for possible ECPR initiation) vs. "standard" resuscitation strategies (predominantly performed on-scene). Between groups, we compared outcomes of the initial resuscitation and 180- and 30-day favourable neurological outcomes (CPC 1–2), and within categories based on resuscitation duration (collapse-to-ROSC/ECPR interval). We plotted the dynamic probability of favourable outcomes with increasing durations of unsuccessful resuscitation.
Results: Among invasive and standard groups, respectively: 34/124 (27%) vs. 58/132 (44%) had sustained ROSC (difference –17%, 95% CI –5.0 to –28); 38/124 (31%) vs. 24/132 (18%) had 30-day favourable neurological outcomes (difference 12%; 95% CI 2.0–23); and 39/124 (31%) vs. 29/132 (22%) had 180-day favourable neurological outcomes (difference 9.5%; 95% CI –1.3 to 20). For favourable outcome cases: standard group resuscitation durations were right-skewed within the first 60 min; for the invasive group the distribution was bimodal, extending to 77 min. For invasive- and standard-treated cases, the probability of favourable outcomes among those in refractory arrest at 30 min was 28% and 7.6%, respectively; declining to 0% at 77 and 60 min.
Conclusion: In comparison to standard resuscitation, invasive strategy cases had fewer achieved sustained ROSC,

however, improved overall 30- day favourable neurological outcomes. While standard resuscitation yield was limited to < 60 min, invasive protocols offer a second extended window of potential successful resuscitation.

Keywords: cardiopulmonary resuscitation, extracorporeal membrane oxygenation, heart arrest, out-of-hospital cardiac arrest

IMPACT OF MITRAL VALVE REPAIR ON REGIONAL AND GLOBAL LV REMODELING IN BARLOW'S DISEASE

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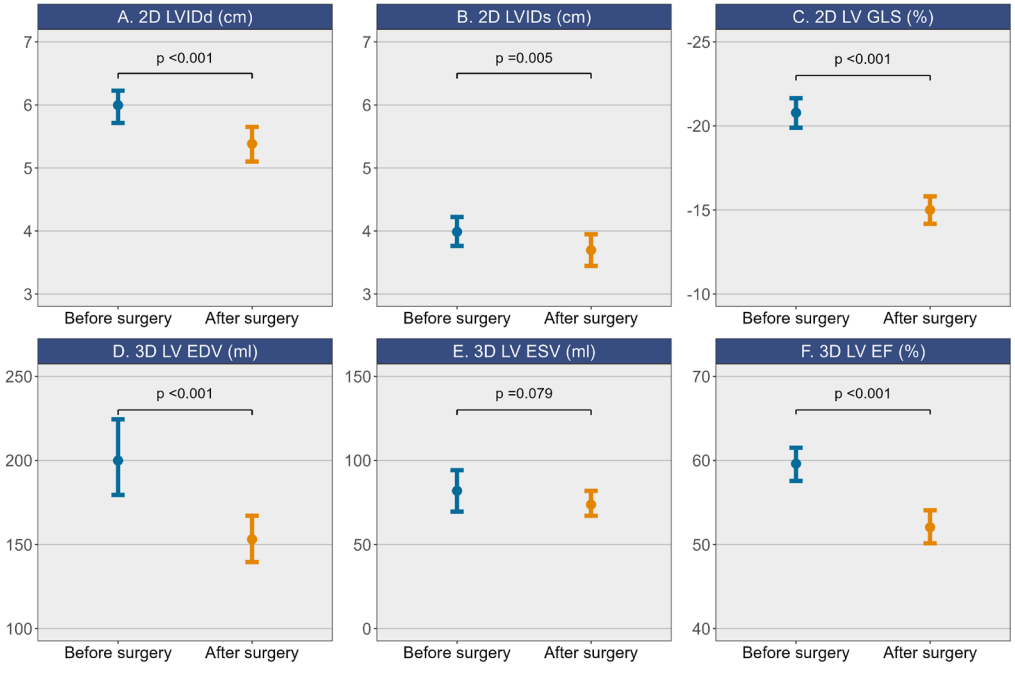
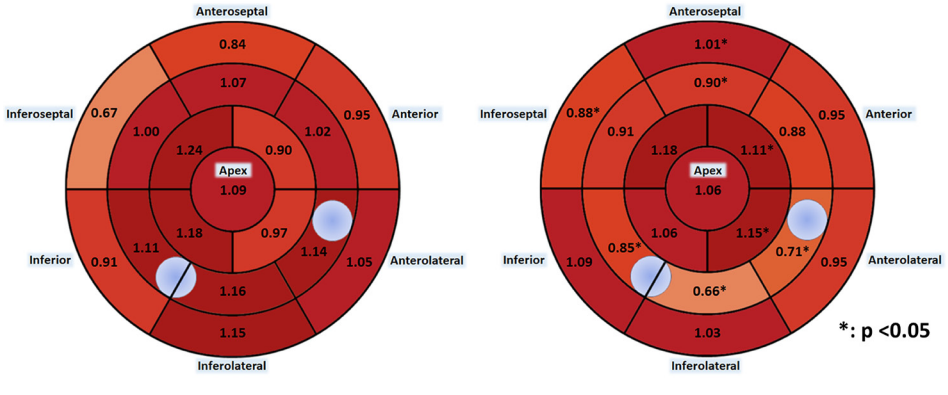
Topic: Valvular disorders

Aims: To assess the left ventricular (LV) reverse remodeling 1.5 years after mitral surgery in patients with Barlow's disease.

Sample and methodology: Patients with Barlow's disease referred for mitral surgery were recruited prospectively at one Heart Valve Clinic between 2017–2022. LV size was evaluated in 2D by the end diastolic (LVIDd) and end-systolic (LVIDs) diameters, and in 3D by the end-diastolic (EDV) and end-systolic (ESV) volumes. LV global function was evaluated by 3D ejection fraction (EF) and 2D global longitudinal strain (GLS). Postoperative changes in regional LV function were assessed by the ratio of basal, middle, and apical longitudinal speckle-tracking strain, to global LV GLS.

Results: 20 patients with median follow-up time 16 months. All patients were operated with mitral valve repair with annuloplasty and implantation of neo-chordae. Ventricularisation of disjunction was done in all patients with mitral annular disjunction (MAD), while leaflet resection was performed in 65% of patients. 2D LV end-diastolic and end-systolic diameters were reduced after surgery (6.0 ± 0.6 to 5.4 ± 0.6, $p < 0.001$ and 4.0 ± 0.6 to 3.7 ± 0.6, $p = 0.005$). Reduction of 3D end-diastolic volumes occurred in all patients (200 ± 50 ml to 153 ± 32 ml, $p < 0.001$). 3D end-systolic volumes did not change (82 ± 28 to 74 ± 18, $p = 0.079$). 2D LV GLS (–20.8 ± 2.1% to –15.0 ± 1.9 %) and 3D LV ejection fraction (60 ± 5 % to





Before surgery **After surgery**

52 ± 5 %) fell significantly after surgery (both $p < 0.001$). In regional LV longitudinal strain, inferolateral (IL), anterolateral (AL), and inferior papillary muscle-associated middle segments showed a reduction relative to GLS after surgery: IL 1.16 ± 0.20 to 0.66 ± 0.25, AL 1.14 ± 0.19 to 0.71 ± 0.16, inferior 1.11 ± 0.19 to 0.85 ± 0.17 (all $p < 0.001$).
Conclusions: In patients with Barlow's disease, mitral valve repair is associated with significant LV reverse remodeling and changed strain patterns in regions neighboring the papillary muscles and MAD. The observed changes probably reflect changed forces due to reduced papillary muscle traction and MAD ventricularisation.

PULMONARY HYPERTENSION AND RIGHT VENTRICULAR-PULMONARY ARTERIAL COUPLING IN CHRONIC HEMODIALYSIS POPULATION

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Topic: Pulmonary hypertension

Aims: 1. To analyze the relations of PH and RV-PA coupling with arteriovenous fistula (AVF) flow and current hydration.
2. To analyze the structural heart changes associated with RV-PA uncoupling.
3. To reveal the prevalence and etiology of PH in the Czech hemodialysis population.
Methods: Inclusion visits of the patients included in CZecking Heart Failure in patients with advanced Chronic Kidney Disease study were analyzed. We performed expert echocardiography with non-invasive hemodynamic assessment, evaluation of AVF flow, bio-impedance analysis (BIA) and basic laboratory tests. The presence of PH was defined by the estimated pulmonary arterial systolic pressure > 35 mmHg or by indirect signs of PH. RV-PA coupling was calculated as TAPSE/PASP, with values < 0.36 marked as RV-PA uncoupling.
Results: Data of 336 patients were analyzed. PH was present in 34% of patients, RV-PA uncoupling was present in 25% of patients with PH and in 2% of those without PH. PH and RV-PA uncoupling were related to higher hydration status. The association of AVF flow and the diagnosis of PH was weak (OR 1.27, CI 1.10–1.46), and RV-PA coupling was not dependent on AVF flow. Patients with RV-PA uncoupling had a worse function and a greater dilation of both ventricles compared to those with RV-

Table 1 – Differences in patients with PH and with normal and pathological right ventricular-pulmonary arterial coupling

	TAPSE/PASP > 0.36; N = 70	TAPSE/PASP > 0.36; N = 24	*p*-value
Dialysis access flow (L/min)	1020 (900)	765 (1050)	0.235
Age (years)	72.6 (13.4)	73.35 (24.65)	0.689
Dialysis vintage (months)	40.5 (65)	30 (75)	0.805
NT-proBNP (ng/L)	10264 (17802)	35000 (20348)	< 0.0001
CVP (mmHg)	8 (8)	18 (5)	< 0.0001
Overhydration (L)	1.7 (2.8)	2.9 (1.6)	0.095
LAVi (mL/m^2)	47 (20)	52.5 (27)	0.052
EDVi (mL/m^2)	56.14 (23.1)	76.33 (43.32)	0.009
LVMi (g/m^2)	103.5 (69)	77 (63.5)	0.894
CO (mL/min)	5.78 (2.43)	4.21 (2.56)	0.001
Qa/CO	0.17 (0.18)	0.19 (0.23)	0.666
EF LV (%)	59 (13)	42 (20.5)	0.001
EDA (mm^2)	20 (7.65)	27.5 (9)	0.002
ESA (mm^2)	11.55 (5)	19.5 (13	0.001
RAEDV (L)	69 (41.5)	74 (46)	0.162
FAC (%)	41 (15)	31.5 (22)	0.018
TVR (Wood units)	19.88 (9.14)	21.97 (14.06)	0.059
SVR (Wood units)	16.12 (6.55)	19.04 (7.84)	0.218
Albumin (g/L)	38 (5)	38 (5.6)	0.884
Hemoglobin (g/L)	109.5 (15)	108.5 (18.5)	0.853

CO – cardiac output; COef – effective cardiac output; CVP – central venous pressure; EDA – end-diastolic area of the right ventricle; EDVi – indexed end-diastolic left ventricular volume; EF LV – ejection fraction of the left ventricle; ESA – end-systolic area of the right ventricle; FAC – fractional area change; LAVi – indexed left atrial volume; NT-proBNP – N-terminal pro-brain natriuretic peptid; Qa/CO – arteriovenous fistula flow to cardiac output ratio; RAEDV – right atrial end-diastolic volume; SVR – systemic vascular resistance; TVR – total vascular resistance.

PA coupling (**Table 1**). In patients with PH, there was significantly higher prevalence of heart failure (HF) (79% vs 37.5%, $p < 0.0001$).
Conclusions: 1. The relation between AVF flow and PH is weak. RV-PA coupling is not dependent on AVF flow. Both PH and RV-PA uncoupling are related to a current hydration status.
2. RV-PA uncoupling is associated with more advanced structural heart changes of both ventricles.
3. PH is present in about one third of Czech hemodialysis population. HF is the strongest contributor of PH in hemodialysis population.

LONG-TERM SURVIVAL AFTER AN ISCHEMIC STROKE. THE ESH-STROKE SURVEY

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Topic: Acute conditions in cardiology

Background: Identification of factors affecting long-term survival following ischemic stroke is of utmost importance. The aim of the present study was to assess long-term survival and factors associated with increased mortality after an ischemic stroke.
Design and method: Consecutive patients hospitalized between March 2009 and January 2012 for their first-ever ischemic stroke in 2 large university hospitals in the Czech Republic were enrolled in this survey. Baseline data were obtained from hospital medical records. The median follow-up was 10.2 years. Vital status was determined using the death registry on July 28, 2023.

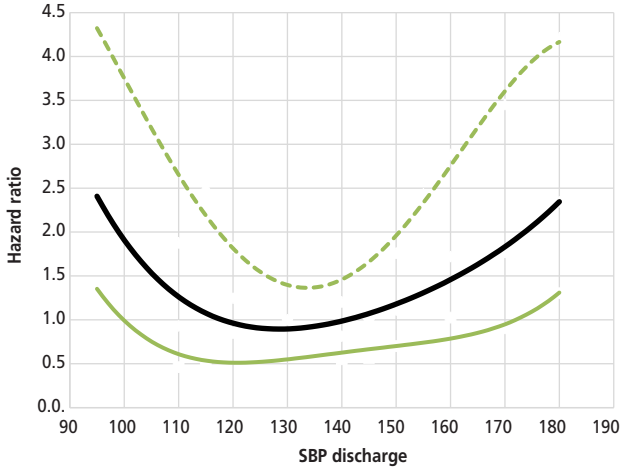

Fig. 1 – Hazard ratio of SBP at discharge vs. SBP at discharge = 130 mmHg.*
* Adjusted for age, sex

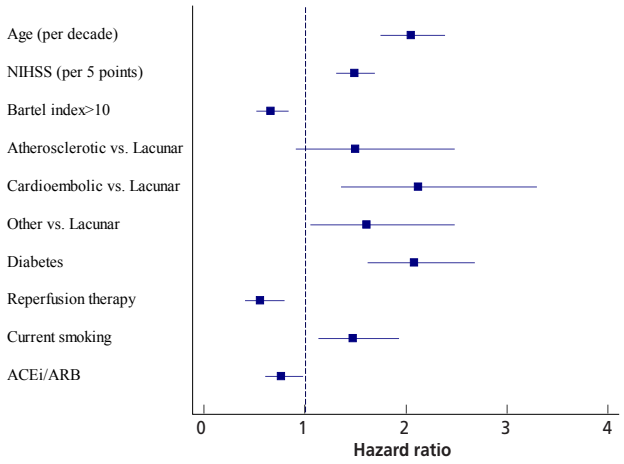

Fig. 2 – Outcome predictors in post-stroke patients.

Results: In total, 736 patients (mean age 66 ±11 years; 58% men) were included in this analysis. The cumulative risk of death at 1, 3, 5 and 10 years was 13.6%, 20.8%, 29.3%, and 48.4%, respectively. After adjusting for age and sex, patients with discharge systolic blood pressure between 110 and 150 mmHg had the lowest mortality risk (**Fig. 1**). Increased age, higher NIHSS and increased functional impairment, diabetes, and current smoking were associated with higher mortality risk, while lacunar stroke subtype, reperfusion therapy, and renin-angiotensin system blockers were associated with a lower mortality (**Fig. 2**).
Conclusions: Despite several advances in stroke management, the mortality remains high. Timely reperfusion therapy applied together with renin-angiotensin system blockers may reduce the risk of mortality.

EVALUATING THE RIGHT VENTRICLE AND TRICUSPID VALVE IN HEART FAILURE

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Topic: Congenital and valvular heart diseases from the bedside

Right side of the heart mostly requires special attention in advanced stages of heart failure, considering the feasibility of new minimally invasive solutions for the tricuspid valve (TV). Goals of evaluation include:
- right ventricular (RV) and right atrial remodeling,
- etiology and severity of tricuspid regurgitation (TR),
- tricuspid annular dimensions, leaflet tethering,
- presence of pulmonary hypertension,
- feasibility of interventions.

2D echocardiography is the pivotal imaging modality for that. Since RV and TV both are complex anatomical structures, we must apply not only multiple dimensions and multiple modalities to fully evaluate and quantitate morphometry and function. Multi-modality imaging has

become the standard for the assessment of procedural eligibility.
RV remodeling may be the cause of TR, may indicate its severity, is important to guide decision-making regarding interventions and significantly affects patient prognosis. Patients with RV dysfunction are less likely to benefit from interventions.
The essential set of RV parameters:

- **RV size (diameters);**
- **longitudinal function:**
  - TAPSE (cut-off 17 mm),
  - S' velocity (cut-off 9.5 cm/s);
- **fractional area change;**
- **3D RV EF** (cut-off 45%);
- **2D free wall or entire RV longitudinal strain** (cut-off -20%).

3D echocardiography is the only ultrasound method for calculation of RV EF in patients with good acoustic windows. In other cases CMR must be used.
Altered loading conditions especially complicate the assessment of RV function. In chronically pressure-overloaded RVs, longitudinal function decreases, while circumferential function increases, preserving RV EF.
For predicting probability of RV failure after the intervention indices of RV coupling to pulmonary circulation are suggested.
TV is a dynamic structure that changes its shape and size during cardiac cycle, it is more circular compared to the elliptical MV. By 2D Echo it is not possible to see all three leafltes in a single slice; on the contrary, three-dimensional (3D) echocardiography allows for the simultaneous visualization of the TV leaflets and their commissures, may be useful to clarify difficult anatomies and etiology of regurgitation.

Take home messages

- **Multiparametric multi-modality approach is needed for evaluation of RV, TV, RA remodeling and severity of TR.**
- **Assessment of RV function must consider loading conditions.**
- **Loss of longitudinal function of RV can be compensated by increasing circumferential function, preserving RVEF and favorable outcomes.**
- **3D echocardiography provides a better assessment of RV size and function, TV geometry and TR severity.**

CATHETER ABLATION IN CARDIOGENIC SHOCK TREATED BY A MECHANICAL CIRCULATORY SUPPORT

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Topic: Heart rhythm disorders

Background: Mechanical circulatory supports (MCS) including VA ECMO and Impella devices provide hemodynamic stability for selected cardiogenic shock (CS) patients. Even though, recurrent arrhythmias complicate the treatment and worsen the prognosis.
Methodology: This is a retrospective analysis of a dedicated registry of patients who underwent a catheter ablation (CA) in our cardiac center between 01/2020 and 08/2024 while being treated with MCS for a CS. Both patients with SVTs and VTs were included but their data were analyzed separately. The main evaluated outcomes were the MCS weaning success rate and 30-day mortality.
Results: We identified 9 patients (8 males, median age 69 years) ablated for a refractory VT. ImpellaCP was used in 6 cases, 2 patients were on a VA ECMO and 1 patient was completely supported by ECPELLA. After the CA, 7 patients were successfully weaned off the MCS and 2 patients died in the 30 days after the CA. The VT reoccurred in 4 patients and a clinically significant complication of MCS was reported in 6 patients. The CA itself was complicated only in 1 patient by the need of a pacemaker implantation.
4 patients were ablated for torpid SVT while being on a MCS for CS (3 males, median age 73 years). 3 patients were treated by a non-selective AV node ablation following a CRT implantation. 1 patient underwent a radiofrequency ablation of a focal atrial tachycardia. The MCS was successfully explanted in all 4 patients and no patient died in 30 days. The MCS related hemolysis was reported in 1 patient.
Conclusion: CA for refractory arrhythmias in CS is feasible and can facilitate the MCS weaning process. The CA itself appears to be safe but the complications of MCS are common. Patients with VTs have worse prognosis than patients with SVTs are in a high risk of arrhythmia recurrence even after the CA procedure.

CHANGES IN RIGHT VENTRICLE AND RIGHT ATRIUM FUNCTION FOLLOWING MITRAL VALVE REPAIR FOR PRIMARY MITRAL REGURGITATION

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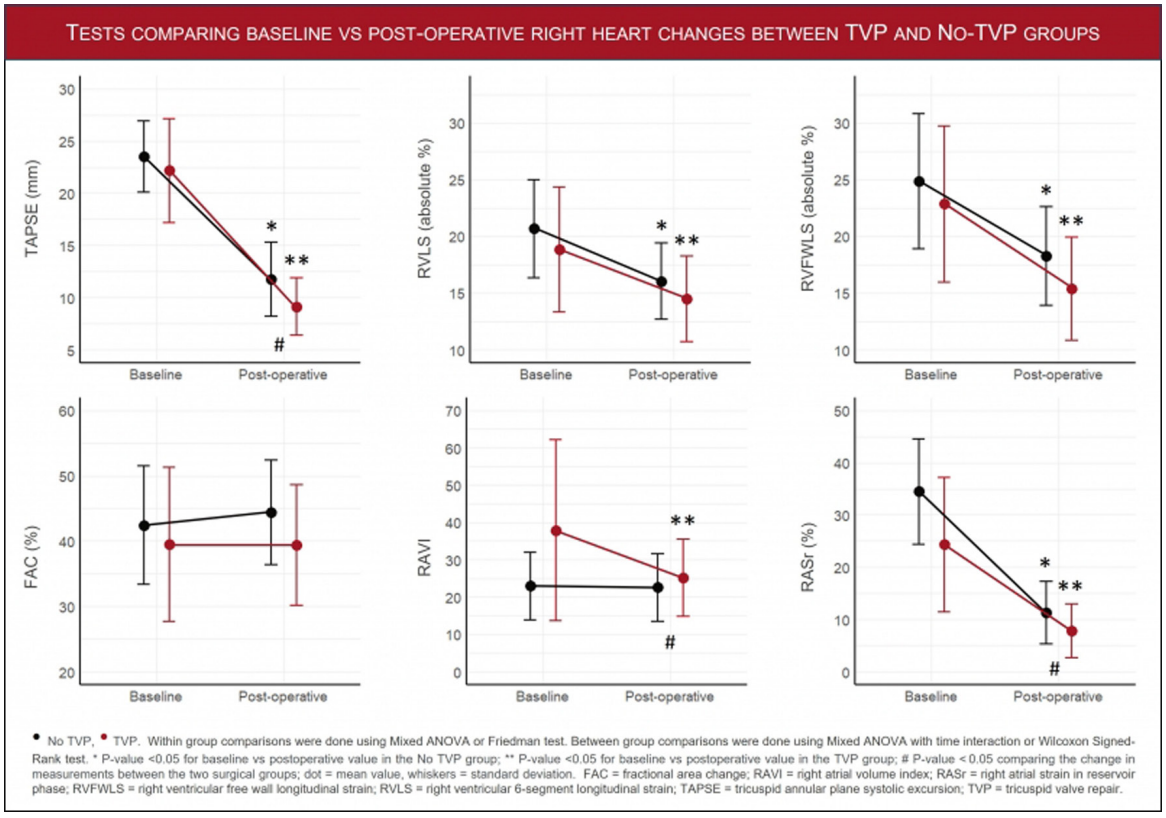
Topic: Echocardiography

Background: The assessment of right heart function following cardiac surgery remains a challenge.
Aims: To assess changes in echocardiographic measures of the right ventricle (RV) and right atrium after mitral valve surgery.
Methods: A total of 255 patients undergoing surgery for primary mitral regurgitation were included. Measurements were compared before and immediately after surgery (pre-discharge), and included tricuspid annular



plane systolic excursion (TAPSE), fractional area change (FAC), RV longitudinal (RVLS) and free wall (RVFWLS) strains, and right atrial volume index and reservoir strain.
Results: As compared to baseline values, TAPSE (23 vs 11 mm; $p < 0.001$), RVLS (–19.8 vs –15.3%; $p < 0.001$) and RVFWLS (–23.9 vs –16.7%; $p < 0.001$) significantly decreased after surgery, while FAC did not show a significant change (41% vs 42%; $p = 0.22$). Right atrial reservoir strain also showed a significant decrease after surgery (29.9 vs 9.5%; $p < 0.001$). Patients who received concomitant tricuspid valve repair (n = 115; 45%) experienced significantly higher drop in TAPSE ($p = 0.04$) but significantly lower drop in right atrial strain ($p < 0.001$). Right atrial volume index decreased only in patients who received tricuspid valve repair (38 vs 25 ml/m^2; $p < 0.001$).
Conclusions: Following surgery for primary mitral regurgitation, all parameters of RV function showed a significant decrease except for FAC. Similarly, right atrial function, as measured by strain, decreased significantly after surgery.

PULSED FIELD ABLATION INDUCES HEMOLYSIS IN VITRO DEPENDING ON THE STRENGTH OF THE ELECTRIC FIELD

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Topic: Heart rhythm disorders

Aim: Several cases of renal failure due to intravascular hemolysis after pulsed field ablation (PFA) have been observed. Red blood cell (RBC) disintegration and increased haptoglobin concentration have also been observed in human patients undergoing PFA. The aim of this study was to investigate the hemolytic effect on plasma samples from healthy volunteers using short high voltage electric pulses with different electric field strength.
Methods: Anticoagulated blood samples from healthy volunteers were obtained according to the European Union regulation. Blood samples were exposed to different electric field strengths generated by an electric pulse generator (TONAGENA, CZ). The electroporation set-up used a burst consisting of 216 bipolar pulses lasting 2 µs. Each burst was repeated 20 times with a frequency 1 Hz. Applied electric fields ranged from 250 V/cm to 1500 V/cm. Hemolysis was quantified by cell-free hemoglobin

concentration and by the number of red blood cell microparticles (RBCμ) from separated plasma.
Results: All electric fields strengths induce increase of RBCμ. The increase in the number of RBCμ increased exponentially (r2 = 0.96) with linearly increasing electric field. Significant increase in cell-free hemoglobin (0.32 ± 0.16 g/L, 2.2 ± 0.96 g/L, and 5.7 ± 0.39 g/L vs control group – 0.08 g/l; $p < 0.01$) was observed from electric field strength 1000 V/cm.
Conclusion: High-voltage electrical impulses cause damage to RBC, leading to hemolysis. A significant increase in cell-free hemoglobin was observed from an electrical filed strength of 1000 V/cm. Higher levels of RBCμ were observed at all electric field strengths (250–1500 V/cm). This result may suggest that RBC damage can occur at very low electric field strengths and detection of RBCμ may provide a more sensitive marker of RBC damage than detection of cell-free hemoglobin.

TEN-YEAR FOLLOW-UP OF PATIENTS WITH UNEXPLAINED LEFT VENTRICULAR SYSTOLIC DYSFUNCTION EVALUATED BY ENDOMYOCARDIAL BIOPSY

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Topic: Myocardial and pericardial diseases

Background and aims: The long-term prognosis of patients with recent-onset left ventricular dysfunction (LVSD) is variable. The role of endomyocardial biopsy (EMB) and clinical predictors including left ventricular reverse remodelling (LVRR) in these patients is still unclear. Our study aimed to analyse the prognostic role of LVRR and EMB, along with other clinical baseline data during a ten-year follow-up of these patients.
Methods: We prospectively evaluated 133 patients (37 women; 55 [46, 61] years) that underwent EMB for recently diagnosed unexplained LVSD at our centre between 2007 and 2013. LVRR was evaluated in the year one after baseline. Regarding baseline predictors of prognosis, mortality and heart transplantation were used as endpoints.
Results: During the ten-year follow-up period, 27% of individuals died and 3% underwent heart transplantation. There were 51 heart failure hospitalisations in 27 individuals. 35 episodes of ICD/CRT-D therapy were recorded in 13 individuals (33% of ICD/CRT-D recipients). In a multivariate analysis, baseline right atrial area and neutrophile-lymphocyte ratio were identified as statistically significant predictors of ten-year mortality and heart transplantation (all $p < 0.01$). LVRR was documented in 46% and was associated with a reduced risk of the combined endpoint comprised of death, heart transplantation, and ICD/CRT-D therapy ($p = 0.002$).
Conclusions: Achievement of LVRR was strongly related to the long-term prognosis of patients with recently diagnosed unexplained LVSD. Furthermore, our study demonstrates the importance of right heart involvement and subclinical systemic inflammation for the long-term prognosis of these patients. Neither the presence of EMB-proved myocarditis by immunohistochemical criteria nor the presence of viral agents in EMB predicted outcome.

CARDIAC RHYTHM CONVERSIONS AND THE OUTCOME IN REFRACTORY OUT-OF--HOSPITAL CARDIAC ARREST. COMPARISON OF EXTRACORPOREAL VS. CONVENTIONAL CARDIOPULMONARY RESUSCITATION

Havránek Š, Neuhofer J, Veselá M, Kaválková P, Rob D, Fingrová Z, Šmalcová J, Franěk O, Huptych M, Dusík M, Pudil J, Linhart A, Bělohlávek J

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Topic: Acute conditions in cardiology

Background: Whether cardiac rhythm conversions during cardiopulmonary resuscitation (CPR) in refractory out-of-hospital cardiac arrest (OHCA) affect outcome is not completely understood. A Prague OHCA study demonstrated that an invasive approach is a feasible and effective treatment strategy in a refractory OHCA. In this post-hoc analysis we aimed to stratify the outcome according to the detailed course of heart rhythm during pre-hospital period and compared in patients treated with extracorporeal vs. conventional CPR.
Methods: All patients randomized to Prague OHCA study were enrolled in this analysis. First documented, during the resuscitation and on admission heart rhythms were analyzed in relation to neurological outcome after 180 days in ECPR and conventionally resuscitated patients.
Results: Within the study cohort of 256 patients (median age 58 y, 17% females), 156 (61%) manifested ventricle fibrillation, 45 (18%) asystole, and 55 (21%) pulseless electrical activity as an initial rhythm. Patients with an initial VF who reached a sustained recovery of spontaneous circulation (ROSC) had the highest proportion of reaching a primary outcome: 32/44 (73%). Conversely, no patient with an initial VF who converted to asystole as their on admission rhythm (24 pts) attained neurologically favorable outcome at 180 days; HR 3.44 (95% CI 1.76–6.74). Patients who experienced intermittent ROSC showed a higher success rate in achieving the primary outcome when treated with ECPR based approach compared to conventional strategy: 26 out of 34 (76%) versus 24 out of 50 (48%); $p < 0.05$.

Conclusion: Rhythm conversions during CPR in refractory OHCA are associated with outcome, with intermittent or sustained ROSC being the most favorable predictors. Patients presenting with VF with intermittent ROSC who remain in VF seem to be optimal candidates for an invasive approach.

IMPACT OF AUTOLOGOUS STEM CELL TRANSPLANTATION ON CARDIAC PERFORMANCE IN SYSTEMIC SCLEROSIS

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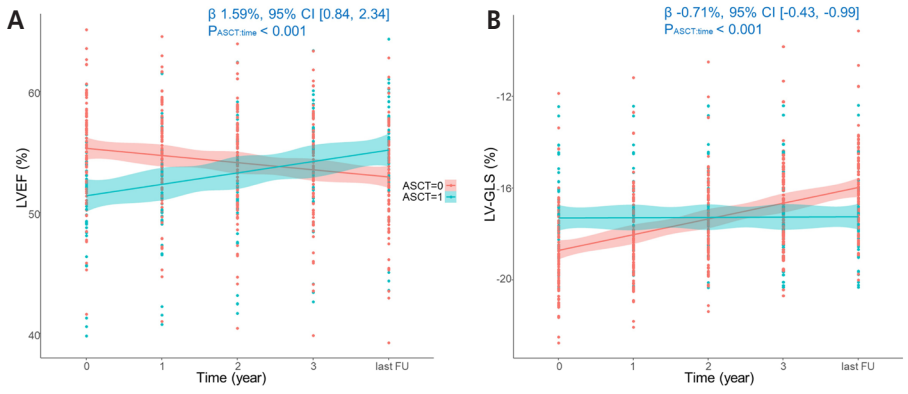
Topic: Echocardiography

Aim: Systemic sclerosis (SSc) is a connective tissue disorder with frequent cardiac involvement. Autologous stem-cell transplantation (ASCT) showed to improve symptoms and survival in SSc, but its impact on cardiac function remains unknown.

Sample and methodology: Consecutive SSc patients undergoing ASCT were included and matched 1 : 1 with controls using propensity scores adjusting for sex, age, and disease duration. Echocardiography was performed before ASCT and then annually: left ventricular ejection fraction (LVEF), left ventricular global longitudinal strain (LV-GLS), and diastolic function parameters were measured. Linear mixed-effect models were used to analyze their changes over time.

Results: A total of 86 patients (n = 43 per each group) were included. Both LVEF and LV-GLS were comparable between ASCT patients and controls at baseline, but significantly improved (LVEF: β 1.59%, 95% confidence interval CI [0.84, 2.34], interaction $p < 0.001$; LV-GLS: β –0.71%, 95% CI [–0.43, –0.99], interaction $p < 0.001$) in the ASCT group at the third year and at last follow-up, while worsened over time in the controls (**Fig. 1**). In turn, LV diastolic function parameters, including EA ratio, tricuspid regurgitation velocity, E/e', and left atrial volume index showed no significant changes over time in both groups.

Conclusion: In SSc patients, ASCT showed a favorable impact on LV systolic function. Myocardial response to this treatment should be monitored over time by using echocardiographic measures such as LV-GLS.



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	Non-ASCT (n = 43)	ASCT (n = 43)	Difference between groups (95% CI)	P value
LVEF at baseline (%)	54.8 (53.4 , 56.1)	53.6 (51.6 , 55.6)	1.15 (-1.28 , 3.58)	0.352
LVEF at 1 year (%)	53.7 (52.3 , 55.1)	52.4 (50.3 , 54.4)	1.35 (-1.14 , 3.84)	0.289
LVEF at 2 years (%)	54.6 (53.1 , 56.1)	52.8 (50.7 , 54.9)	1.81 (-0.81 , 4.42)	0.175
LVEF at 3 years (%)	53.3 (51.8 , 54.8)	56.5 (54.4 , 58.7)	-3.21 (-5.86 , -0.56)	0.0178
LVEF at last FU (%)	51.8 (50.1 , 53.4)	56.8 (54.3 , 59.3)	-5.01 (-8.04 , -1.99)	0.0012
LVGLS at baseline (%)	-19.0 (-18.5 , -19.6)	-18.6 (-17.9 , -19.4)	0.39 (-0.55 , 1.34)	0.414
LVGLS at 1 year (%)	-17.1 (-16.5 , -17.6)	-16.9 (-16.1 , -17.7)	0.18 (-0.80 , 1.15)	0.721
LVGLS at 2 years (%)	-17.1 (-16.5, -17.6)	-17.3 (-16.4 , -18.1)	-0.21 (-1.22 , 0.81)	0.691
LVGLS at 3 years (%)	-16.9 (-16.3, -17.5)	-18.5 (-17.7 , -19.3)	-1.61 (-2.64 , -0.59)	0.002
LVGLS at last FU (%)	-15.7 (-15.0, -16.3)	-18.0 (-17.1 , -19.0)	-2.34 (-3.50 , -1.17)	0.0001

Figure. A. LVEF changes over time; B. LV-GLS changes over time; C. Estimated marginal means between groups

MARKERS OF HAEMOLYSIS AND RENAL TUBULAR INJURY AFTER CATHETER ABLATION FOR ATRIAL FIBRILLATION USING PULSED FIELD AND RADIOFREQUENCY ENERGY

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Topic: Heart rhythm disorders

Background: Pulsed field ablation (PFA) represents a novel non-thermal alternative in catheter ablation of atrial fibrillation (AF). However, infrequent cases of acute renal failure secondary to intravascular haemolysis have been described after PFA procedures with a very high number of PF impulses.
Objective: To investigate the impact of ablation energy (PFA vs. radiofrequency ablation [RFA]) on the plasma concentration of cell-free haemoglobin (CFH), neutrophil gelatinase-associated lipocalin, and kidney injury molecule-1 (NGAL and KIM-1; markers of tubular injury).
Methods: This was a prospective non-randomized study. In a consecutive cohort of patients who underwent AF ablation (PFA of RFA), blood samples were drawn just before the procedure (Sample 1: CFH, NGAL, and KIM-1), immediately after the procedure (Sample 2: CFH) and one day after the procedure (Sample 3: CFH, NGAL, and KIM-1).
Results: Among 70 patients enrolled (mean age 64.3 ± 10.3 years, 61% male), 23 underwent RFA and 47 PFA (mean number of PF impulses 52.85 ± 18.37, range 32–100). Baseline serum creatinine levels were comparable (91.7 ± 22.1 μmol/L vs. 88.8 ± 22.1 μmol/L, $p = 0.44$). In the PFA cohort, a significant increase in CFH was observed immediately post-ablation with a rapid decline to baseline values one day after the procedure (median 60.6 [interquartile range 121.1] μg/mL vs. 2074.1 [2521.5] μg/mL vs. 94.9 [122.6] μg/mL, $p < 0.001$). No significant peri-procedural increase in CFH was observed in the RFA cohort. Compared to baseline, neither the PFA nor the RFA group showed a significant increase in NGAL or KIM-1 postoperatively.
Conclusions: Compared to RFA, PFA leads to significant peri-procedural haemolysis. However, no increase in markers of renal tubular injury was observed in a cohort in which the total number of PF applications was less than 100.

SEX-DIFFERENCES IN TRIGLYCERIDEMIC GENETIC RISK SCORES AND RISK OF MYOCARDIAL INFARCTION

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Topic: Hypertension, atherosclerosis

Aim: Elevated plasma triglyceride (TG) levels are an independent risk factor for the development of cardiovascular disease, including myocardial infarction (MI). Final TG levels are influenced by both environmental (such as dietary habits or physical activity) and genetic factors. We have focused on potential sex differences in the genetic prediction of MI using the TG-associated genetic risk score (GRS).
Methodology: Single nucleotide polymorphisms (SNPs) within 18 genes (*GCKR*, *APOE*, *APOA5*, *CAPN3*, *NAT2*, *FRMD5*, *TYW1B*, *LPL*, *CYP26A1*, *LIPC*, *LRP1*, *MAP3K1*, *CTF1*, *GALNT2*, *CETP*, *TRIB1*, *HLA* and *CILP2*) were genotyped in controls (890 males and 1341 females) and MI patients (913 males and 680 females). Only adults aged between 18 and 65 years at the time of examination were included. Male-specific (mGRS) and female-specific (fGRS) GRSs were created based on the presence of risk alleles for individual SNPs.
Results: In controls, only variants within *APOA5* and *CILP2* were associated with plasma TG levels in both males and females. SNPs were not consistently associated with an increased risk of MI. Within *CAPN3*, *FRMD5*, *TYW1B*, *LPL*, and *CILP2*, the risk alleles differed between males and females. fGRS was not associated with an increased risk of MI in females and was not informative in males. Males with mGRS values over 6 were under increased risk of MI (OR; 95% CI = 1.85; 1.34–2.56; $p < 0.0005$) when compared with subjects with mGRS 3 and less. mGRS was not informative for females (0.84; 0.57–1.25; $p = 0.40$).
Conclusion: The genetic risk of elevated TG seems to be associated with an increased risk of MI only in males. To estimate the genetic risk of MI associated with triglycerides, sex differences must be taken into account and sex-specific GRSs need to be established.

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LEFT ATRIAL STRAIN INDEX IN PATIENTS WITH HEART FAILURE WITH PRESERVED EJECTION FRACTION

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Topic: Echocardiography

Background: In patients with heart failure with preserved ejection fraction (HFpEF), assessment of left ventricular end-diastolic pressure (LVEDP) is crucial but challenging. Left atrial (LA) reservoir strain was found to improve the diagnostic accuracy of conventional echocardiography parameters, but with limited utility in patients with normal LV function. Left atrial strain index (LASi) is a machine learning-derived measure that integrates the entire LA strain curve, and has been validated against invasive measure to indicate normal or elevated LVEDP. However, its clinical value in patients with HFpEF has not been explored. We therefore measured LASi in a well characterized HFpEF cohort and evaluated its association with outcomes.
Methods: 211 HFpEF patients from a dedicated outpatient program were included. Study outcome was a composite of heart failure hospitalization and all-cause mortality.
Results: A total of 117 (55%) patients presented with elevated LVEDP based on LASi measure. These patients were older, more often had atrial fibrillation, higher HFA-PEFF score, NT-proBNP, and more impaired diastolic parameters compared to patients with normal LVEDP. During a follow-up of 61 months, 95 events occurred. Patients with elevated LVEDP showed a worse outcome ($p < 0.001$), irrespective of HFA-PEFF score. Multivariable analysis demonstrated that LASi was independently associated with the composite endpoint, after correcting for age, sex, NYHA class, comorbidities, and HFA-PEFF score ≥ 5 (HR 2.72 [1.61–4.58], $p < 0.001$). Likelihood analysis showed an incremental predictive value of LASi on top of clinical and standard echocardiographic variables.
Conclusion: LASi, as a new index of elevated LVEDP, is associated with an outcome in patients with HFpEF, and may be an adjunct to current diastolic dysfunction assessment to improve risk stratification.

IRON DEFICIENCY AND ALL-CAUSE MORTALITY AFTER MYOCARDIAL INFARCTION

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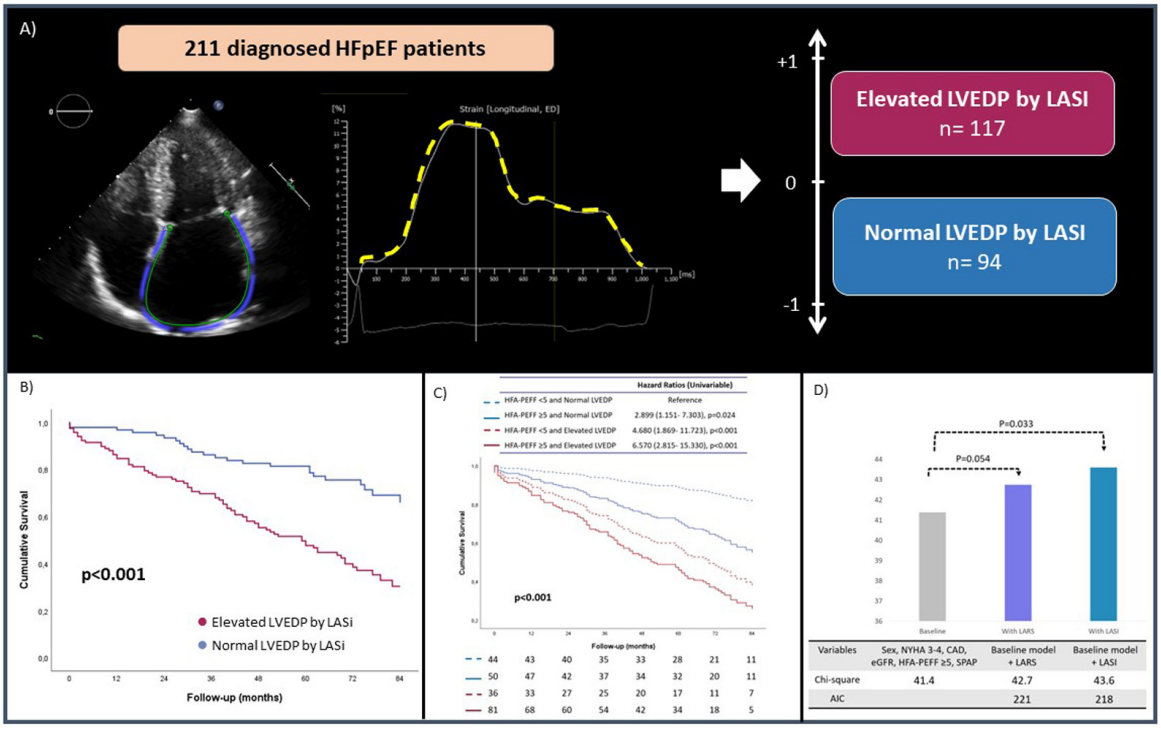
Topic: Heart failure

Introduction: Iron deficiency (ID) is a common comorbidity of cardiovascular diseases, including myocardial infarction (MI). However, the data on the clinical significance of ID in patients with MI are conflicting.
Aim: The aim of our study was to compare the association of different ID criteria with all-cause mortality after MI.
Sample and methodology: Consecutive patients hospitalized at a large tertiary heart centre for type 1 MI without previous history of coronary artery disease were included. We evaluated the association of different iron metabolism parameters with all-cause mortality during the follow-up by using Cox regression analysis. Moreover, we



analysed additional predictive value of different ID criteria to the GRACE (Global Registry of Acute Coronary Events) score.
Results: Of a cohort that included 1156 patients (aged 64 ± 12 years, 25% women), 194 (16.8%) died during the median follow-up of 3.4 years (IQR 626–1782 days). All ID criteria except for ferritin were independently associated with all-cause mortality. However, only the iron level and our own Prague ID criteria in particular provided additional prognostic value to the GRACE score.
A total of 51.7% of post-MI patients had low iron levels (≤ 13 μmol/L), and 57.6 % suffered from ID according to Prague ID criteria (at least one of these parameters: low iron level [≤ 12.8 μmol/l] and high sTfR [≥ 3 mg/L]).
After multivariate adjustment, iron level ≤ 13 μmol/L (HR 1.67, 95% CI 1.19–2.34) and the combination of iron level ≤ 12.8 μmol/L and sTfR ≥ 3 mg/L (HR 2.56, 95% CI 1.64–3.99) were associated with an increased risk of mortality.
Conclusion: ID affects more than half of patients with the first MI. The criteria based on iron and soluble transferrin receptor levels provide the best prediction of mortality, and should be evaluated in future interventional studies with intravenous iron therapy.

EFFECTIVENESS OF CONTEMPORARY RISK STRATIFICATION IN PATIENTS WITH HYPERTROPHIC CARDIOMYOPATHY: A PILOT STUDY

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Topic: Myocardial and pericardial diseases

Risk stratification and primary prevention of sudden cardiac death (SCD) in patients with hypertrophic cardiomyopathy (HCM) is a challenging discipline. When using current stratification systems, there is always a compromise between sensitivity and specificity. In our pilot study, we sought to determine the incidence of SCD and the effectiveness of stratification systems, i.e., the ESC HCM Risk-SCD score and the system of individual major risk factors (RF) according to ACC/AHA in patients followed in an expert center. Patients with HCM were risk-stratified and followed for 10 ± 8 years at the referral HCM center. **Results:** Five hundred fifty-six patients were stratified, and 71 (13%) were implanted with a cardioverter-defibrillator (ICD) based on risk stratification. During follow-up, 12 (17%) patients had ≥ 1 appropriate ICD therapy. None of the ICD patients died of SCD. During follow-up, 118 (21%) patients died, of which 28 (5%) from HCM-related causes, 12 (2%) from stroke, 11 (2%) from advanced heart failure, one perioperatively (myectomy) and 4 (1%) patients died suddenly (SCD). In conclusion, with current risk stratification, albeit imperfect, SCD is rare in HCM patients managed at an expert center.

SMARTBAND – FEASIBILITY STUDY OF INVASIVE BLOOD PRESSURE MONITORING AFTER PROXIMAL AND DISTAL TRANSRADIAL CARDIAC CATHETERIZATION AND INTERVENTION VIA AN ARTERIAL CANNULA INSERTED UNDER THE TR BAND

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Topic: Interventional cardiology

Patients with acute coronary syndrome complicated by heart failure and patients after cardiac arrest usually undergo an urgent coronary catheterization and intervention without prior invasive monitoring and detailed examination. Therefore they do not have continuous blood pressure and heart rate invasive monitoring after the transradial procedure and the standard sheath removal with following postprocedural radial artery compression. This has been the reason for another arterial cannulation on ICU with increasing risk of local complications until now. We present results of the pilot phase of our new study with the method of continuous invasive monitoring after proximal or distal transradial procedures via an arterial cannula introduced under the compressive device TR Band. This method enables continuous monitoring without the need of additional arterial access.

EICOSANOIDS IN CORONARY SINUS NEGATIVELY CORRELATE WITH NATRIURETIC PEPTIDES IN HEART FAILURE WITH REDUCED EJECTION FRACTION: INSIGHTS FROM EICOSANOIDS IN HUMAN HEART FAILURE STUDY

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Topic: Heart failure

Background: The diagnostic and therapeutic potential of eicosanoids, metabolites of arachidonic acid with positive cardio-renal activity in preclinical heart failure models,

remains unclear in human chronic heart failure with reduced ejection fraction (HFrEF).
Purpose: The aim of this part of a traslational Eicosanoids in Human Heart Failure Study was to investigate levels of eicosanoids in different body compartments and their relation to natriuretic peptides.
Methods: Eleven consecutive patients with HFrEF indicated to cardiac resynchronisation therapy (CRT) were enrolled to measure plasmatic 14,15-epoxyeicosatrienoic acid (14,15-EET) and 14,15-dihydroxyicosatrienoic acid (14,15-DHET) levels from venous, arterial, and coronary sinus (CS) blood samples and correlate them with N-terminal pro B-type natriuretic peptide (NT-proBNP) from the same compartments.
Results: In CS, NT-proBNP levels negatively correlated with plasmatic 14,15-EET levels (r = –0.63, p = 0.03) and positively with the DHET/EET ratio (r = 0.73, p = 0.02). This correlation was not found in the other compartments. Plasmatic 14,15-EET nor 14,15-DHET levels in measured compartments did not differ statistically (p = 0.21, p = 0,64, respectively). In individual patients, the levels of both eicosanoids correlated across all compartments. Peripheral plasma 14,15-EET levels in controls were lower compared to HF patients.
Conclusion: Peripheral venous eicosanoid (14,15-EET, 14,15-DHET) levels correlate and do not differ from arterial and CS levels in patients with HFrEF indicated to CRT. In CS, NT-proBNP levels negatively correlated with plasmatic 14,15-EET levels and positively with the DHET/EET ratio, an indirect soluble epoxide hydrolase activity parameter.

DIAGNOSTIC PERFORMANCE OF AI-QCTISCHEMIA FOR ABNORMAL FFR ACROSS VARIOUS PLAQUE TYPES AND BURDENS

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Topic: Hypertension, atherosclerosis

Aim: Quantitative evaluation of coronary plaque and vascular morphology using coronary CT angiography (CCTA), enhanced by artificial intelligence (AI-QCTISCHEMIA), offers reliable estimates of ischemia at the vessel level. This study assesses its diagnostic performance against abnormal invasive fractional flow reserve (FFR), focusing on calcified plaque burden and total plaque burden, indicated by percent atheroma volume (PAV).
Methods: Symptomatic patients in the CREDENCE (n = 305) and PACIFIC-1 (n = 208) studies underwent CCTA, myocardial perfusion imaging (MPI; SPECT/PET), FFR-CT, and invasive coronary angiography with unbiased 3-vessel invasive FFR as reference standard. The performance of non-invasive tests was compared at the vessel level across tertiles of calcified plaque volume, non-calcified plaque volume, and PAV on an intention-to-diagnose basis (uninterpretable results were deemed abnormal).
Results: In the CREDENCE study, AI-QCTISCHEMIA achieved AUC ROC values of 0.887, 0.850, and 0.816 to predict ischemia by FFR across calcified plaque tertiles 1 to 3. For non-calcified plaque burden, the AUC ROC values were 0.848, 0.790, and 0.890, while for PAV, the values were 0.863, 0.814, and 0.815, across all tertiles. In the PACIFIC-1 study, AI-QCTISCHEMIA achieved AUC ROC values of 0.811, 0.860, and 0.817 across the calcified plaque tertiles.
Conclusion: AI-QCTISCHEMIA shows strong diagnostic performance for invasive FFR across various plaque characteristics and burdens.

INNATE IMMUNITY AND DOXORUBICIN-CARDIOMYOPATHY

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Topic: Pharmacotherapy

Rationale: Cytokines such as TNFα have been implicated in cardiac dysfunction and toxicity associated with doxorubicin (DOX). While TNFα can elicit different cellular responses including survival or death, the mechanisms underlying these divergent outcomes in the heart remain cryptic. The E3 ubiquitin ligase TRAF2 provides a critical signaling platform for K63-linked ubiquitination of RIPK1, crucial for NF-kB activation by TNFα. Whether alterations in TNFα-TRAF2 signaling underlie the cardiotoxic effects of DOX, remains poorly understood.
Objective: To investigate TRAF2 signaling in the pathogenesis of DOX cardiotoxicity.
Methods: Using a combination of in vivo (4 weekly injections of DOX [5 mg/kg/week] in cardiac-myocyte restricted expression of AAV9-GFP and AAV9-TRAF2 mice [C57/BL6J]) and in vitro approaches (rat, mouse and human iPSCs derived cardiac myocytes), we monitored TNFα levels, LDH, cardiac ultrastructure and function, mitochondrial bioenergetics and cardiac cell viability.
Results: In contrast to vehicle treated mice, severe ultrastructural defects including cytoplasmic swelling, mitochondrial perturbations, and elevated TNFa levels were observed in the hearts of mice treated with DOX. While investigating the involvement of TNFa in DOX cardiotoxicity, we discovered that in the absence of DOX, NF-kB was readily activated by TNFa. However, TNFα-mediated NF-kB activation was impaired in cardiac myocytes treat-

ed with DOX. This coincided with loss of K63-linked polyubiquitination of RIPK1, attributed to the proteasomal degradation of TRAF2. Further, TRAF2 protein expression was markedly reduced in hearts of cancer patients treated with DOX. Impaired TRAF2 signaling resulted in the activation of Bnip3 and mitochondrial perturbations, including disrupted bioenergetics, loss of membrane potential and permeability transition pore opening. We further established that the reciprocal actions of the ubiquitinating and de-ubiquitinating enzymes c-IAP1 and USP19 respectively regulated the proteasomal degradation of TRAF2 in DOX treated cardiac myocytes. Importantly, an E3 ligase mutant of c-IAP1(c-IAP1 H588A) or gain of function of USP19, prevented proteasomal degradation of TRAF2 and DOX-induced cell death. Further, wild type TRAF2 but not a RING finger mutant defective for K63 ubiquitination of RIPK1, restored NF-kB signaling and suppressed DOX-induced cardiac cell death. Finally, cardiomyocyte-restricted expression of TRAF2 (AAV9-TRAF2) in vivo protected against mitochondrial defects and cardiac dysfunction induced by DOX.
Conclusions: Our findings reveal a novel signaling axis that functionally connects the cardiotoxic effects of DOX to proteasomal degradation of TRAF2. Disruption of the critical TRAF2 survival pathway by DOX, sensitized cardiac myocytes to TNFa mediated necrotic cell death.

THE ACCURACY OF DETAILED ANALYSIS OF OPTICAL COHERENCE TOMOGRAPHY IN DETECTION OF PLAQUE LIPID CONTENT: DUAL-IMAGING STUDY WITH OPTICAL COHERENCE TOMOGRAPHY AND NEAR-INFRARED SPECTROSCOPY

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Topic: Interventional cardiology

Aim: Lipid-rich plaque covered by a thin fibrous cap (FC) has been identified as a frequent morphological substrate for the development of acute coronary syndrome. Optical coherence tomography (OCT) permits the identification and measurement of the FC. Near-infrared spectroscopy (NIRS) has been approved for detection of coronary lipids. We aimed to assess the ability of detailed OCT analysis to identify coronary lipids, using NIRS as the reference method.
Sample and methodology: In total, 40 patients with acute coronary syndrome underwent imaging of a non-culprit lesion by both NIRS and OCT. For each segment, the NIRS-derived 4 mm segment with maximal lipid core burden index (maxLCBI4mm) was assessed. OCT analysis was performed using a semi-automated method including measurement of the fibrous cap thickness (FCT) of all detected fibroatheromas. Subsequent quantitative volumetric evaluation furnished FCT, FC surface area (FC SA), lipid arc, and FC (fibrous cap) volume data. OCT features of lipid plaques were compared with maxLCBI4mm. Predictors of maxLCBI4mm > 400 was assessed by using univariable and multivariable analysis.
Results: OCT features (mean FCT, total FC SA, FC volume, maximal, mean, and total lipid arcs) strongly correlated with the maxLCBI4mm (p = 0.012 for the mean FCT, respectively p 400 were the maximal (p = 0.002) and mean (p = 0.002) lipid arc, and total FC SA (p =0.012).
Conclusion: We found a strong correlation between the OCT-derived features and NIRS findings. Detailed OCT analysis may be reliably used for detection of the presence of coronary lipids.

THE IMPORTANCE OF SEX DIFFERENCES IN LEFT VENTRICULAR REMODELING FOR RISK STRATIFICATION OF PATIENTS WITH AORTIC REGURGITATION

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Topic: Valvular disorders

Background: Left ventricular (LV) dilatation is an established prognosticator in aortic regurgitation (AR). Current guidelines recommend using LV end-systolic diameter index (LVESDi) to assess the need for aortic valve surgery (AVS), applying the same threshold of 25 mm/m^2 regardless of sex. However, LV volumes have been suggested to better depict LV remodeling in AR.
Purpose: To assess sex differences in LV remodeling using linear and volumetric measurements in patients with moderate–severe AR and their association with outcomes.
Methods: 1070 patients (56 ± 18 years, 691 men) with moderate-severe AR were included. The primary outcome was all-cause mortality.
Results: Women were older (58 ± 19 vs. 55 ± 17, p = 0.023) and had more advanced HF symptoms than men (NYHA class III–IV 12% vs. 9%, p = 0.017).Men showed larger LVESDi (21 ± 5 vs. 20 ± 5 mm/m^2, p = 0.013) and LV end-systolic volume index (LVESVi 37 ± 28 vs. 26 ± 17 ml/m^2, p < 0.001).
During a median follow-up of 89 (IQR, 54–132) months 168 patients died. Women had lower survival rates at 10 years compared to men (75.3% vs. 84.1%, p = 0.005) (**Fig. 1A**). However, sex mortality difference was no longer significant when patients were treated surgically (p = 0.705) (**Fig. 1B**). Spline curve analysis revealed that the LVESDi threshold associated with an increased risk of mortality was 20 mm/m^2 for both sexes (**Fig. 2**). The LVESVi threshold was 40 ml/m^2 for women and 45 ml/m^2 for men (**Fig. 2**). LV dilatation defined by these cut-offs remained in-

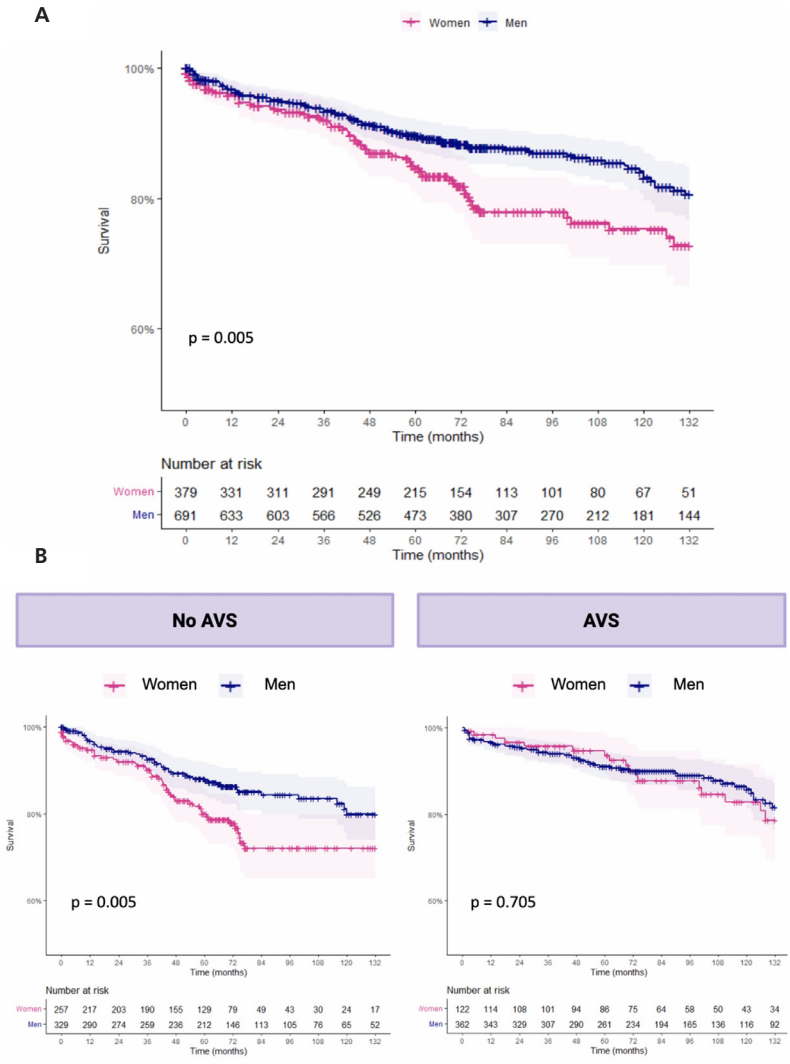

Figure 1. A. Kaplan-Meier curves for all-cause mortality according to sex; **B**. Kaplan-Meier curves for all-cause mortality according to sex and AVS.

	A. Multivariate Cox Regression				B. Likelihood Ratio
	Model 1: LVESDi HR (95% CI)	P-value	Model 2: LVESVi HR (95% CI)	P-value	
Women					
Age	1.043 (1.024-1.063)	**<0.001**	1.045 (1.025-1.065)	**<0.001**	
NYHA Class III-IV	2.137 (1.228-3.720)	**0.007**	2.017 (1.124-3.618)	**0.019**	
AVS*	0.483 (0.255-0.913)	**0.025**	0.422 (0.212-0.839)	**0.014**	
LVEF <55%	1.695 (1.034-2.785)	**0.007**	1.809 (1.065-3.071)	**0.028**	
LVESDi >20 mm/m²	1.710 (1.003-2.916)	**0.006**			
LVESVi >40 ml/m²			1.968 (1.119-3.463)	**0.019**	
Men					
Age	1.064 (1.045-1.084)	**<0.001**	1.066 (1.047-1.086)	**<0.001**	
NYHA Class III-IV	1.876 (1.117-3.152)	**0.017**	1.767 (1.048-2.979)	**0.033**	
AVS*	0.391 (0.238-0.642)	**<0.001**	0.373 (0.226-0.616)	**<0.001**	
LVEF <55%	2.041 (1.232-3.379)	**<0.001**	1.871 (1.097-3.191)	**0.021**	
LAVI ml/m² (per 5 ml increase)	1.029 (1.001-1.058)	**0.042**	1.029 (1.001-1.058)	**0.044**	
LVESDi >20 mm/m²	1.638 (1.015-2.643)	**0.043**			
LVESVi > 45 ml/m²			1.775 (1.076-2.928)	**0.025**	

Table 1. Multivariate Cox regression analysis for all-cause mortality for men and women **(A)**. Likelihood ratio: the presence of volumetric LV dilatation (Model 2) demonstrates a higher incremental prognostic value compared to LVESDi >20 mm/m² (Model 1) when added to a basal model for women, which included age, NYHA Class III-IV, LVEF <55%, and AVS*, and basal model for men, which included age, LVEF <55%, AVS*, and LAVI **(B)**.

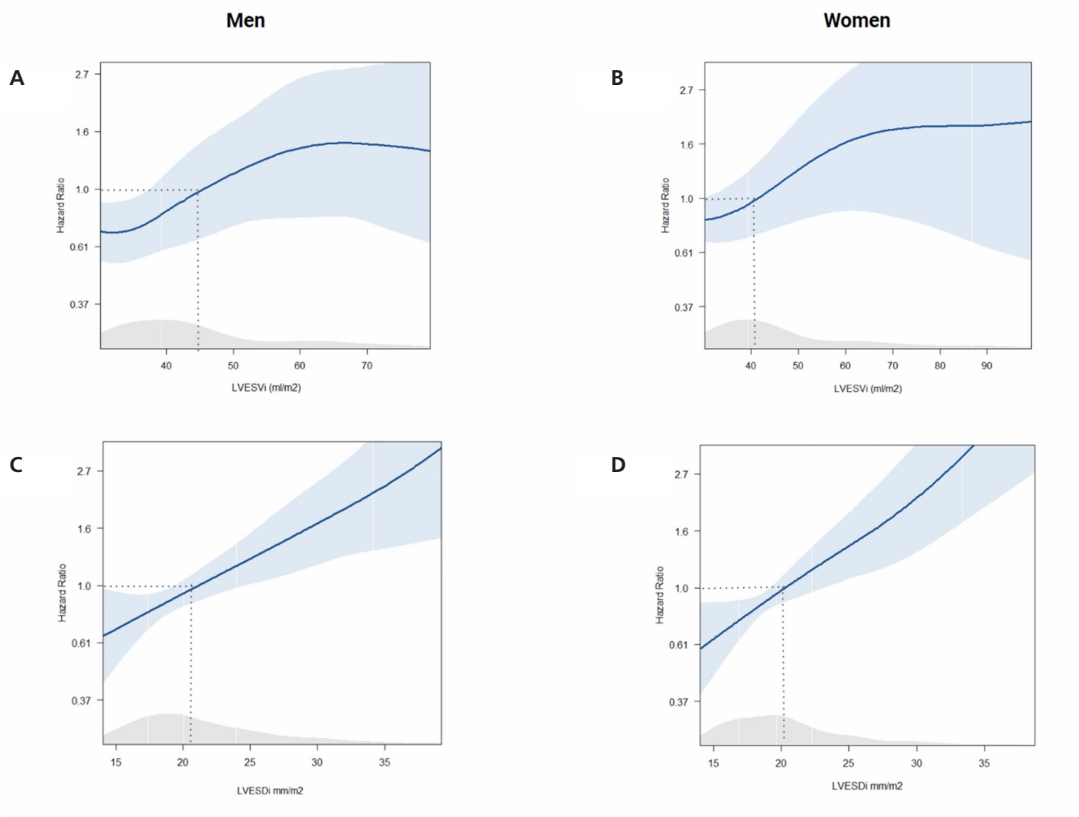

Figure 2. Penalized spline curves for all-cause mortality according to LVESVi and LVESDi values. The spline curve illustrates the HR change for the primary endpoint with 95% CIs (shaded blue areas). A: LVESVi spline curve for men adjusted for age; B: LVESVi spline curve for women adjusted for age; C: LVESDi spline curve for men adjusted for age; D: LVESDi spline curve for women adjusted for age.
LVESVi, left ventricular end-systolic volume index.

dependently associated with mortality after adjusting for clinical and echocardiographic variables (**Table 1A**).
Conclusion: In moderate-severe AR, similar LVSEDi thresholds (20 mm/m^2) for both sexes, but lower than currently recommended by guidelines, were associated with mortality. For LVESVi, lower thresholds for women compared to men (40 ml/m^2 vs. 45 ml/m^2) were associated with a worse survival.

INHERITED LONG QT SYNDROME – RECENT ADVANCES

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Topic: Heart rhythm disorders

Long QT syndrome (LQTS) is one of the inherited arrhythmic conditions, where affected individuals may be asymptomatic or may present with syncope or sudden cardiac death. Since the original descriptions in 1957 by Jervell and Lange-Nielsen and in 1964 by Romano and Ward, our understanding of the pathophysiology of the condition and myocardial channel dysfunction has greatly increased. Molecular investigations have revealed that there are multiple sub-types, with LQT1, LQT2, and LQT3 being the most common. Accurate measurement of the QT interval may be difficult in certain circumstances, and various formulae for correction based on heart rate have been widely used. Interpretation of the QT interval in competitive athletes may be particularly challenging. Genetic testing, where available, and cascade screening, where appropriate, have become accepted as standard practice. Risk stratification models are well established but also have limitations. There is now a strong evidence base for the use of beta-blocker therapy, with additional interventions, such as left cardiac sympathetic denervation and implantable cardiac devices, being recommended for selected high-risk individuals. Novel genetic approaches, such as siRNA technology, are being explored in cellular models. Of interest, clinical trials using drugs which have been licensed for other channelopathies, are currently underway and may result in the identification of novel therapeutic options.
Aim: Long QT syndrome (LQTS) is one of the inherited arrhythmic conditions, where affected individuals may be asymptomatic or may present with syncope or sudden cardiac death. Since the original descriptions in 1957 by Jervell and Lange-Nielsen and in 1964 by Romano and Ward, our understanding of the pathophysiology of the

condition and myocardial channel dysfunction has greatly increased.
Methodology: Molecular investigations have revealed that there are multiple sub-types, with LQT1, LQT2, and LQT3 being the most common. Accurate measurement of the QT interval may be difficult in certain circumstances, and various formulae for correction based on heart rate have been widely used. Interpretation of the QT interval in competitive athletes may be particularly challenging.
Results: Genetic testing, where available, and cascade screening, where appropriate, have become accepted as standard practice. Risk stratification models are well established but also have limitations. There is now a strong evidence base for the use of beta-blocker therapy, with additional interventions, such as left cardiac sympathetic denervation and implantable cardiac devices, being recommended for selected high-risk individuals. Novel genetic approaches, such as siRNA technology, are being explored in cellular models.
Conclusion: Of interest, clinical trials using drugs which have been licensed for other channelopathies, are currently underway and may result in the identification of novel therapeutic options.

AN ASSOCIATION OF BIOMARKERS OF CARDIAC REMODELING, MYOCARDIAL FIBROSIS, AND INFLAMMATION WITH THE PARAMETERS OF HEART FUNCTION AND STRUCTURE IN THE PATIENTS WITH ARTERIAL HYPERTENSION

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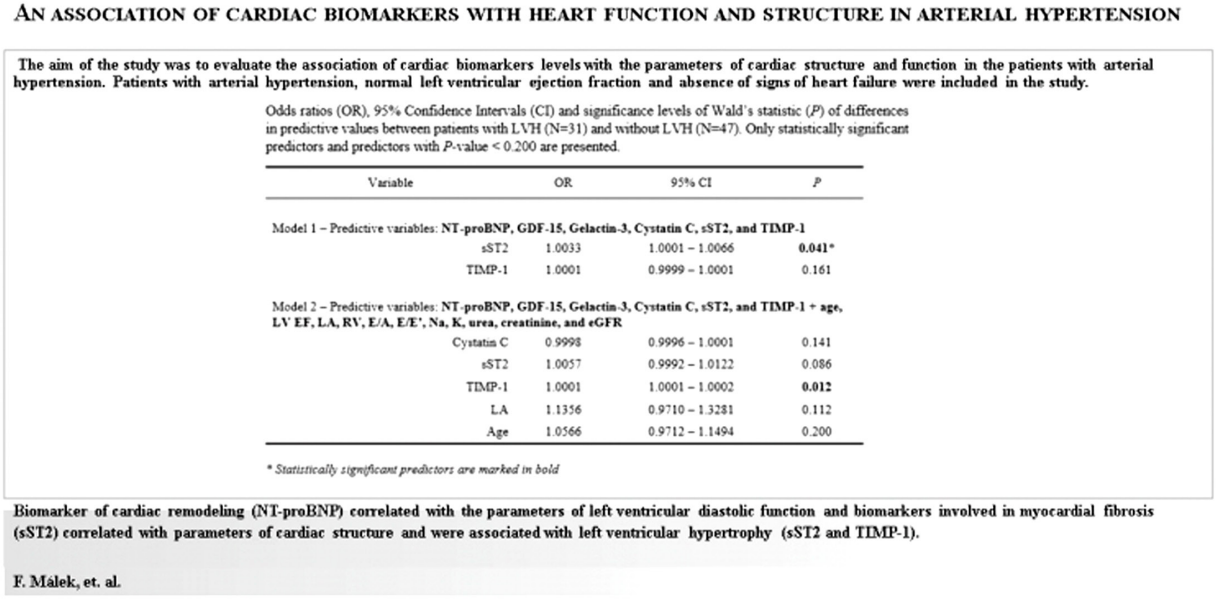
Topic: Hypertension, atherosclerosis

Backround: An early evaluation of the cardiac remodeling may be usefull in the prediction of heart failure development in the patients with arterial hypertension.
Study objective: To evalute the association of cardiac biomarkers levels with the parameters of cardiac structure and function in the patients with arterial hypertension.
Patients and methods: Patients with arterial hypertension with normal left ventricular ejection fraction (LV EF) and absence of signs of heart failure were included in the study. The levels of biomarkers: NT-proBNP, sST2, Galectin-3, GDF-15, Cystatin C, TIMP-1 and ceruloplasmin were measured and assessed together with other biochemical and echocardiographic parameters.
Results: Total number of 92 patients (61 % men) with mean age 61.5 years were included in the study. Mean LV EF was 64.7 % and mean LV mass index was 91.7 g/m^2. NT-proBNP level correlated significantly with the parameters of LV diastolic function: velocity of E wave ($r = 0.377$, $p < 0.002$), and with E/A ratio, ($r = 0.455$, $p < 0.0001$), with E lat ($r = –0.354$, $p = 0.006$), E/E´ ratio, $r = 0.393$, $p < 0.002$, with ePAP ($r = 0.390$, $p = 0.014$), and with age ($r = 0,384$, $p < 0.0001$).
In comparison of patients with and without left ventricular hypertrophy, statistically significant differences were found only in LA ($p < 0.0001$) and sST2 ($p = 0.004$).
In a multivariate logistic regression, sST2 and TIMP were independent predictors of left ventricular hypertrophy.
Conclusion: NT-proBNP level as a biomarker of cardiac remodeling correlates in the patients with arterial hypertension with the parameters of LV diastolic function. Soluble ST2 correlates with parameters of cardiac structure. Biomarkers sST2 and TIMP-1 are associated with left ventricular hypertrophy.



AN ASSOCIATION OF CARDIAC BIOMARKERS WITH HEART FUNCTION AND STRUCTURE IN ARTERIAL HYPERTENSION

The aim of the study was to evaluate the association of cardiac biomarkers levels with the parameters of cardiac structure and function in the patients with arterial hypertension. Patients with arterial hypertension, normal left ventricular ejection fraction and absence of signs of heart failure were included in the study.

Odds ratios (OR), 95% Confidence Intervals (CI) and significance levels of Wald's statistic (*P*) of differences in predictive values between patients with LVH (N=31) and without LVH (N=47). Only statistically significant predictors and predictors with *P*-value < 0.200 are presented.

Variable	OR	95% CI	*P*
Model 1 – Predictive variables: **NT-proBNP, GDF-15, Galactin-3, Cystatin C, sST2, and TIMP-1**			
sST2	1.0033	1.0001 – 1.0066	**0.041***
TIMP-1	1.0001	0.9999 – 1.0001	0.161
Model 2 – Predictive variables: **NT-proBNP, GDF-15, Galactin-3, Cystatin C, sST2, and TIMP-1 + age, LV EF, LA, RV, E/A, E/E', Na, K, urea, creatinine, and eGFR**			
Cystatin C	0.9998	0.9996 – 1.0001	0.141
sST2	1.0057	0.9992 – 1.0122	0.086
TIMP-1	1.0001	1.0001 – 1.0002	**0.012**
LA	1.1356	0.9710 – 1.3281	0.112
Age	1.0566	0.9712 – 1.1494	0.200

** Statistically significant predictors are marked in bold*

Biomarker of cardiac remodeling (NT-proBNP) correlated with the parameters of left ventricular diastolic function and biomarkers involved in myocardial fibrosis (sST2) correlated with parameters of cardiac structure and were associated with left ventricular hypertrophy (sST2 and TIMP-1).

F. Málek, et. al.

ACETYLSALICYLIC ACID USE AND DEVELOPMENT OF CARDIAC ALLOGRAFT VASCULOPATHY: A NATIONAL PROSPECTIVE STUDY USING HIGHLY AUTOMATED 3-D OPTICAL COHERENCE TOMOGRAPHY ANALYSIS

Mayerová L[1], Wohlfahrt P[2], Sonka M[3], Chen Z[3], Kautzner J[1], Melenovský V[1], Karmazín V[1], Málek I[1], Bedáňová H[4], Tomášek A[4], Ozábalová E[5], Krejčí J[5], Kovárník T[6], Pazderník M[1]

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Topic: Heart failure

Aim: There is conflicting evidence on the role of acetylsalicylic acid (ASA) use in the development of cardiac allograft vasculopathy (CAV).
Methodology: A nationwide prospective two-center study investigated changes in the coronary artery vasculature by highly automated 3-D optical coherence tomography (OCT) analysis at 1 month and 12 months after heart transplant (HTx). The influence of ASA use on coronary artery microvascular changes was analyzed in the overall study cohort and after propensity score matching for selected clinical CAV risk factors.
Results: In total, 175 patients (mean age 52 ± 12 years, 79% males) were recruited. During the 1-year follow-up, both intimal and media thickness progressed, with ASA having no effect on its progression. However, detailed OCT analysis revealed that ASA use was associated with a lower increase in lipid plaque (LP) burden (p = 0.013), while it did not affect the other observed pathologies. Propensity score matching of 120 patients (60 patient pairs) showed similar results, with ASA use associated with lower progression of LPs (p = 0.002),while having no impact on layered fibrotic plaque (p = 0.224), calcification (p = 0.231), macrophage infiltration (p = 0.197), or the absolute coronary artery risk score (p = 0.277). According to Kaplan–Meier analysis, ASA use was not associated with a significant difference in survival (p = 0.699).
Conclusion: This study showed a benefit of early ASA use after HTx on lipid plaque progression. However, ASA use did not have any impact on the progression of other OCT-observed pathologies or long-term survival.

INFLAMMATORY PATHWAYS ARE INVOLVED IN THE DEVELOPMENT OF PULMONARY VASCULOPATHY IN HEART FAILURE: TRANSPULMONARY PROTEOMICS STUDY

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Topic: Heart failure

Background: Some, but not all patients with heart failure (HF) develop pulmonary vascular disease (PVD), which contributes to poor prognosis. Mechanisms leading to PVD in HF are poorly understood. Analysis of transpulmonary gradients may identify mediators of PVD that are consumed or elaborated across the lung vascular bed.
Methods: 21 non-HF controls and 160 patients with advanced HFrEF underwent pulmonary artery (PA) catheterization with blood sampling from the PA catheter in the wedged (02sat > 90%) or un-wedged position to obtain transpulmonary gradients. Samples from controls and HF from the highest quartile (Q4, n = 40) and lowest quartile (Q1, n = 40) of pulmonary vascular resistance (PVR) were analyzed using PEA assay of 275 proteins (Olink Target 96, panels CVII, CVIII, Inflammation). PA transpulmonary fold-change gradients were plotted against significance (Vulcan plots).
Results: Patients (age 56 ± 8 y, NYHA 3.0 ± 0.6, 87% males, LVEF 24 ± 9.6%) and controls had similar anthropometrics, gender and age. HF patients in Q1 had median PVR 1.5 (IQR: 0.3–1.7) WU and those in Q4 had PVR 5.4 (4.3–6.6) WU. Protein gradients from HF lungs showed significant uptake of 14 mediators, most of which were associated with inflammatory responses (top 5: OSM, MMP9, CCL19, BNP, TR), and release of 8 mediators (top 4: IL-6, IL-33, CCL4, CXCL10). Protein gradients were negligible in controls. Patients in Q4 PVR group were characterized by the highest pulmonary uptake of OSM (Oncostatin-M), CCL19, BNP, MMP9, and significant transpulmonary release of IL-6 and IL-33.
Conclusions: Lungs of patients with HF, and particularly those with high PVR, display abnormal release of pro-inflammatory chemokines IL-6 and IL-33, along with increased pulmonary uptake of Oncostatin-M, known mediator of lung inflammation/fibrosis, suggesting a novel role in PVD due to HF.

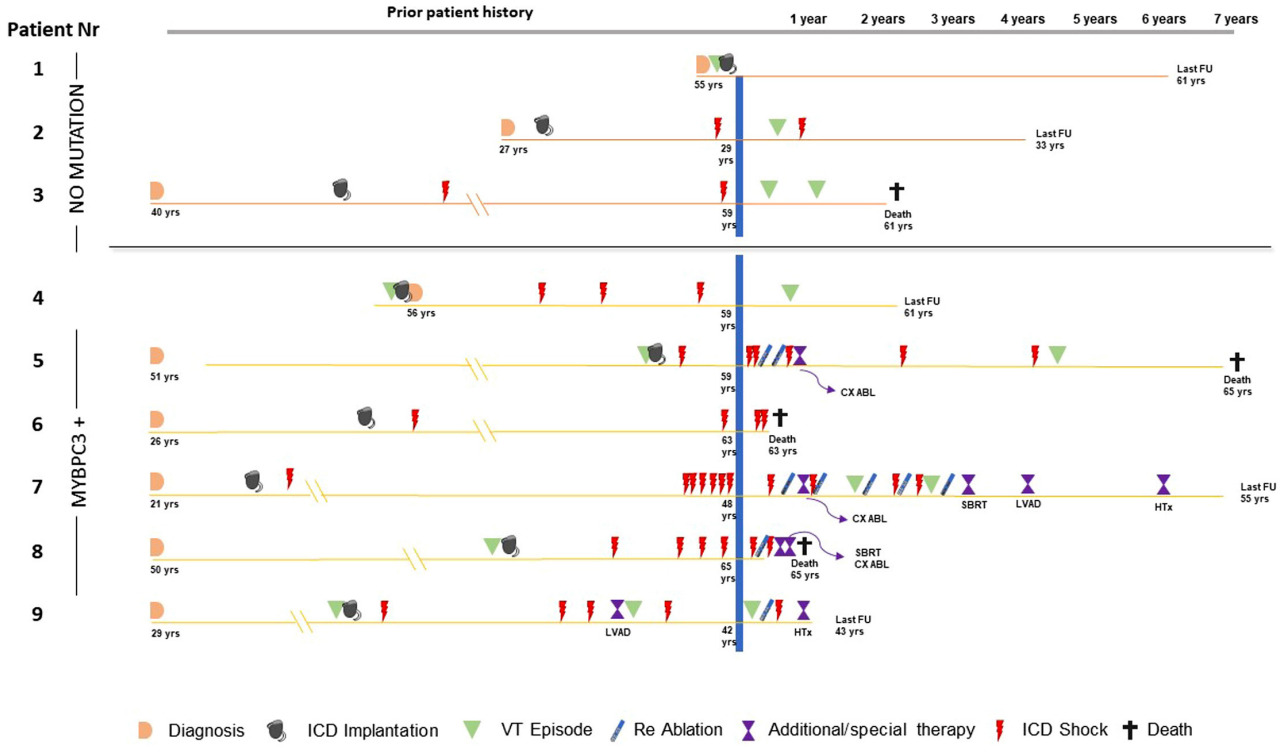

Fig. 1 – The disease course in the patient series.

GENOTYPE, PHENOTYPE AND OUTCOMES OF PATIENTS WITH HYPERTROPHIC CARDIOMYOPATHY REFERRED FOR ABLATION OF VENTRICULAR TACHYCARDIA

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Topic: Heart rhythm disorders

Background: Sustained monomorphic ventricular tachycardia (SMVT) is the most common ventricular arrhythmia (VA) subtype in hypertrophic cardiomyopathy (HCM) patients with ICD. Data on catheter ablation is limited, focusing on non-genotyped patients with mild hypertrophy or apical aneurysms.
Purpose: This study describes the genotype, phenotype, and outcomes of consecutive HCM patients referred for CA ablation of refractory SMVT.
Methods and results: Among 976 patients referred for SMVT ablation between 01/2016 and 10/2023, nine had an HCM phenotype. Most (8/9) exhibited dominant septal hypertrophy; none had LV outflow tract obstruction, and only one had an apical aneurysm. The median max wall thickness was 25 mm, and the median LVEF was 34%. Six patients had a class IV/V variant in the myosin-binding protein C (*MYBPC3*) gene, while no disease-causing variant was identified in three. All *MYBPC3* mutation carriers presented with electrical storm/incessant VT refractory to antiarrhythmic drugs (AAD), including amiodarone. Four of these patients required multiple ablations and additional interventions like transcoronary alcohol-ablation, surgical resection, and radiotherapy. After a median follow-up of 25 months, all *MYBPC3* variant carriers experienced VT recurrence; three died, and one underwent heart transplantation. In contrast, patients without class IV/V variants had better outcomes, with only one VT recurrence and one death 24 months post-CA.
Figure 1 shows the disease course in the patient series.
Conclusions: Only 1% of patients referred for SMVT ablation at a high-volume center had an HCM phenotype. A *MYBPC3* variant was found in 67%, with 89% having severe hypertrophy. VT-free survival is particularly poor in *MYBPC3* variant carriers, underscoring the need for early advanced heart failure management, including consideration of heart transplantation.

RENAL DENERVATION IMPROVES RIGHT VENTRICULAR FUNCTION, RESTORES NOREPINEPHRINE LEVELS, AND REVERSES VENTRICULAR SPECIFICITY OF SELECTED MARKERS IN HYPERTENSIVE RATS WITH HEART FAILURE INDUCED BY VOLUME OVERLOAD

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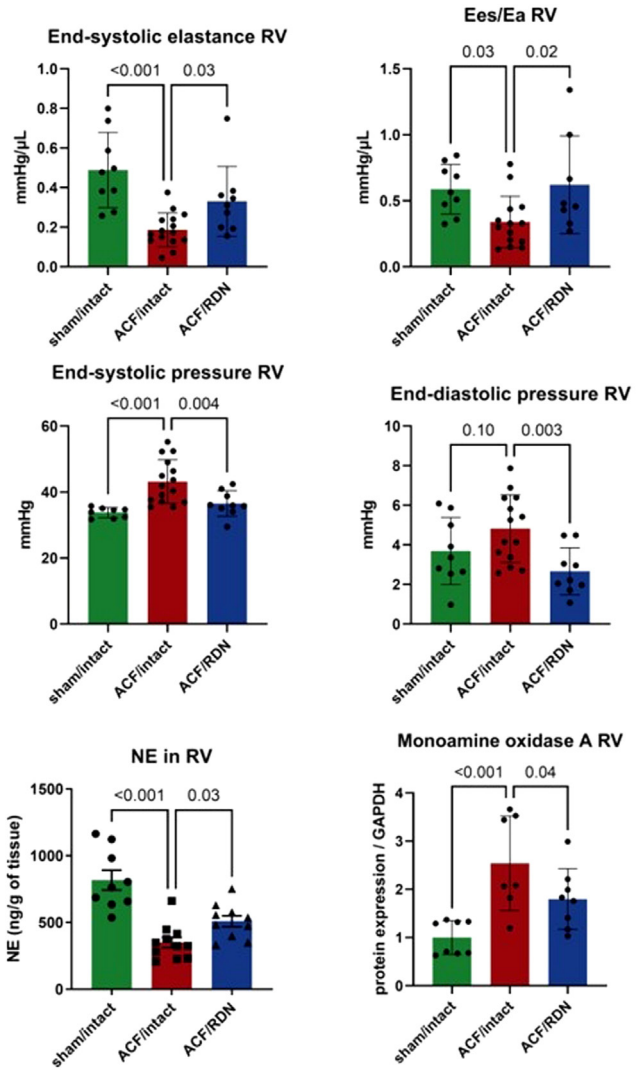
Topic: Heart failure

Aim: Despite the known antihypertensive effect of renal denervation (RDN), its influence on the cardiac function, particularly of right ventricle (RV) and cardiac sympathetic nervous system in heart failure (HF) is poorly understood. This study aimed to investigate the effect of RDN on RV function, myocardial norepinephrine (NE), and left versus right ventricular (LV/RV) dominance of HF markers in HF induced by aorto-caval fistula in rats (ACF).

Sample and methodology: ACF was created in hypertensive Ren-2 transgenic rats. RDN was performed by phenol application. RV and LV function was measured by echocardiography and pressure-volume analysis. NE levels were measured using an ELISA kit, protein expression by western blotting, gene expression by TaqMan PCR, RNA-seq by NovaSeq and ROS by Amplex Red assay.

Results: RDN in ACF rats decreased RV hypertrophy and dilatation, RV end-systolic (ESP) and end-diastolic pressure (EDP), improved RV systolic function, decreased HF gene markers Nppa, Collagen I/III ratio, Tgm2, Myh7/6 ratio, and increased SOD2 protein expression. RDN decreased plasmatic NE, increased NE in RV, and decreased monoamine oxidase (MAO-A) in RV. RDN downregulated most of profibrotic transcripts which ACF upregulated. ACF changed ventricular specificity from LV to RV in Ees, EDPVR, and molecular markers MAO-A, ROS production by MAO-A, Nppa, Myh7, Myh7/6 ratio, Tgm2, Uchl1, and Beta1/Chrm2 ratio. Interestingly, RDN reversed ventricular specificity back towards LV in gene markers Mao-a, Nppa, Myh7, Tgm2, Uchl1, and Beta1/Chrm2 ratio.

Conclusion: RDN decreased RV ESP and EDP, improved RV systolic function, restored NE levels, decreased expression of MAO-A, decreased RV gene expression of selected HF markers, and reversed their RV/LV dominance, probably by reduction of central sympathetic nerve drive and alternations of the cardiac sympathetic nervous system.



CLINICAL CHARACTERISTICS AND LONG-TERM SURVIVAL OF CHRONIC THROMBOEMBOLIC PULMONARY HYPERTENSION (CTEPH) PATIENTS TREATED WITH MULTIMODAL THERAPY – DATA FROM NATIONWIDE DATABASE

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Topic: Pulmonary hypertension

Introduction: CTEPH is a rare complication of acute pulmonary embolism. Management of CTEPH has significant-

ly changed and is now multimodal with an individualized combination of pulmonary endarterectomy (PEA), balloon pulmonary angioplasty (BPA), and medical therapy.
Aim: We report clinical characteristics and survival of all adult CTEPH patients diagnosed between 2017–2022 in the Czech Republic.
Methodology: All newly diagnosed CTEPH patients have been treated based on a multidisciplinary team discussion. Survival from diagnosis was calculated using Kaplan–Meier estimates. Data have been descriptively compared with the historical CTEPH cohort (patients diagnosed between 2003 and 2016 when the main treatment option was limited to surgery).
Results: Characteristics of patients (N = 321) at diagnosis when compared with the historical cohort were: median age of 66.9 vs 65.2 years, 53% vs 55% male, NYHA functional class III–IV 80% vs 92%, median 6-minute walk distance 404 vs 336 m, median time from 1st pulmonary embolism to CTEPH diagnosis 1 vs 2.2 years. Median time from diagnosis to the last follow-up was 2.4 years. 114 (36%) patients benefitted from PEA. At least one session of BPA was performed in 94 not operated patients, in 60 patients in combination with medical therapy. Prevalence of comorbidities was: cancer 11.6 % diabetes 20.9%, COPD 21.6%, sleep apnoea 19.7%, arterial hypertension 66.9%, atrial fibrillation 17.8 %, atrial flutter 6.2 %, ischemic heart disease 17.2 %. The 3-year survival was 80% for overall, 88% for operated, 75% for not operated.
Conclusion: These data indicate a shortening of time to CTEPH diagnosis and a high prevalence of comorbidities affecting mainly the survival of not operated patients in the CTEPH multimodal therapy era.

PRETREATMENT WITH DUAL ANTIPLATELET THERAPY IN ACUTE MYOCARDIAL INFARCTION

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Topic: Acute conditions in cardiology

Background: Combined antithrombotic therapy prevents thrombus progression and its components embolization, and thus, it has an essential role in coronary microcirculation (re)perfusion in acute myocardial infarction (AMI). Pretreatment with $P2Y_{12}$ inhibitors, on top of aspirin, before primary angioplasty, has not been satisfactorily studied in STEMI.
Purpose: To investigate the impact of combined antiplatelet therapy on-treatment on the outcome of patients with STEMI.
Methods: Patients who suffered STEMI during the 7 years (1/2016–12/2022) were included. The analysis is based on population data from the National Health Information System (NHIS). Information on AMIs from the Intervention Module of the Registry of Cardiovascular Operations and Interventions was combined with prescription data from the Registry of Reimbursed Health Services 6 months before MI and identification of deceased patients from the Registry of Death Records. Data from the NHIS covers almost 100% of all cases in the population. Standard descriptive statistics and test were applied in the analysis. Multivariate logistic regression adjusted for clinical and procedural characteristics was adopted to analyze the influence of pretreatment on the risk of 1) out-of-hospital cardiac arrest (OHCA), 2) clinical condition at admission – need of mechanical ventilation and circulatory instability (Killip III, IV), 3) initial TIMI flow through the infarct-related coronary artery (IRA), and 4) short term mortality.
Results: The study sample consisted of data from 40,383 STEMIs of which 1,601 patients were on dual antiplatelet therapy (DAPT) with aspirin plus $iP2Y_{12}$ lasting 1 to 6 months before the event occurred. Patients on chronic oral anticoagulation (N 2101) were excluded. Patients on DAPT versus those without antiplatelet therapy or on aspirin at a daily dose of 100 mg were older, had higher comorbidity rates, and were at higher risk of mortality.
The multivariate logistic regression analysis showed that patients on DAPT at the time of MI onset and lasting for at least one month had a higher likelihood of preserved perfusion through the IRA (odds ratio [OR] and 95% confidence interval [95% CI] 1.193 [1.074–1.326], p = 0.001). However, the DAPT pretreatment did not reduce the risk of OHCA, the need for mechanical ventilation, or initial circulatory destabilization. It did not positively affect the patients' prognosis.
Conclusion: The significant benefit of the DAPT pretreatment on the preservation of infarct-related coronary artery flow did not translate into a positive effect on the prognosis of STEMI patients.

Characteristics		Total	Non-Aortic stenosis	Aortic stenosis	p
		N = 4 414	N = 4 334	N = 80	
Men		3 293 (74.6%)	3 205 (74.9%)	57 (71.3%)	*0.44*
Age	<50	574 (13.0%)	569 (13.3%)	1 (1.3%)	***<0.01***
	50–59	858 (19.4%)	850 (19.9%)	6 (7.5%)	***<0.01***
	60–69	1 352 (30.6%)	1 332 (31.1%)	13 (16.3%)	***<0.01***
	70–79	1 145 (25.9%)	1 074 (25.1%)	41 (51.3%)	***<0.01***
	≥ 80	485 (11.0%)	455 (10.6%)	19 (23.8%)	***<0.01***
Chronic obstructive pulmonary disease		601 (13.6%)	574 (13.4%)	17 (21.3%)	***0.05***
Diabetes mellitus		860 (19.5%)	823 (19.2%)	23 (28.8%)	***0.04***
Hypertension		3 266 (74.0%)	3 139 (73.3%)	77 (96.3%)	***<0.01***
Heart failure		1 619 (36.7%)	1 522 (35.6%)	59 (73.8%)	***<0.01***
Coronary artery disease		3 853 (87.3%)	3 725 (87.0%)	75 (93.8%)	*0.09*
Atrial fibrillation		536 (12.1%)	490 (11.4%)	24 (30.0%)	***<0.01***
Dyslipidemia		3 576 (81.0%)	3 460 (80.8%)	70 (87.5%)	*0.15*
Mortality 7 days		1 089 (24.7%)	1 039 (24.3%)	35 (43.8%)	***<0.01***
Mortality 30 days		1 432 (32.4%)	1 368 (32.0%)	45 (56.3%)	***<0.01***
Mortality 365 days		1 796 (40.7%)	1 714 (40.0%)	57 (71.3%)	***<0.01***

Table 1 – Comparison of patients with out-of-hospital cardiac arrest due to AMI in 2017–2021 according to pre-existing left-sided significant aortic stenosis

THE OUT-OF-HOSPITAL CARDIAC ARREST IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION AND PRE-EXISTING AORTIC STENOSIS

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Topic: Acute conditions in cardiology

Pre-existing significant aortic stenosis (sAS) in patients with out-of-hospital cardiac arrest (OHCA) may lead to ineffective chest compressions due to hemodynamic of stenosis, reducing the probability of return of spontaneous circulation, and the resuscitation may be complicated. We aimed to analyze the influence of sAS on the risk of OHCA in AMI (AMI-OHCA), on the complicity of resuscitation and survival. The analysis was based on national registries of coronary interventions, reimbursed health services and deaths. Our dataset included all AMI-OHCA patients (N=4,414) in the country (2017–2021), of whom 1.8% patients had pre-existing sAS (**Table 1**). The incidence of sAS was 1.7% in OHCA and 1.8% in AMI without OHCA, p = 0.66. The AMI-OHCA patients were divided into three groups – those who died during OHCA (N = 238, AS in 4.2%), those who were admitted after OHCA on mechanical ventilation (N = 3,255, AS in 1.8%) and spontaneously ventilating (N = 921, AS in 1.2%). Multivariate analysis showed that sAS was not a risk factor for the use of mechanical ventilation in AMI-OHCA, OR 1.61 (95%CI 0.83–3.09), p = 0.16, however, sAS presents a significant risk of pre-hospital mortality of AMI-OHCA, OR 3.4 (95% CI 1.20–9.58), p = 0.02. Additionally, in-hospital, 30-day, and long-term prognosis of AMI-OHCA is adverse-

ly affected by sAS, OR 2.47 (95% CI 1.38–4.41), 2.83 (95% CI 1.61–4.95), and 1.81 (95% CI 1.38–2.38) vs. non-VHD respectively, $p < 0.01$ for all.
Conclusion: Pre-existing sAS have a significant adverse influence on the survival of AMI-OHCA patients and is a significant risk factor of pre-hospital mortality. Therefore, patients with AS should be carefully screened for coronary artery disease, antithrombotic therapy should be considered, and the earlier planning of valvular intervention after AMI should be evaluated.

SPINAL CORD STIMULATION IN THE TREATMENT OF REFRACTORY ANGINA PECTORIS: 25-YEAR CLINICAL EXPERIENCE AT A SINGLE CENTER

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Topic: Interventional cardiology

Background: The efficacy of spinal cord stimulation (SCS) in refractory angina pectoris (RAP) has been proven by several smaller randomized trials and one prospective randomized multicenter registry. Long-term evidence regarding the efficacy is scarce.
Aim: To report long-term clinical single-center data.
Sample and methodology: 43 patients were implanted with SCS for the indication of RAP from 2000 until 2024 using quadri- or octopolar lead inserted in the epidural space targeting the T1–T4 spinal cord segments. Clinical data were obtained twice a year.
Results: Study population follow-up involved 320 patient-years. There were no deaths or severe adverse events related to the implant procedure. Lead repositioning or other SCS system revision for non-infectious reasons was necessary in 7 patients. In three subjects, the system had to be explanted due to infection. In two patients, the stimulator was explanted for being unresponsive to the therapy. No interactions between SCS and other cardiac implantable electronic devices were detected.
We observed short-term (6-month) improvement in on all tested clinical parameters (angina severity and frequency, quality of life, physical limitation) with SCS compared to baseline. However, the effect of the therapy persisted throughout the entire follow-up. The severity of angina according to the Visual Analogue Scale (VAS) of pain decreased from 7.4 ± 1.7 at baseline to 2.5 ± 1.5 at 6 months (n = 20), 2.4 ± 1.4 at 5 years (n = 13), 2.0 ± 1.0 at 10 years (n = 9) and 1.7 ± 0.7 at 5 years (n = 5; all *p*-values were < 0.001 when compared with baseline). Similarly, quality of life assessment by a short version of the Seattle Angina Questionnaire improved (**Fig. 1**).
Conclusion: Our data suggest that SCS is an effective therapy for RAP, with persistent long-term efficacy and favorable safety profile.

EFFECT OF SODIUM-GLUCOSE COTRANSPORTER 2 INHIBITORS IN ADULTS WITH CONGENITAL HEART DISEASE

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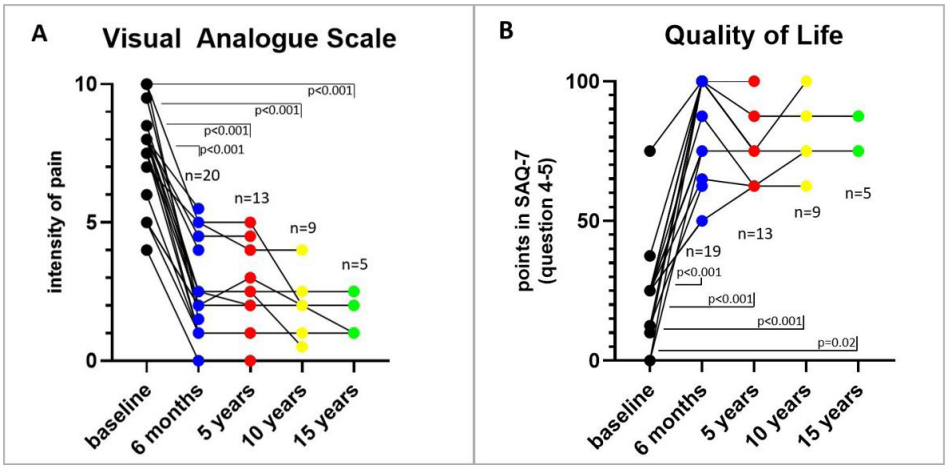

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Topic: Congenital disorders

Aim: Robust evidence-based treatment options are lacking for adult congenital heart disease (ACHD) patients with heart failure (HF). This study evaluated the safety, tolerability, and short-term HF-related effects of sodium-glucose cotransporter 2 inhibitors (SGLT2i) in a real-world ACHD population.
Sample and methodology: All ACHD patients treated with SGLT2i in four European ACHD centers were included in this international, multicenter, retrospective cohort study. Data were collected from one year before starting SGLT2i to the most recent follow-up. Data on safety and tolerability (side effects and discontinuation), mortality, NT-proBNP, and hospitalizations were collected.
Results: In total, 174 ACHD patients were treated with SGLT2i from April 2016 to July 2023. The mean age was 48.7 (± 15.3) years, 72 (41.4%) were female, and 29 (16.7%) had type 2 diabetes mellitus. Ten (5.7%) patients had mild, 75 (43.1%) moderate, and 89 (51.1%) severe congenital heart disease. HF was the most frequent starting indication (n = 162, 93.1%), followed by type 2 diabetes (n = 11, 6.3%) and chronic kidney disease (n = 1, 0.6%). After a median follow-up of 7.7 (3.9–13.2) months, 18 patients (10.3%) reported side effects, 12 (6.9%) permanently discontinued SGLT2i, and 4 (2.3%) died of SGLT2i unrelated causes. A significant reduction in HF-hospitalization rate was observed from the 6 months before to the 6 months after starting SGLT2i (relative hospitalization rate = 0.30 [95% confidence interval 0.14–0.62], $p = 0.001$).
Conclusion: SGLT2i were generally well-tolerated and safe in 174 ACHD patients. SGLT2i was associated with a 3-fold reduction in the 6-month HF hospitalization rate. The positive effects observed warrant further prospective randomized investigation of the potential benefits of SGLT2i for ACHD patients.

ADVERSE EFFECTS OF SHIFT WORK ON CARDIOVASCULAR HEALTH DURING PREGNANCY AND FETAL DEVELOPMENT

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Topic: Sex – an important variable in cardiovascular diseases

Background: Pregnancy is a dynamic process associated with significant physiological changes in the cardiovascular system. During pregnancy, there is an increased metabolic demand of the mother and fetus to ensure adequate uteroplacental circulation for fetal growth and development. Insufficient hemodynamic changes can result in maternal and fetal changes to the cardiovascular system.
Shift work during pregnancy results in significant changes to circadian rhythm of both mother and fetus. Furthermore, shift work is linked to increased risk for developing cardiac disease. Therefore, engaging into shift work during pregnancy may adversely affect the cardiovascular health of the mother and have negative implications on the offspring, including increased risk for cardiovascular disease, obesity, and diabetes.
While the link between shift work and negative pregnancy outcomes, such as miscarriage, preterm birth, and reduced fetal growth has been previously established, the outcomes of pregnancy on cardiovascular health in shift working mothers is not well understood.
Methods: To study the effect of shift work on cardiac health during pregnancy, we subjected pregnant mice to a night shift work model and assessed their cardiac and hemodynamic adaptations, as well as genetic and biochemical changes in response to shift work.
Results: Herein, we provide new evidence that shift work during pregnancy results in changes in genes controlling endothelial function and vascular regulation, coincident with increased cardiac hemodynamic demand. Furthermore, in silico analysis revealed that genes responsible for hemodynamic and endothelial function are regulated by the circadian genes Clock and *BMAL1*. Downregulation of these genes following shift work, leads to failed vascular response and insufficient metabolic supply to the maternal–fetal system, resulting in placental insufficiency and restricted fetal growth.
Conclusions: Our findings provide the first evidence for a direct link between hemodynamic function and circadian regulation during pregnancy. Understanding the key genes and networks that are associated with circadian rhythms and cardiac hemodynamics during pregnancy may contribute to developing new therapeutic strategies to mitigate the adverse effects of shift work during pregnancy.

STUDY OF THE EFFECTIVENESS OF MINERALOCORTICOID RECEPTOR ANTAGONISTS ON NEUROHUMORAL PARAMETERS IN PATIENTS WITH CHRONIC HEART FAILURE

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Topic: Heart failure

Aim: To study the effectiveness of mineralocorticoid receptor antagonists – spirinolactone and eplerenone on neurohumoral parameters in patients with chronic heart failure (CHF).
Methods: 100 patients with ischemic heart failure with II and III FC heart failure were examined initially and after 6 months of treatment. To assess the comparative effectiveness of AMRK patients were divided into 2 groups: the first group (I) consisted of 54 patients were taken for 6 months against the background of standard therapy – spirinolactone; the second group (II) – 46 patients eplerenone.
Results: The result of the therapy with spirinolactone in patients with II FC, the AL content decreased by 26.6% ($p < 0.001$) from the initial values, and the content of NA decreased by 20.2%. In patients with III FC, there was a decrease only in the AL level by 20.2% ($p < 0.05$).

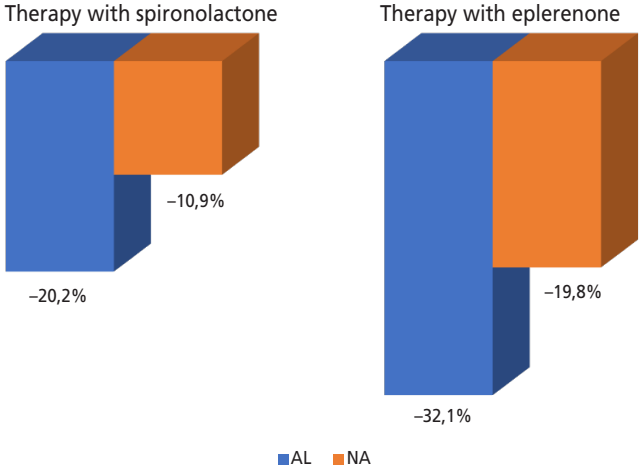

Fig. 1 – The results of the therapy of patients with III FC.

The level of NA decreased by 10.9% from the initial value, which was statistically insignificant. The results of eplerenone therapy showed that in this group of patients significantly reduced the content of neurohormones in the blood of patients with CHF as FC II and FC III. As a result of the therapy, patients with FC II had a significant decrease in AL content by 28.4% ($p < 0.01$), and by 24.6% ($p < 0.01$) from the baseline. In patients with CHF FC III, the Al content decreased by 32.1%, and NA by 19.8% ($p < 0.05$) from the baseline. The results of the comparative effectiveness of spirinolactone and eplerenone showed that the effectiveness of complex therapy on the level of neurohormones is almost similar in both groups in patients with FC II. However, patients with FC III have a clear superiority of complex therapy with eplerenone than with spirinolactone.
Conclusion: Thus, in complex therapy with the use of AMCR in patients with CHF, eplerenone more significantly reduced the level of neurohormones, both in patients with II and III FC CHF.

DEVELOPMENT OF SIGNIFICANT TRICUSPID REGURGITATION AFTER PACEMAKER IMPLANTATION: ASSOCIATION WITH RIGHT VENTRICULAR FUNCTION

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Topic: Valvular disorders

Aim: Tricuspid regurgitation (TR) is a common complication after pacemaker implantation (PMI). However, its association with right ventricular (RV) function remains unclear. We aimed to clarify the association between RV function and TR development after PMI and its impact on clinical outcomes.
Sample and methodology: A total of 455 patients underwent PMI with no/mild TR at baseline were included. RV function was assessed using tricuspid annular plane systolic excursion (TAPSE), RV fractional area change (RV FAC), and RV free wall strain (RV FWS). The primary endpoint was the development of moderate/severe TR during follow-up; the secondary endpoint was a composite of all-cause death or HF hospitalization.
Results: During a median follow-up of 4.0 (IQR: 1.8–7.2) years, significant TR developed in 166 (36%) patients. After adjusting for age, gender, atrial fibrillation, left sided valvular heart disease, pacing rate, left and right atrium dimension, and TR grade), RV FAC < 35% and RV FWS < 20% were independently associated with significant TR development (HR 1.46 [1.05–2.02], $p = 0.02$, and HR 1.87 [1.31–2.67], $p < 0.001$), while TAPSE < 17 mm was not (HR 1.35 [0.95–1.93], $p = 0.09$). Significant TR development as a time-dependent covariate was significantly associated with a higher risk of all-cause death or HF hospitalization during further follow-up, irrespective of RV function (**Table** 1).

Table 1 – Cox regression analysis for clinical endpoints considering significant TR development as a time-dependent covariate

Significant TR development as a time-dependent covariate	All-cause death or HF hospitalization (N = 142)		All-cause death (N = 105)	
	HR (95% CI)	P value	HR (95% CI)	P value
Not adjusted	2.27 (1.57-3.28)	<0.001	2.01 (1.35-3.01)	<0.001
Adjusted for baseline model*	1.85 (1.24-2.77)	0.003	1.78 (1.13-2.79)	0.01
Adjusted for baseline model + TAPSE < 17 mm	1.77 (1.17-2.68)	0.007	1.69 (1.06-2.69)	0.03
Adjusted for baseline model + RV FAC < 35%	1.84 (1.23-2.75)	0.003	1.75 (1.12-2.75)	0.01
Adjusted for baseline model + RV FWS < 20%	2.06 (1.31-3.24)	0.002	2.16 (1.28-3.66)	0.004

*Adjusted for 12 variables below from the univariate Cox model for the composite endpoint with P < 0.10.

Age, diabetes mellitus, arterial hypertension, atrial fibrillation, previous myocardial infarction, leadless pacemaker, pacing rate, left ventricular ejection fraction, left atrial volume, significant mitral regurgitation, significant aortic stenosis, right atrial area.

Conclusion: Decreased RV FAC and RV FWS are significantly associated with the development of TR after PMI. In these patients, the development of significant TR is associated with a worse outcome at long-term follow-up, independently of RV dysfunction.

ACCURACY OF EVENT RATE AND EFFECT SIZE ESTIMATION IN MAJOR CARDIOVASCULAR TRIALS

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Topic: Multidisciplinary approach to cardiovascular diseases

Background: For the design of a randomized controlled trial (RCT), the estimation of the expected event rate (ER) and effect size (ES) of an intervention is needed to calculate the sample size. Overestimation of either ER or ES might lead to an underpowered trial.
Objective: To evaluate the accuracy of the published estimates of ER and ES in contemporary cardiovascular RCTs.
Methods: We searched "Medline" for cardiovascular RCTs published in the *New England Journal of Medicine (NEJM)*, *the Journal of the American Medical Association (JAMA)* or *the Lancet* between 2010 and 2019. Data were extracted from the original publication or the study protocol. The accuracy of estimation was determined by comparing the observed to the hypothesized ER in the control group and ES, respectively. The association of the accuracy of estimation with trial characteristics was determined by linear regression.
Results: Of 875 identified RCT publications, 374 underwent full review. After exclusion of trials with insufficiently reported data for these analyses, data from 344 trials were analyzed. 186 trials (54.1%) were conducted by an academic research organization and 145 (42.2%) were industry-sponsored. The median observed event rate was 9.0% (IQR 4.3, 21.4%) and was significantly lower compared with the estimated event rate (11.0% [IQR 6.0, 25.0%]; $p < 0.001$). 196 trials (61%) overestimated the expected event rate (**Fig. 1**). The accuracy of both the event rate and the effect size estimation was associated with a higher likelihood of refutation of the null hypothesis. The median observed ES was 0.910 (IQR 0.740, 0.990) and was significantly lower compared with the estimated ES (0.724 [IQR 0.600, 0.795]; median overestimation of effect size 23.1% [95% CI, 17.9, 28.3%]). 216 (82.1%) trials overestimated the effect size.
Conclusion: In contemporary cardiovascular RCTs, the event rates for the primary endpoint and effect sizes of an intervention are frequently overestimated. This optimism bias may lead to inability to answer the trial hypothesis.

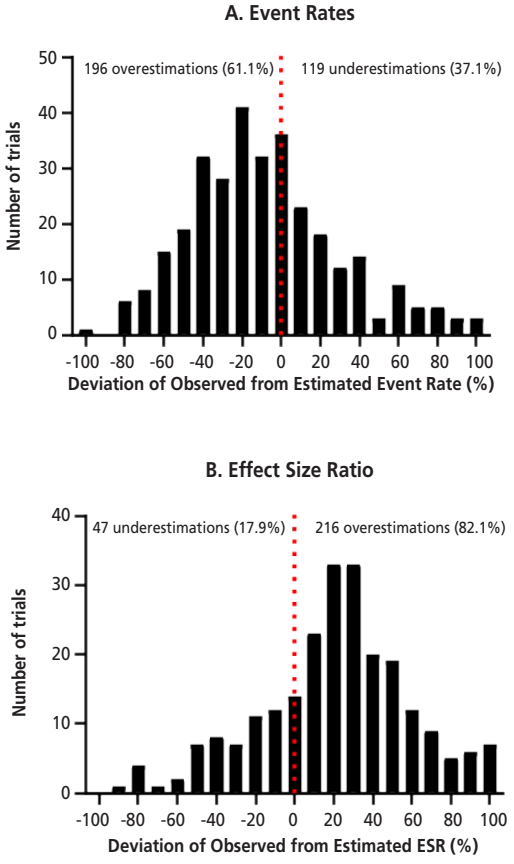

Fig. 1 – Accuracy of event rate and effect size estimation

COMPARISON OF PULMONARY CIRCULATION PARAMETERS ACQUIRED BY CARDIOVASCULAR MAGNETIC RESONANCE WITH RIGHT HEART CATHETERIZATION AND ECHOCARDIOGRAPHY IN PATIENTS WITH RECENT-ONSET DILATED CARDIOMYOPATHY

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Topic: Heart failure

Aim: Pulmonary circulation parameters (PCP) are a relatively new technique with the potential for complex evaluation of the cardio-pulmonary system as a whole. Right heart catheterization (RHC) is the gold standard in evaluating pulmonary hypertension (PH) and hemodynamics.
Methodology: Eighty-four patients with recent-onset dilated cardiomyopathy (RODCM) were included retrospectively in this study. All patients had a CMR examination allowing for calculating the PCP – namely pulmonary transit time (PTT) and pulmonary transit beats (PTB), and ECHO and RHC. Patients were divided into groups according to the PH measured by RHC and the diastolic function measured by echocardiography.
PTT and PTB were correlated with ECHO and RHC markers and the ability of PTT to determine a presence of RHC-defined PH was expressed by the area under receiver operating characteristic (ROC) curve.
Results: According to ECHO, 17 patients had a normal diastolic function, 35 impaired relaxation, 13 pseudonormalization, and 19 restrictive filling pattern. From RHC, 47 had either post- or precapillary PH.
Both PTT and PTB correlated with LVEF, PCWP and cardiac index (all $p < 0.01$).
In addition, only PTT correlated with pulmonary vascular resistance ($p = 0.015$), and with much higher correlation coefficients with E/A ($p = 0.01$), and E/e' ($p = 0.03$) as well. Patients with restrictive filling pattern showed significantly longer PTT ($p = 0.01$); p finally, the ROC curve for PTT and PH was assessed with an area under curve of 72.7% with a cut-off value of 8.62 s.
Conclusion: To our knowledge, this is the first study focused on CMR-derived PCP in a RODCM group, including all three diagnostic modalities as gold standards. Their comprehensive evaluation is very important and from our findings, PTT might offer non-invasive option for such an evaluation.

SEX DIFFERENCES IN CARDIAC TOLERANCE TO OXYGEN DEPRIVATION – 40 YEARS OF CARDIOVASCULAR RESEARCH

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Topic: Myocardial and pericardial diseases

Experimental and clinical studies have clearly demonstrated significant sex differences in myocardial structure and function, both under physiological and pathological conditions. The best examples are significant sex differences in the cardiac tolerance to ischemia/reperfusion injury: pre-menopausal adult female hearts are more resistant as compared to the male myocardium. The importance of these findings is supported by the fact that the number of studies dealing with this issue increased significantly in

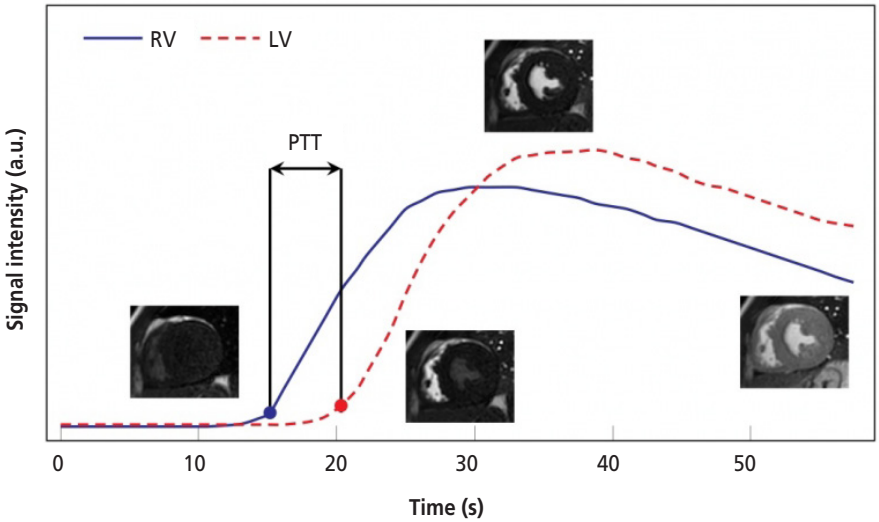

Fig. 1 – Pulmonary transit time analysis. Regions of interest (not shown) are manually traced in the right ventricle (RV) and the left ventricle (LV) to create the signal intensity vs. time curves. The pulmonary transit time (PTT) corresponds to the difference between the onsets, selected as the points where the signal surpasses 10% of the maximum values.

recent years. Detailed molecular and cellular mechanisms responsible for sex differences are yet to be elucidated; however, it has been stressed that the differences cannot be explained only by the effect of estrogens. In recent years, a promising new hypothesis has been developed, suggesting that mitochondria may play a significant role in the sex differences in cardiac tolerance to oxygen deprivation. However, one is clear already today: sex differences are so important that they should be taken into consideration in the clinical practice for the selection of the optimal diagnostic and therapeutic strategy in the treatment of ischemic heart disease. The present review attempts to summarize the progress in cardiovascular research on sex-related differences in cardiac tolerance to oxygen deprivation during the last 40 years, i.e. from the first experimental observation. Particular attention was paid to the sex-related differences of the normal heart, sex-dependent tolerance to ischemia-reperfusion injury, the role of hormones and, finally, to the possible role of cardiac mitochondria in the mechanism of sex-dependent differences in cardiac tolerance to ischemia/reperfusion injury.

EXTRACORPOREAL MEMBRANE OXYGENATION IN THE THERAPY OF CARDIOGENIC SHOCK: ONE-YEAR OUTCOMES OF THE MULTICENTER, RANDOMIZED ECMO-CS TRIAL

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Topic: Acute conditions in cardiology

Background and aims: Among patients with cardiogenic shock, immediate initiation of extracorporeal membrane oxygenation (ECMO) did not demonstrate any benefit at 30 days. The present study evaluated one-year clinical outcomes of the ECMO-CS trial.
Methods: The ECMO-CS trial randomized 117 patients with severe or rapidly progressing cardiogenic shock to: immediate initiation of ECMO or early conservative strategy. Primary endpoint for this analysis was one-year all-cause mortality. Secondary endpoints included a composite of death, resuscitated cardiac arrest or implantation of another type of mechanical circulatory support, and durations of mechanical ventilation, intensive care unit (ICU), and hospital stays. In addition, an unplanned post hoc subgroup analysis was performed.
Results: At one year, all-cause death occurred in 40 of 58 (69.0%) patients in the ECMO arm and in 40 of 59 (67.8%) in the early conservative arm (HR 1.02 [95% confidence interval (CI) 0.66–1.58]; $p = 0.93$). The composite endpoint occurred in 43 (74.1%) subjects in the ECMO group and in 47 (79.7%) in the early conservative group (hazard ratio [HR] 0.83 [95% CI 0.55–1.25]; $p = 0.29$). The durations of mechanical ventilation, ICU stay and hospital stay were comparable between groups. Significant interaction with treatment strategy and one-year mortality was observed in subgroups according to baseline mean arterial pressure (MAP) indicating lower mortality in subgroup with low baseline MAP: < 63 mmHg: HR 0.58 (95% CI 0.29–1.16); $p$interaction = 0.017.
Conclusions: Among patients with severe or rapidly progressing cardiogenic shock, immediate initiation of ECMO did not improve clinical outcomes at one year compared to the early conservative strategy. However, immediate ECMO initiation might be beneficial in patients with advanced hemodynamic compromise.

SALBUTAMOL ATTENUATES THE ARRHYTHMOGENIC EFFECT OF AMINOPHYLLINE IN CARDIAC ORGANOIDS EXPERIMENTAL MODEL

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Topic: Heart rhythm disorders

Background: The combination of aminophylline and salbutamol is used in the treatment of obstructive lung diseases. Side effects (including arrhythmias) of the individual bronchodilator drugs were described, those of combined treatment are almost unknown. We aimed to study the arrhythmogenic potential of combined aminophylline and salbutamol in vitro.
Methods: We used the established model of atomic force microscopy (AFM) coupled with cardiac organoids from human pluripotent stem cells (hPSC-CMs). We focused on the chronotropic, inotropic, and arrhythmogenic effects of salbutamol and aminophylline alone and combined.

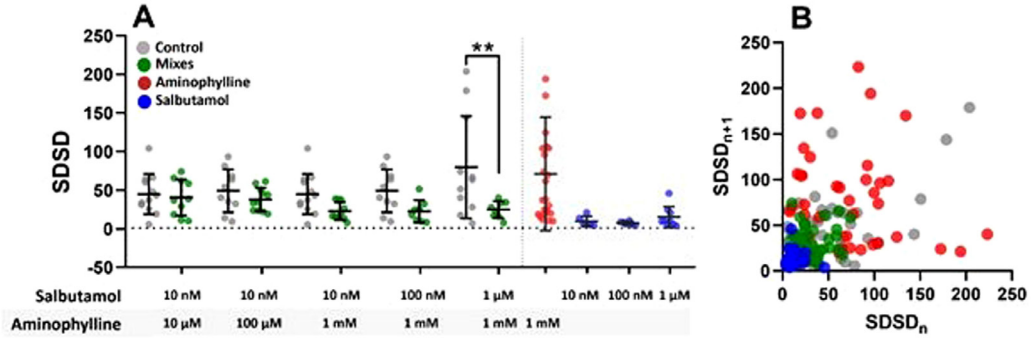

Fig. 1 – VT recurrences according to large/small border zone.

Results: Salbutamol and aminophylline had a synergistic chronotropic and inotropic effects compared to the effects of their separate application. Salbutamol reduced the arrhythmogenic effect of aminophylline, most likely mediated by endothelial nitric oxide synthase activated by beta-2 adrenergic receptors. Findings were replicated and confirmed using hPSC-CM derived from 2 cell lines (CCTL14 and CCTL12).
Conclusions: Data suggest that salbutamol as an add-on therapy may not only deliver a bronchodilator effect but also increase the cardiovascular safety of aminophylline, as salbutamol reduces its arrhythmogenic potential.

Acknowledgement
CarDia (EXCELES, No. LX22NPO5104) EU Next Generation and by the EC Horizon Europe MUQUABIS GA no. 101070546 and MUNI/A/1624/2023 MEYS CR Figure BRV analysis with combined salbutamol and aminophylline treatments. Scatter plots indicate means and SDs of SDSDs measured with mixed treatments and control (n = 10 for controls, n = 10, 11, 10, 8, 8, 24, 6, 6, and 9 for treatments; ordinary one-way ANOVA test). (A) SDSD results of cardiac organoids with indicated concentrations of salbutamol and aminophylline supplemented with separate measurements of both treatments for comparison. (B) Poincaré plots of SDSD intervals.

THE IMPORTANCE OF THE SCAR BORDER ZONE FOR CHARACTERISTICS OF VENTRICULAR TACHYCARDIA AND ABLATION OUTCOME IN POST--MYOCARDIAL INFARCTION PATIENTS

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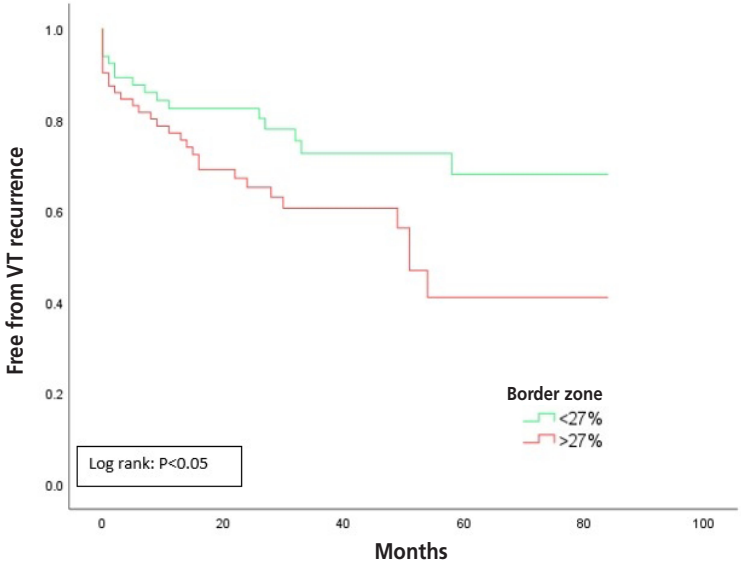
Topic: Heart rhythm disorders

Introduction: Post-myocardial infarction (MI) ventricular tachycardias (VT) are typically related to fixed conduction block in transmural or sub-endocardial scars. However, fast VTs with cycle lengths near the refractory period may be linked to functional re-entry in the scar border zone and difficult to target with current ablation techniques.
Purpose: This study aims to (1) describe electroanatomical voltage map (EAVM) characteristics in post-MI patients with fast VTs and (2) assess the relationship between scar border zone size and ablation outcomes.
Methods: Post-MI patients undergoing VT ablation. Fast VT was defined as a VT cycle length (VTCL) = ventricular refractory period at 500 ms + max. 30 ms. Scar border zones (0.5–2.1/3.0 mV BV, dependent on LV remodelling state) were measured on the EAVM and correlated with clinical outcomes.
Results: 138 patients (86% male, LVEF 35 ± 10%, 86% remodelled LV) were included. The median scar border zone size was 27% of the left ventricular endocardial surface. Median VTCL of presenting fast VTs was 275 ± 52 ms. Patients with presenting fast VT had a larger border zone than those with slower VT (32% vs. 25%, $p = 0.01$).
Post-ablation, 79 (57%) patients remained inducible for any VT, with 59/79 (75%) being inducible for fast VT. These patients had larger border zones than those induc-



Patients at risk	0 months	20 months	40 months	60 months	80 months
Above 27% BZ	71	40	20	6	5
Below 27% BZ	65	40	22	14	6

ible for slower VTs (35% vs. 26%, $p < 0.001$). Over a median follow-up of 26 months, 33% experienced VT recurrence, with higher rates in those with above-median scar border zones (40% vs. 24%, $p = 0.03$).
Conclusion: Spontaneous or post-ablation inducible fast VTs are associated with larger scar border zones, which in turn correlate with higher VT recurrence rates. These results suggest that scar border zones play a critical role in (fast) VT substrate and may be difficult to target with current ablation techniques.

RISK STRATIFICATION AND CORONARY OPTICAL COHERENCE TOMOGRAPHY FINDINGS IN ASYMPTOMATIC PATIENTS WITH TYPE 1 DIABETES MELLITUS

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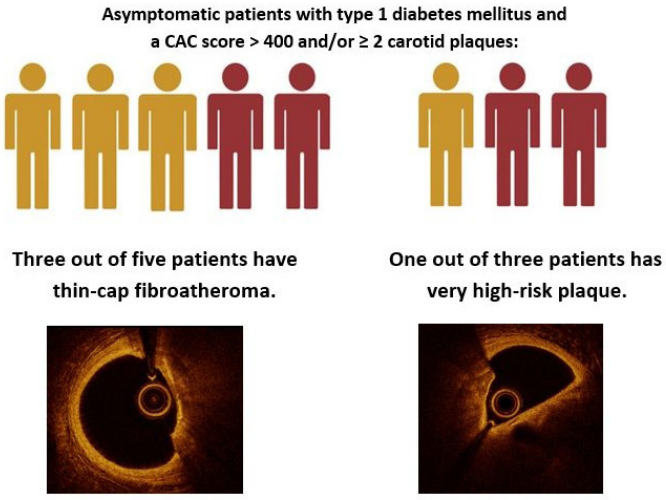
Topic: Primary prevention

Aim: Regarding cardiovascular (CV) risk, patients with type 1 diabetes mellitus (T1D) are a heterogeneous population with CV risk ranging from low to very high. Our study aimed to describe the prevalence of prognostically significant findings on invasive coronary artery examination in patients with subclinical atherosclerosis determined by non-invasive examination of the carotid and coronary arteries.
Methods: Patients with T1D for at least 10 years, without a prior history of CV disease or target organ damage were enrolled. Non-invasive examinations included carotid ultrasound for carotid plaque detection and a CT for coronary artery calcium (CAC) score evaluation. Patients with the presence of ≥ 2 carotid plaques and/or CAC score of ≥ 400 were classified as very high risk (VHR). These VHR patients were subsequently evaluated using invasive coronary angiography (ICA) for the presence of obstructive coronary artery disease (CAD) and intracoronary optical coherence tomography (OCT) for the presence of thin-cap fibroatheroma (TCFA) and very high-risk plaque. Hemodynamic stenosis relevance was assessed by the vessel fraction flow ratio (vFFR).
Results: Sixty-two T1D patients aged 50.1 ± 12.7 years, 53% women were enrolled. The criteria of VHR were fulfilled in 12/62 (19.4%) patients. The median CAC score of the VHR group was 606.3 (175.3–1515) and the mean number of carotid plaques was 2.75 ± 1.06. ICA showed obstructive CAD in 5/12 (41.7%) patients, and 3/12 (25%) had vFFR-positive lesions. Using OCT, TCFA was present in 7/12 (58.3 %) and a very high-risk plaque in 4/12 (33.3 %) patients.



Conclusion: Among asymptomatic patients with T1D, the combination of coronary artery calcium score and carotid ultrasound identifies a very high-risk group, in which 58.3% of patients had a thin-cap fibroatheroma and 33.3% of patients had a very high-risk plaque.

IDENTIFYING PATIENTS AT RISK FOR LATE-ONSET CARDIOTOXICITY THROUGH GLOBAL LONGITUDINAL STRAIN – TIME FOR INTEGRATION INTO FOLLOW-UP GUIDELINES?

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Topic: Varia

Background: Malignant lymphoma survivors are at a heightened risk of chronic cardiotoxicity. While multiple studies have established global longitudinal strain (GLS) assessments using echocardiography as reliable indicators of acute cardiotoxicity, their efficacy in identifying chronic cardiotoxicity remains to be clarified. GLS evaluation is more time-intensive than left ventricular ejection fraction (LVEF) assessments, necessitating careful consideration of its use in everyday clinical practice. This study aimed to evaluate transthoracic echocardiogram (TTE) parameters that might indicate subclinical cardiotoxicity and explore their effectiveness in diagnosing chronic cardiotoxicity. Enhancing the diagnostic process could allow for earlier intervention before cardiac complications occur.

Methods: The analysis included 88 adult lymphoma survivors, with a median age of 40 years. Among the participants, 46 were males and 42 were females. The median age at initial cancer diagnosis was 29 years. Cardiovascular evaluations were conducted 10 years post-treatment. The primary diagnosis was Hodgkin lymphoma in 89.8% cases, and non-Hodgkin lymphoma in 10.2%. During the follow-up period, all survivors underwent TTE with speckle tracking.

Results: Patients with lower normal LVEF (53–61%) showed a statistically significant reduction in GLS (–17.56 ± 3.2), in comparison to those with higher normal LVEF (> 61%), who had a GLS of (–19.44 ± 2.9), *p*-value 0.043. This suggests that GLS may provide additional diagnostic insights.

Conclusion: Integrating GLS evaluation into follow-up TTE for patients with lower normal LVEF could enhance the detection sensitivity for chronic cardiotoxicity. In theory, those with reduced GLS alongside with lower normal LVEF are potential candidates for immediate cardioprotective therapies and more rigorous follow-up.

INCREMENTAL VALUE OF BIVENTRICULAR STRAIN IN PATIENTS WITH SEVERE AORTIC STENOSIS

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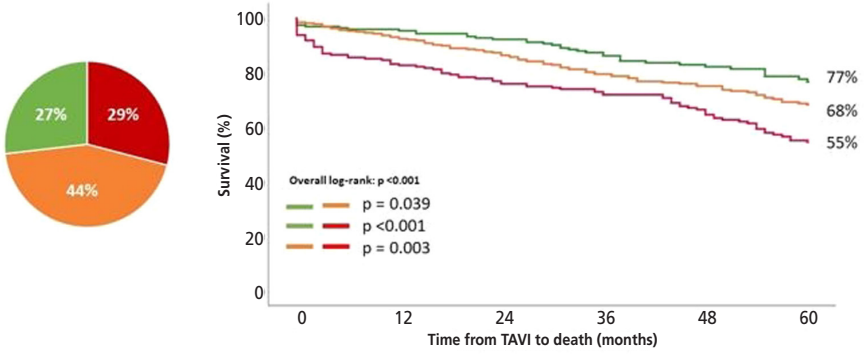
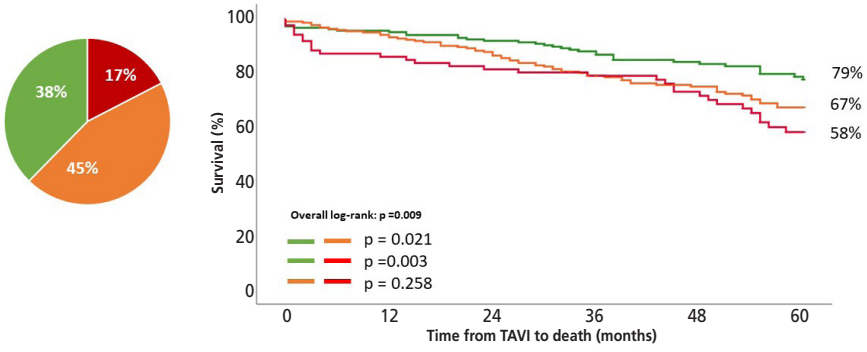
Topic: Aortic valve stenosis

Background: Left ventricular global longitudinal (LVGLS) and right ventricular free wall strain (RVFWS) demon-



Preserved strain group	191	183	176	144	109	73
Single-ventricle impaired strain group	314	292	273	218	170	124
Biventricular impaired strain group	207	172	159	141	106	72

Fig. 1 – Kaplan–Meier estimated survival curves according to the strain-based groups. TAVI – transcatheter aortic valve implantation.



Preserved strain group	186	178	170	141	107	71
Single-ventricle impaired strain group	222	209	194	151	118	86
Biventricular impaired strain group	86	74	70	63	48	29

Fig. 2 – Subgroup analysis in patients with LVEF ≥ 50%: KM survival analysis according to LV GLS (n = 494).

strated prognostic value in patients with severe aortic stenosis (AS) separately. However, studies evaluating combined assessment of LVGLS and RVFWS have shown contradictory results.
Aim: To explore the prognostic value of combining LVGLS and RVFWS in a large group of severe AS patients referred for transcatheter aortic valve implantation.
Methods: Patients were classified into three groups: preserved (LVGLS ≥ 15% and RVFWS > 20%), single ventricle impaired (LVGLS < 15% or RVFWS ≤ 20%), or biventricular impaired strain group (LVGLS < 15% and RVFWS ≤ 20%). Cutoff values were based on previously published data and spline analyses. Endpoint was all-cause mortality.
Results: Of the 712 patients included (age 80 ± 7 years, 53% men), 248 (35%) died. The single-ventricle impaired and biventricular impaired (vs. preserved) strain groups showed significantly lower 5-year survival rates (68% and 55% vs. 77%, respectively, $p < 0.001$; **Fig. 1**). On multivariable analysis, single-ventricle impaired (HR 1.762; 95% CI: 1.114–2.788; $p = 0.015$) and biventricular impaired strain groups (HR 1.920; 95% CI: 1.134–3.250; $p = 0.015$) were independently associated with all-cause mortality. These findings were confirmed by sensitivity analysis in patients with preserved LV ejection fraction (**Fig. 2**).
Conclusions: In patients with severe AS, biventricular strain allows better risk stratification, even if LV ejection fraction is preserved.

DOES ATRIAL FIBRILLATION DETERIORATE THE PROGNOSIS IN PATIENTS WITH SEPTIC OR CARDIOGENIC SHOCK?

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Topic: Acute conditions in cardiology

Atrial fibrillation (AF) is associated with increased risk of mortality in various clinical conditions. However, the prognostic role of preexisting and new-onset AF in critically ill patients, such as patients with septic or cardiogenic shock remains unclear.
This study investigates the prognostic impact of preexisting and new-onset AF on 30-day all-cause mortality in patients with septic or cardiogenic shock. Consecutive patients with sepsis, or septic or cardiogenic shock were enrolled in 2 prospective, monocentric registries from 2019 to 2021. Statistical analyses included Kaplan–Meier, multivariable logistic, and Cox proportional regression analyses.
In total, 644 patients were included (cardiogenic shock: n = 273; sepsis/septic shock: n = 361). The prevalence of AF was 41% (29% with preexisting AF, 12% with new-onset AF). Within the entire study cohort, neither preexisting AF (log-rank $p = 0.542$; hazard ratio [HR] 1.075, 95% confidence interval [CI] 0.848 to 1.363, $p = 0.551$) nor new-onset AF (log-rank $p = 0.782$, HR = 0.957, 95% CI 0.683 to 1.340, $p = 0.797$) were associated with 30-day all-cause mortality compared with non-AF. In patients with AF, ventricular rates > 120 beats/min compared with ≤ 120 beats/min were shown to increase the risk of reaching the primary end point in AF patients with cardiogenic shock (log-rank $p = 0.006$, HR 1.886, 95% CI 1.164 to 3.057, $p = 0.010$). Furthermore, logistic regression analyses suggested increased age was the only predictor of new-onset AF (odds ratio 1.042, 95% CI 1.018 to 1.066, $p = 0.001$).
In conclusion, neither the presence of preexisting AF nor the occurrence of new-onset AF was associated with the risk of 30-day all-cause mortality in consecutive patients admitted with cardiogenic shock.

NATIVE QRS DURATION AND OUTCOMES IN HEART FAILURE WITH MILDLY REDUCED EJECTION FRACTION: RESULTS FROM A LARGE-SCALED REGISTRY

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Topic: Heart failure

Objective: The study investigates the prognostic impact of the native QRS duration in patients with heart failure with mildly reduced ejection fraction (HFmrEF).
Background: The prognostic impact of QRS duration in HFmrEF has been investigated poorly.
Methods: Consecutive patients with HFmrEF were included retrospectively at one institution from 2016 to 2022. Patients with QRS duration ≥ 120 ms were compared to patients with QRS duration < 120 ms, further risk stratification was performed comparing patients with left and right bundle branch block (LBBB vs RBBB). The primary endpoint was all-cause mortality at 30 months, secondary endpoints comprised amongst others the risk of HF-related rehospitalization.
Results: In total, 1,627 patients with HFmrEF were included with a median QRS duration of 90 ms (QRS duration ≥ 120 ms: 15%). Although the risk of long-term

all-cause mortality was not affected by a prolonged QRS duration (35.1% vs 28.7%; p = 0.057; HR = 1.254; 95% CI 0.993–1.583), patients with QRS duration ≥120 ms had a higher risk of rehospitalization for worsening HF (18.2% vs. 11.9%; p = 0.008; HR = 1.574; 95% CI 1.124–2.204), even after multivariable adjustment. A QRS duration ≥120 ms was associated with long-term HF-related rehospitalization even after multivariable adjustment (HR 1.413, 95% CI 1.002–1.992, p = 0.049). Finally, the risks of long-term all-cause mortality and HF-related rehospitalization did not differ among patients with LBBB and RBBB.
Conclusion: A prolonged QRS duration is independently associated with a higher risk of HF-related rehospitalization in HFmrEF, but not long-term all-cause mortality.

PROGNOSTIC IMPACT OF ACUTE DECOMPENSATED HEART FAILURE IN PATIENTS WITH HEART FAILURE AND MILDLY REDUCED EJECTION FRACTION

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Topic: Heart failure

Objective: This study sought to determine the prognostic impact of acute decompensated heart failure (ADHF) in patients with heart failure with mildly reduced ejection fraction (HFmrEF).
Background: ADHF is a major complication in patients with systolic heart failure (HF), however, the prognostic impact of ADHF in patients with HFmrEF has not yet been clarified.
Methods: Consecutive patients hospitalized with HFmrEF (i.e., left ventricular ejection fraction 41–49% and signs and/or symptoms of HF) were included retrospectively from 2016 to 2022. The prognosis of patients with ADHF was compared to those without (i.e., non-ADHF). The primary endpoint was all-cause mortality at 30 months (median follow-up). Among others, secondary endpoints included in-hospital mortality or HF-related rehospitalization at 30 months. Kaplan-Meier, multivariable Cox proportional regression and propensity-score matched analyses were performed for statistics.
Results: 2,184 patients with HFmrEF were included with a rate of ADHF of 22.2%. ADHF was associated with a significantly increased risk of all-cause mortality (50% vs 26%; HR = 2.269; 95% CI 1.939–2.656; p = 0.001) and HF-related rehospitalization at 30 months (27% vs. 10%; HR = 3.250; 95% CI 2.565–4.118; p = 0.001) which was still evident after multivariable adjustment and propensity-score matching. In patients with ADHF, a recurrent hospitalization for ADHF was associated with a higher HF-related rehospitalization (41.7% vs. 23.0%; HR = 2.073; 95% CI 1.420–3.027; p = 0.001), but not all-cause mortality at 30 months (p = 0.264) compared to patients with ADHF without HF-related hospitalization < 12 months.
Conclusion: Even in patients with HFmrEF, ADHF is common and independently associated with 30-month all-cause mortality and HF-related rehospitalization.

PREDICTORS AND PROGNOSTIC IMPACT OF EARLY ACUTE KIDNEY INJURY IN CARDIOGENIC SHOCK: RESULTS FROM A MONOCENTRIC, PROSPECTIVE REGISTRY

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Topic: Acute conditions in cardiology

Introduction: The presence of acute kidney injury (AKI) was shown to increase the risk of mortality following acute myocardial infarction (AMI), however, data regarding the prognostic impact of early AKI in patients with concomitant cardiogenic shock (CS) is limited. The study investigates predictors and the prognostic impact of AKI in patients with CS.
Methods: Consecutive patients with CS from 2019 to 2021 were included at one institution. Laboratory values were retrieved from day of disease onset (day 1) and days 2, 3, 4 and 8 thereafter. Predictors for AKI (defined as an increase of plasma creatinine > 50% within 48 h reffering to pre-admission or baseline creatinine on day 1 and/or the need for continuous veno-venous haemodiafiltration [CVVHDF]) and the prognostic impact of early AKI with regard to 30-day all-cause mortality were assessed. Statistical analyses included univariable t-test, Spearman's correlation, C-statistics, Kaplan–Meier and Cox proportional regression analyses.
Results: 219 CS patients were included with an incidence of early CS-related AKI of 52%. With an area under the curve (AUC) up to 0.689 (p =0.001), creatine discriminated 30-day mortality in CS. Increasing lactate levels (OR = 1.194; 95% CI 1.083–1.316; p = 0.001; per increase of 1 mmol/l) was associated with the occurence of AKI. The presence of AKI was associated with an increased risk of

30-day all-cause mortality (63% vs. 36%; HR = 2.138; 95% CI 1.441–3.171, $p = 0.001$), even after multivariable adjustment (HR = 1.861; 95% CI 1.207–2.869; $p = 0.005$).
Conclusion: Early AKI affects more than half of patients with CS and is independently associated with 30-day all-cause mortality in CS, with the highest risk of death among patients with AKI requiring CVVHDF.

INTRAVASCULAR LITHOTRIPSY OF PERIPHERAL ARTERIES – INTERIM ANALYSIS OF A RANDOMIZED BICENTRIC STUDY

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Topic: Varia

Aim: It is supposed that calcification in arterial plaques may reduce an antiproliferative effect of drug-coated balloons (DCB) causing a mechanical barrier. Intravascular lithotripsy (IVL), where emitters producing pressure waves are integrated within a balloon catheter, has the potential to disrupt these calcified lesions.
The basic hypotheses of our study were as follows: 1) Is the combination of IVL and subsequent DCB angioplasty superior over the combination of IVL and plain balloon angioplasty concerning long-term patency? 2) Could IVL improve long-term results in comparison with DCB angioplasty without previous IVL?
Methodology: Patients with symptomatic peripheral arterial disease and with calcified stenosis of femoropopliteal arteries were included. They were randomized in two groups: "DCB plus group" (DCB+) treated with IVL and subsequent DCB angioplasty and "DCB minus group" (DCB–) treated after IVL with a plain balloon angioplasty. The control group, created retrospectively, consists of patients with calcified femoropopliteal stenosis treated using DCB catheters without previous IVL. Patients were followed up both clinically and with duplex ultrasonography at 6-month intervals within 24 months after procedure. The primary endpoint was a comparison of long-term patency among these three groups.
Results: 61 procedures were performed – 22 in the group DCB+, 23 in the group DCB- and 16 in the control group. Baseline and procedural characteristics, angiographic success, and safety results do not statistically differ among these three groups. There was also no statistical significance in cumulative patency among these cohorts.
Conclusions: Although there is a tendency towards better long-term results in procedures managed with IVL, statistical significance was not found. Further evaluation of IVL is needed.

OPTIMISING VENOARTERIAL ECMO CARE: INSIGHTS FROM A CARDIAC CENTRE WITHOUT ON-SITE CARDIOSURGICAL EXPERTISE

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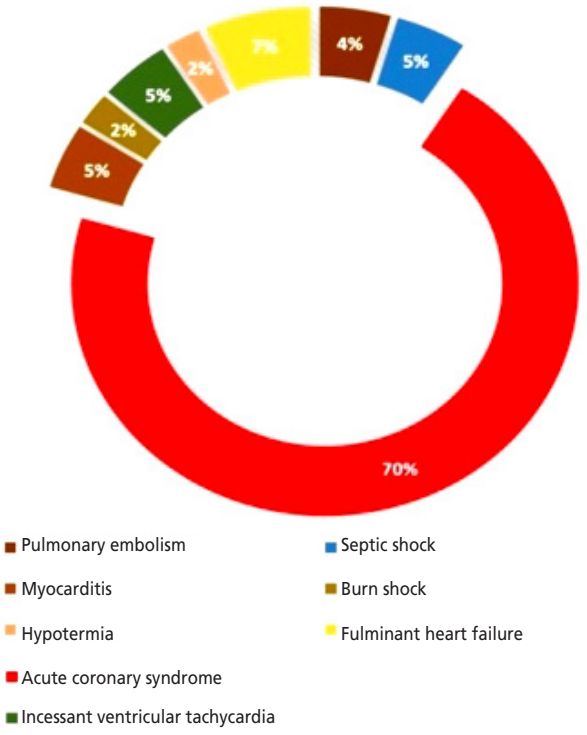
Topic: Acute conditions in cardiology

Introduction: This study evaluates the safety and efficacy of VA-ECMO in a cardiology center without on-site cardiac surgery, focusing on clinical outcomes, procedural details, and challenges.
Methods: A retrospective analysis was conducted on VA-ECMO cases between 2020 and 2023, examining indications, procedures, and outcomes.
The composite 7-day and 90-day survival rates were found to be 68.2% and 45.5%, respectively. Successful transport to a cardiac surgery center for orthotopic heart transplantation (OHT) was achieved in 3 patients, underscoring the potential of VA-ECMO as a bridge to definitive therapy. One patient underwent left ventricular assist device (LVAD) implantation as a destination therapy, highlighting the role of VA-ECMO in facilitating decision-making for long-term MCS options.
VA-ECMO was used in 44 patients, primarily for acute coronary syndrome (ACS) with cardiogenic shock (70%)



(**Fig. 1**). 7-day and 90-day survival rates were 68.2% and 45.5%, respectively. 3 patients underwent OHT, 1 received LVAD. 41% needed IABP, 50% required ECMO during CPR (lower survival in prolonged no-flow > 60 min). 17 cases had ECMO cannula complications (44% hematoma, 39% distal ischemia).
Conclusion: This study provides insights into VA-ECMO use without on-site cardiac surgery. Understanding its challenges and successes is crucial for optimizing patient care in similar settings. The results inform future discussions on VA-ECMO's role in centers without cardiosurgical support.

EARLY MOBILIZATION AFTER PACEMAKER IMPLANTATION (EMAPI)

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Topic: Heart rhythm disorders

Aim: This trial aimed to assess the safety and feasibility of early mobilisation and posibility of same-day discharge following permanent pacemaker implantation.
Methods: The Early Mobilization After Pacemaker Implantation (EMAPI) trial was a prospective, randomized, monocentric study involving 200 patients undergoing pacemaker implantation. Participants were randomly assigned to either the Early Mobilization (EaM) arm, with 4 hours of rest post-procedure, or the Late Mobilization (LaM) arm, with 16–24 hours of immobilisation. Primary endpoints included a composite of common complications such as haematomas, major bleeding, wound infections, pneumothorax, and lead dislodgement. Secondary endpoints compared the incidence of individual complications between the two groups. Follow-up period was at 1 and 6 months.
Results: Of the 200 enrolled patients, follow-up was completed for 191 (95.5%) at 6 months. 150 patients received a dual lead device and 50 received a single lead device. The incidence of primary composite complications was similar between the EaM (4 cases, 4%) and LaM (7 cases, 7%) arms (p = 0.548). There were no significant differences in individual complications such as lead dislodgement or wound infections (atrial lead dislodgement 2 vs 2; EaM vs LaM, ventricular lead dislodgement 0 vs 0; EaM vs LaM, wound infection 1 vs 0; EaM vs LaM). Technical parameters remained stable across both groups, without any significant diferences like drop of sensing, or growth of stimulation threshold.
Conclusion: The EMAPI trial provides strong evidence supporting early mobilisation and posibility of same-day discharge after pacemaker implantation. This approach can potentially streamline care, improve patient outcomes, and reduce healthcare costs. With data from other similar trials, this procedure can be determined as a new standard of care.

CURRENT USE AND OUTCOMES OF CORONARY LITHOTRIPSY IN A REAL-WORLD, ALL-COMERS REGISTRY (BENELUX-IVL)

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Topic: Interventional cardiology

Aim: The aim was to evaluate the safety and efficacy of intravascular lithotripsy (IVL) across an unselected in real-world patient cohort.
Sample and methodology: We included patients who underwent percutaneous coronary intervention using IVL from May 2019 to November 2023 across 7 centers in 2 European countries. Efficacy endpoints were device success (delivery of the IVL-balloon across the target lesion and administration of therapy without related complications), technical success (TIMI 3 flow and residual stenosis < 30% by quantitative coronary analysis) and procedural success (composite of technical success with absence of in-hospital major adverse cardiovascular [MACE: cardiac death, myocardial infarction or target vessel revascularization]). Safety endpoints were IVL-related complications and MACE at one-year follow-up.
Results: 397 patients (age 73 ± 9 years, 76% male) underwent IVL for 415 lesions. Patient presentation was acute coronary syndrome in 46% of the cases. Diverse target lesions subtypes were addressed, including bifurcations (24%), aorto-ostial (22%), in-stent (38%), and CTO (8%). A mean of 70 ± 23 pulses with an IVL-balloon size of 3.4 ± 0.5mm was administered. Additional plaque modification was used in 64 (15%) cases. Post-IVL treatments included stent implantation (77%) and DEB (7%). ICI was utilized in 221 (53%) target lesions. Device, technical, and procedural success were achieved in 98%, 89%, and 89% of patients, respectively, while IVL-related complications occurred in 5 (1%). At one-year follow-up, MACE was observed in 13%.
Conclusion: In this real-world registry, IVL demonstrated efficacy across diverse clinical and anatomical scenarios. High success rates, low complication rates and MACE rates were observed acutely and at one-year follow-up.

THE HEMODYNAMIC EFFECTS OF SILVER NANOPARTICLES IN A SEPTIC PORCINE MODEL

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Topic: Varia

Introduction: Infectious diseases, which frequently lead to life-threatening sepsis and septic shock, represent a significant global health challenge. The pursuit of novel therapeutic strategies remains a primary focus of preclinical research.
Methodology: This prospective experimental study, conducted using a porcine model, involved 39 pigs divided into six groups. The first group (n = 6) served as the control group. The second group (n = 6) received silver nanoparticle treatment. The third group (n = 7) had bacteremia induced via continuous *Klebsiella pneumoniae* infusion. The fourth group (n = 6) was subjected to bacteremia with concomitant administration of silver nanoparticles. The fifth group (n = 6) received bacteremia induction followed by antibiotic treatment with piperacillin-tazobactam. The sixth group (n = 8) received both bacteremia induction and treatment with silver nanoparticles in conjunction with antibiotics.
Results: Heart rate showed a significant increase in the septic group, the group treated with silver nanoparticles, and the group treated with both silver nanoparticles and antibiotics. Mean pulmonary arterial pressure increased significantly across all groups by the conclusion of the experiment. Lactate levels were significantly elevated in the septic group treated with silver nanoparticles, as well as in the septic group treated with both silver nanoparticles and antibiotics. Fluid balance showed significant increases in the septic groups. Systemic vascular resistance was significantly reduced in the septic group and the group with sepsis treated with silver nanoparticles.
Conclusion: The application of silver nanoparticles, either alone or in combination with antibiotics, did not show any beneficial effects on hemodynamics of septic pigs and was not superior to the standard antibiotic therapy.

DNA BREAKS AND ELECTRIC CARDIOVERSION

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Topic: Myocardial and pericardial diseases

Background: The electric cardioversion (ECV) is a strong external stress factor, despite its protective effect to restore sinus rhythm is well known. DNA is the crucial biopolymer for the health and life. The most severe DNA damages (DNA breaks), when stay unrepaired, may be fatal for the cells survival.
Aim: To investigate whether the ECV may induce the most severe DNA damages.
Methods: To this prospective controlled study we are planning to enrol 15–25 patients with persistent, optimally lone, atrial fibrillation and 5–10 matched health controls. In everyone 3 blood samples will be collected (pre-ECV, 30 and 60 min post-ECV) for DNA break analysis. The most severe DNA breaks will be analysed using Comet assay and γH2AX in peripheral blood cells (lymphocytes). Results will be expressed as mean (standard deviation) or median (max–min). Level of significance ($p < 0.05$).
Conclusion: Authors expect that ECV will induce the severe DNA damages followed by prompt DNA damage reparation.

POSTERS

IDENTIFYING PREDICTORS OF RISK STRATIFICATION IN HOSPITALIZED HEART FAILURE PATIENTS

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Topic: Heart failure

Aim: To identify predictors of early rehospitalization in patients with heart failure.
Methodology: We analyzed data of 3125 patients, a total of 4137 consecutive hospitalizations, with a primary (N = 1538; 37%) or secondary discharge diagnosis of heart failure according to the International Classification of Diseases ICD-10 (Dg. I500, I501, I509) for the period 1.1.2021–31.3.2023. We assessed rehospitalization for heart failure

decompensation within 90 days as of June 30, 2023. Continuous variables were analysed using Student's t-test or the Mann–Whitney U-test. Categorical variables were analysed using the χ^2 test and Fisher's exact test. Logistic regression was performed to evaluate the effects of selected predictors on rehospitalization. Predictors of rehospitalization in the univariate analysis with *p*-values < 0.05 were entered into a backwards stepwise logistic regression model. The predictors that remained significant were retained in the final model. A receiver operator characteristic curve was used for the analysis of the risk scores to assess discrimination.
Results: 362 (i.e. 8.75%) of the 4137 hospitalizations were acute rehospitalizations. The significant risk factors (AUC 0.603, $p < 0.001$) for early rehospitalization of heart failure were length of hospitalization (more than 5 days, sensitivity 76.2%, specificity 38.3%), age (more than 61 years, sensitivity 90.6%, specificity 13.2%), history of ischemic heart disease, cancer, chronic respiratory disease (including COPD and asthma), laboratory measurements NT-proBNP level (more than 5654 ng/l, sensitivity 61.9%, specificity 47.7%).
Conclusion: Based on administrative data, we identified a combination of the above comorbidities, higher age, length of hospitalization, and NT-proBNP levels as relevant risk factors for early rehospitalization for heart failure decompensation.

THE IMPLANTATION OF LVAD CAUSES CHANGES IN THE AORTIC MIRNOME AND PROTEOME

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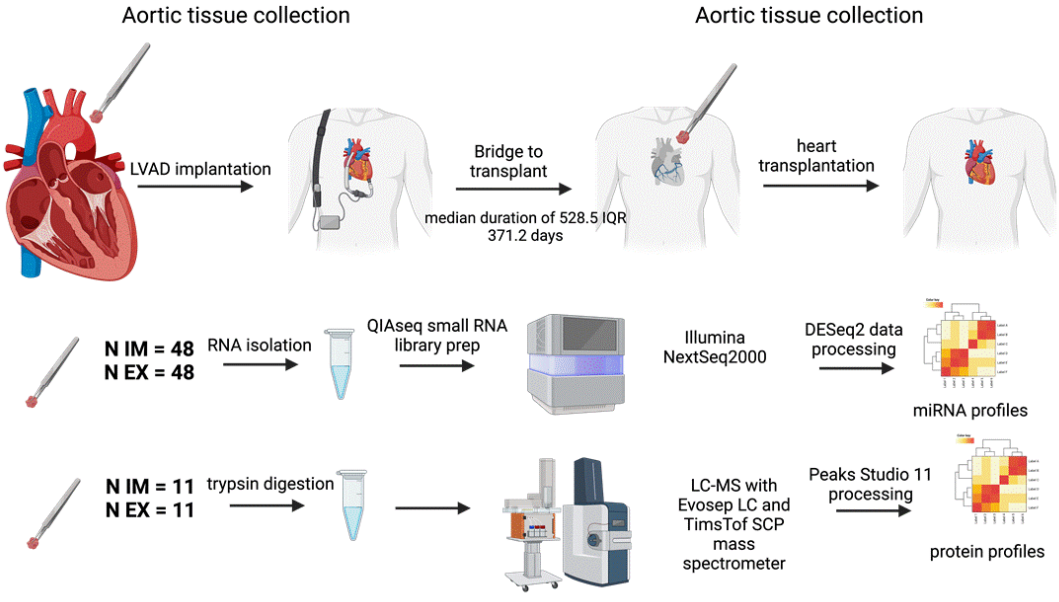
Topic: Heart failure

Background: Left ventricular assist devices (LVAD) have been widely used and accepted to treat patients with end-stage heart failure (HF). LVAD non-physiological blood flow velocity, wall shear stress distribution, vorticity current intensity, and vorticity flow generation affect the pathophysiology of vascular changes in aortic tissue.
Purpose: In this study, we employed multi-omics-based analysis of the aorta to identify molecular markers that could clarify vascular remodelling during LVAD support.
Methods: A group of 48 patients (average age 48.7 ± 13.6 years; 18.4% female; mean INTERMACS profile 2.7) was studied. All patients had LVAD (HeartMate 3TM) implanted as a bridge to transplantation. Tissue specimens (96 pair-matched samples) were taken from the ascending aorta during LVAD implantation and explantation. Small RNA-Seq screening using Next Generation Sequencing and proteomic profile using Data-Independent Acquisition mass spectroscopy were conducted.
Results: We found that the most upregulated miRNAs in explanted samples target genes involved in extracellular matrix (ECM) remodelling, collagen deposition, smooth muscle cell (SMC) and endothelial cell (EC) proliferation. Gene enrichment analysis of both omics suggests highly differentiated cell cycle and transcriptional regulation in the explanted samples. Enriched Gene Ontology (GO) terms were related to apoptotic mitochondrial changes, mitochondrial membrane organization, the mitochondrial matrix, and collagen trimer.
Conclusion: The GO-enriched results suggest significant changes in mitochondria. Considering the interplay be-



tween ECM and mitochondria in this context, further research is needed to investigate the impact of non-physiological flow patterns on vascular function and vascular energy metabolism.

SECRETONEURIN AND ITS ABILITY TO IDENTIFY PATIENTS AFTER OHCA VERSUS PATIENTS WITHOUT A HISTORY OF VENTRICULAR ARRHYTHMIA

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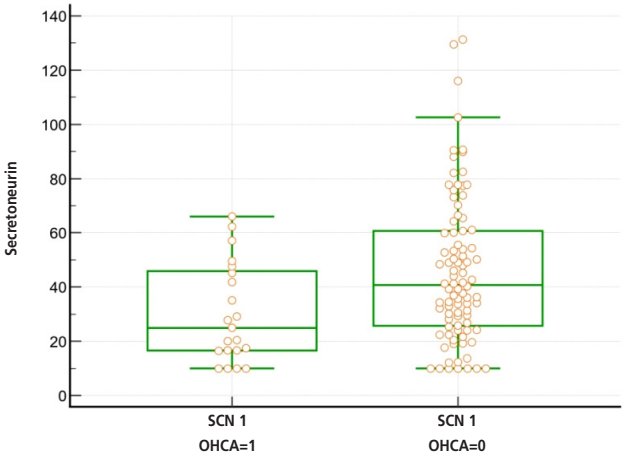
Topic: Acute conditions in cardiology

Introduction: The incidence of out-of-hospital cardiac arrest (OHCA) has strong local variability. The reported global average is 55 adult patients per 100,000 population with an overall very unfavorable prognosis. The most common cause is acute coronary syndrome (ACS). Early diagnosis and treatment of ACS in patients after OHCA is the only way to improve their prognosis. However, there is no laboratory or other parameter that can detect these patients before the development of OHCA.
Methods: We prospectively evaluated the collected levels of secretoneurin (SN) in patients after OHCA who had an implanted cardioverter-defibrillator (ICD) for secondary prevention with a group of patients with ICD implantation for primary prevention of sudden cardiac death. We took these values a total of 3 times for both groups of patients at 0, 3, and 6 months. SN was analyzed from venous blood by ELISA. Values are expressed as mean, variables are compared using standard statistical methods.
Results: In our group of patients (N = 111), we compared SN levels in OHCA survivors (N = 21; 18.9%) with patients without a history of OHCA (N = 90; 81.1%). Males and females differed in anthropometric and other clinical parameters. Significantly higher maximum SN values (66 vs. 131.3 pmol/l) and median 24.9 vs. 40.75 pmol/l in all 3consecutive samplings with a sufficient time interval (p = 0.0098).
Conclusion: Secretoneurin values are significantly higher in patients with an implanted ICD for secondary prevention than in patients with primary preventive ICD implantation, even long after the event, when they continue to be elevated.



THE IMPACT OF EARLY USE OF ECHOCARDIOGRAPHY PERFORMED BY NON-CARDIOLOGIST IN PATIENTS WITH CHEST PAIN – THE ENDEMIC STUDY

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Topic: Acute conditions in cardiology

Background: Echocardiography is a well-established method in the management of chest pain at emergency department (ED). However, evidence on the optimal scope of the examination and the education of the examiner is scarce. Primary objective was to assess the impact of POCE on length of stay at emergency department. Secondary objectives were to evaluate the impact of POCE on time to revascularization and on the accuracy of the diagnosis at the initial examination.
Methods: ENDEMIC study is a prospective, randomised, open-label single-centre study. Prior to enrolment, physicians without any previous experiences with POCE were educated according to BSE standard level 1. Patients were enrolled into the study and randomised in even-odd manner for POCE within 90 min or for usual management. In all patients the length of ED stay, time to coronary angiography, and accuracy of working diagnosis. Time to revascularization was retrieved from patient's medical records and confirmed by telephonic visit.
Results: The study was terminated early after enrolment of 150 patients, because main objectives were met. The use of POCE resulted in a significant shortening of both a time of decision (138.0 [68.5–230.5] min vs. 252.0

[165.5–304.0] min, p = 0.000004) and a length of ED stay (209.0 [143.5–260.0] min vs. 271.0 [206.5–336.0] min, p = 0.0002. Moreover, in patients indicated for further follow-up, utilisation of POCE resulted in a better concordance of working and final diagnosis: 91,6 % vs. 50 %; RR = 1.83 (1.104–2.565); p = 0.0063. Benefits of POCE were most pronounced in patients requiring hospitalization.
Conclusion: The study showed that echocardiography performed by sufficiently educated physician in patients with acute chest pain results in a significant shortening of ED stay along with improved diagnostic accuracy.

WILD-TYPE TRANSTHYRETIN CARDIAC AMYLOIDOSIS: THE JOURNEY TO DIAGNOSIS IN THE CZECH REPUBLIC. THE RESEARCH PROJECT OF THE CZECH SOCIETY OF CARDIOLOGY

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Topic: Varia

Background and aim of the study: Wild-type transthyretin cardiac amyloidosis (ATTRwt-CA) is an increasingly recognized cause of heart failure (HF) due to population ageing. The purpose of our study was to assess the journey to a correct diagnosis for ATTRwt-CA in the Czech Republic.
Methods: Between November 2022 and May 2023, data were prospectively collected from 118 ATTRwt-CA patients (86% males) followed in 4 referral centres in the Czech Republic.
Results: The mean age at the time of diagnosis was 77 ± 6 years. NYHA class I or II was present in 10% and 56% of patients, respectively. The diagnosis was non-invasive in 63% cases. The most frequent clinical presentation leading to the diagnosis of ATTRwt-CA were HF symptoms (62%). The history of carpal tunnel syndrome preceding the diagnosis of ATTRwt-CA was reported by 54% of patients. The median time intervals between the onset of symptoms to suspected and confirmed diagnosis were 7.5 months.
The diagnosis of ATTRwt-CA was first suspected by outpatient cardiologist in 33% of cases, followed by a tertiary cardiac centre cardiologist (25%). The previous different diagnosis was present in 45% patients, most commonly hypertrophic cardiomyopathy and HF with preserved EF (40% and 26%, respectively).
Conclusions: In the Czech Republic, ATTRwt-CA is noninvasively diagnosed in majority of patients. HF symptoms represent the most common presenting clinical scenario. The history of typical cardiac or extracardiac manifestations is reported by a significant number of patients. Nevertheless, there is still a significant delay between the onset of symptoms and suspected disease, with hypertrophic cardiomyopathy and HF with preserved EF representing the most frequent misdiagnoses. Therefore, educational activities among cardiologists and other physicians are necessary to further increase the awareness of ATTRwt-CA.

INCIDENCE OF APPROPRIATE AND INAPPROPRIATE SHOCKS IN PATIENTS WITH ICD FROM SECONDARY PREVENTION

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Topic: Heart rhythm disorders

Aim: The primary objective of the research was to determine the incidence of appropriate and inappropriate shocks, arrhythmic storms, and recurrence of ventricular arrhythmias after the implantation. The secondary objective was to determine the risk factors to create a profile of patients at risk of appropriate and inappropriate shock.
Methodology: We analysed 393 patients with implanted ICDs for secondary prevention between 2014 and 2018. The analysis was retrospective, with a partially prospective study until 2021. Minimal follow-up was 12 months. We observed risk factors. We analysed data from intracardial ECG to determine the incidence of ventricular arrhythmias, appropriate and inappropriate shocks, and arrhythmic storms.
Results: Data on 393 patients with ICD for secondary prevention (mean age 73 years) was obtained with a mean follow-up of 49 months. The ICD was implanted in 57.8% due to VF and 39.7% due to VT. The incidence risk of VT/VF was 40.4%, with 7.1% of patients experiencing an arrhythmic storm. Appropriate shock incidence was 26.2%,

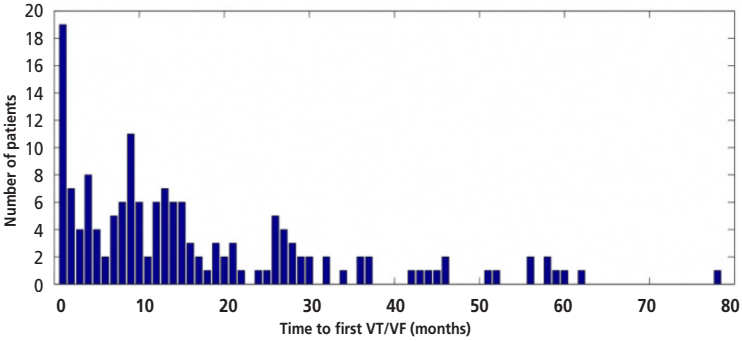

Fig. 1 – Time to the first ventricular fibrillation (VF) / sustained ventricular tachycardia (VT) during follow-up.

while inappropriate shock incidence was 8.9%. Although the primary arrhythmia was mainly ventricular fibrillation, the arrhythmic recurrence was 89.9% in sustained ventricular tachycardia. 51% of patients with arrhythmic recurrence had a ventricular arrhythmia within the first 12 months after the implantation (**Fig. 1**). Surprisingly, no statistically significant risk factors were found to determine appropriate or inappropriate ICD shock.
Conclusion: During the 7-year follow-up, recurrence of ventricular arrhythmia was observed in about 40%, and mainly within the first two years after ICD implantation. Close monitoring during this period is crucial. No statistically significant risk factors for appropriate or inappropriate shocks were found.

EXERCISE-INDUCED POLYMORPHIC VENTRICULAR ARRHYTHMIAS IN PATIENTS WITH FREQUENT VENTRICULAR COMPLEXES

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Topic: Heart rhythm disorders

Aim: Polymorphic ventricular tachycardia (PVT) is a potentially malignant arrhythmia, making it essential to determine the etiology, as different types require varied therapeutic approaches. Our study aimed to determine the etiology of adrenergic-dependent polymorphic ventricular arrhythmias (PVAs) in patients initially undergoing exercise testing due to frequent premature ventricular complexes (PVCs).
Methods: We analyzed 54 patients referred for frequent PVCs (over 30 per hour). All underwent cardiology exams, including exercise tests. Adrenergic-dependent PVAs were identified based on the presence of polymorphic couplets and/or non-sustained PVT during exercise. Patients exhibiting adrenergic-dependent PVT subsequently underwent extensive cardiac assessments, including imaging and genetic testing.
Results: Adrenergic-dependent PVAs were induced in 15 patients. Echocardiography revealed severe mitral regurgitation in one patient, while coronary angiography diagnosed ischemic heart disease in two patients. Magnetic resonance imaging detected signs of arrhythmogenic cardiomyopathy in three patients. After excluding structural heart disease, four additional patients met the criteria for catecholaminergic polymorphic ventricular tachycardia (CPVT), but mutations in the *RYR2* and *CASQ2* genes were not found. However, cardiomyopathy gene analysis identified a mutation in the *FLNC* gene in one patient. Among five patients with confirmed adrenergic dependence and excluded structural heart disease, the etiology remained unclear. Familial occurrence was confirmed in one case.
Conclusion: Adrenergic-dependent PVT represents potentially life-threatening arrhythmia. The differential diagnosis encompasses various conditions, ranging from structural heart disease to channelopathies. Cardiac stress testing can reveal hidden issues in previously asymptomatic patients.

MELATONIN LEVELS IN PATIENTS WITH ATRIAL FIBRILLATION – PILOT RESULTS

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Topic: Heart rhythm disorders

Introduction: Atrial fibrillation is linked to atrial fibrosis, inflammation, and oxidative stress. To date, the sleep hormone melatonin has not been explicitly associated with atrial fibrillation, despite its recognized antioxidant, antifibrotic, and anti-inflammatory properties. A recent study conducted on mice in 2022 demonstrated that melatonin plays a role in partially inhibiting the aforementioned processes involved in the development of atrial fibrillation. However, the endogenous levels of melatonin in patients with atrial fibrillation remain undescribed in the existing literature. The present study aims to investigate the melatonin profiles of patients with atrial fibrillation and to compare these profiles with those of healthy control subjects.
Methods: Saliva samples were collected within a 24-hour period according to a predetermined schedule (10:00, 13:00, 16:00, 19:00, 22:00, 01:00, 04:00, 07:00, 10:00) using specially marked tubes and adhering to strict protocol measures. Following collection, the samples were frozen and subsequently transported to the laboratory for analysis via radioimmunoassay. After measurement, the melatonin levels were statistically evaluated.
Results: In the pilot group of patients (n = 13) and controls (n = 10), melatonin concentrations were found to be reduced in patients with atrial fibrillation compared to controls. Additionally, patients with atrial fibrillation exhibited a lower amplitude of melatonin production.
Conclusion: Atrial fibrillation has been associated with decreased levels of melatonin in a pilot cohort of patients. Melatonin may serve as a protective factor against fibrotic changes and might play a role in mitigating inflammatory and oxidative processes.

Supported by CarDia and EXCELES, No. LX22NPO5104 and MUQUABIS GA no. 101070546.

GLOBAL LONGITUDINAL STRAIN PREDICTS CLINICAL OUTCOME IN PATIENTS AFTER ACUTE ISCHEMIC STROKE WITHOUT LEFT VENTRICULAR DYSFUNCTION

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Topic: Acute conditions in cardiology

Background: Global longitudinal strain (GLS) is a sensitive marker of myocardial dysfunction that could help predict adverse outcomes.
Purpose: We assessed whether GLS can help predict adverse clinical outcomes in patients after acute ischemic stroke (AIS).
Methods: 155 enrolled patients after AIS had echocardiographic examination, due to image quality or LV dysfunction, GLS was assessed in 110 patients with normal LV function. Patients without LV dysfunction after AIS were divided into groups according to abnormal GLS (≤ 15.9%) or normal GLS (≥ 15,9 %). Clinical data, functional outcome, and all-cause mortality at 1 year were compared between groups. Blood samples were obtained to determine levels of high-sensitive troponin I (hs-cTnI).
National Institutes of Health Stroke Scale (NIHSS) at the time of admission and the modified Rankin Scale (mRS) 90 days following the patient's discharge.
Results: The overall mortality was more common in patients with abnormal GLS compared to patients with normal GLS and was significant when comparing mean values (**Fig. 1A**).
The Kaplan-Meier survival curve accentuated a significantly elevated all-cause mortality among patients with abnormal GLS (**Fig. 2**).
Abnormal GLS was associated with positive hs-cTnI (**Fig. 1B**) and was connected to unfavorable functional outcome evaluated by mRS at 90 days (**Fig. 1C**).
Severe stroke (NIHSS >15) was not significantly associated with abnormal GLS.
Conclusion: Abnormal GLS could be helpful predictor for clinical events and subclinical myocardial injury.

Funding
This study was supported by the project National Institute for Research of Metabolic and Cardiovascular Diseases (CarDia) (Programme EXCELES, ID project no. LX22NPO5104), funded by the European Union – Next generation EU.

Table 1 – Association between lower GLS with stroke severity and short-term prognosis in patients after AIS

n=110	GLS≤15,8 % (n=28)	GLS ≥ 15,9 % (n=82)	Unadjusted OR (95% CI)	P value
Death				
90 days	3	2	6.67 (1.1497 to 38.6581)	0.034
1 year	6	6	3.45 (1.0127 to 11.7842)	0.048
Unfavorable outcome				
mRS 90days ≥4	11	15	2.89 (1.1260 to 7.4187)	0.027
Stroke severity				
NIHSS≥16	6	9	2.21 (0.7091 to 6.9009)	0.171

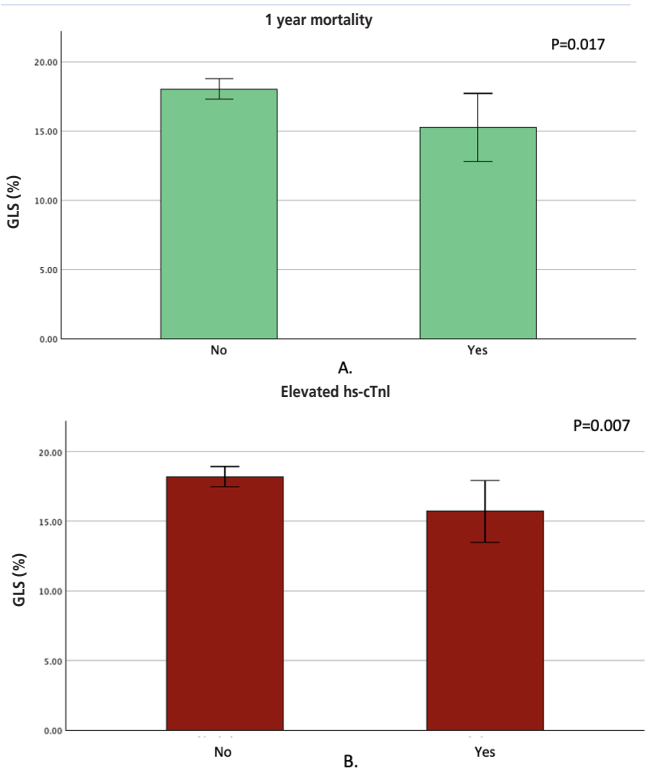

Fig. 1 – Association between abnormal GLS with 1-year mortality (A), hs-cTnI elevation (B).

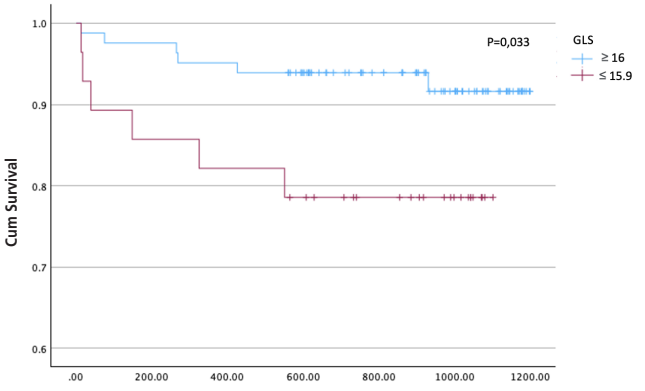

Fig. 2 – Kaplan–Meier event rate curves showing cumulative incidence of death in patients after ischemic stroke with abnormal global longitudinal strain (GLS).

ROLE OF FOLLISTATIN-LIKE 1 (FSTL1) PROTEIN IN RECENT ONSET DILATED CARDIOMYOPATHY: ENERGETIC METABOLISM PERSPECTIVE

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Topic: Heart failure

Aim: Follistatin-like 1 (FSTL1) protein is a cardiokine involved in heart failure pathophysiology. In our previous study, we have shown that changes in its plasmatic levels predict left-ventricular function recovery in recent onset dilated cardiomyopathy (RODCM) patients. In the current study we aimed to better describe its role in cardiomyocytes energetic metabolism to further explain our observations.
Methods: CCTL14 (human embryonic stem cells) cell line was used. FSTL1 knockdown was induced by transfection with lentiviral vector plasmids. Levels and distribution of proteins involved energetic metabolism were studied using western blot and immunocytochemistry. Involvement of FSTL1 in energetic/mitochondrial metabolism was analyzed using the ATP luminescence assay, mitochondrial membrane potential (MMP) measurement (using tetramethyl rhodamine methyl ester fluorescent dye), and mitochondrial oxygen consumption rate (OCR) using Seahorse XFp analyzer.
Results: We show that FSTL1 knock-down negatively affects oxidative phosphorylation of several proteins leading to decrease in ATP production in CCTL14 cells under normoxia. Decrease in FSTL1 further decreased MMP in CCTL14 cells, and decreased both basal (55.05 ± 3.35 vs. 33.70 ± 2.07 pmol/min/cells [p = 0.003]), and maximal (78.53 ± 6.59 vs. 47.35 ± 2.82 pmol/min/cells [p = 0.006]) OCR compared to controls.
Conclusion: We have shown that FSTL1 affects mitochondrial/energetic metabolism by altering MMP, OCR, and ATP production in cardiomyocytes in vitro.

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CORONARY ARTERY MICROVASCULAR DYSFUNCTION

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Topic: Myocardial and pericardial diseases

Introduction: Ischemia with non-obstructed coronary arteries (INOCA) represents a significant challenge in cardiovascular (CV) medicine. Conventional imaging methods often fail to detect underlying microvascular dysfunction.
Aim: To identify microvascular dysfunction (vasomotor disorders) in coronary arterial system, evaluate its risk, and compare it with similar conditions in peripheral arteries.
Patients and methods: This prospective controlled study aims to enroll 40–60 adults with negative coronary angiograms (atherosclerosis ≤ 30% of the artery lumen), indicated for typical angina pectoris or myocardial dysfunction (left ventricular ejection fraction < 50%), along with abnormal electrocardiograms (ECG) of unknown etiology suggestive of ischemia. Exclusion criteria include other significant active or uncontrolled comorbidities (e.g., neoplasms, inflammatory diseases, myocardial hypertrophy, and aortic valve stenosis), localized myocardial dysfunction, and well-known conditions (e.g., thyroid disorders, toxo-nutritional issues). An innovative dynamic myocardial SPECT technique will be the primary method for assessing coronary microvascular dysfunction. To detect microvascular dysfunction in peripheral artery networks relevant dynamic tests will be used. The matched control group will be selected from participants with normal results in coronary angiograms, myocardial function, SPECT, and ECG. Risk assessment will be based on "Major Adverse Cardiac Events (MACE)" during a 1-year follow-up. Data will be expressed as mean (standard deviation) or median (maximum, minimum). Statistical significance will be set at $p < 0.05$.
Conclusion: The authors expect to identify microvascular coronary dysfunction in 30% of the selected patients, with no incidence of major adverse cardiac events (MACE), due to the short follow-up period.

EPICARDIAL ABLATION IN PATIENTS WITH BRUGADA SYNDROME: A SINGLE CENTRE EXPERIENCE

Rafaj A, Peichl P, Krebsová A, Wichterle D, Stojadinovič P, Čihák R, Hašková J, Štiavnický P, Borišincová E, Kautzner J

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Topic: Heart rhythm disorders

Aim: Retrospective analysis of the results of catheter ablation by epicardial approach and genetic testing in patients with a diagnosis of Brugada syndrome (BrS) and repeated adequate ICD interventions.
Sample and methodology: In 2013–2024, catheter ablation by epicardial approach was performed in our centre in 9 patients diagnosed with BrS (mean age 41 ± 6 years, nine males). All patients had an ICD implanted for secondary prevention of sudden cardiac death and presented with adequate ICD therapies (mean 9 ± 11 shocks/patient in the last six months before catheter ablation). Patients underwent cardiogenetic testing.

Results: Type 1 electrocardiogram (ECG) pattern was present at baseline ECG in four (44%) patients; in five (56%) patients, type 1 was induced after ajmaline administration. Genetic testing was performed in seven patients, and only one patient (14%) was found to have a pathogenic mutation in the *SCN5A* gene. Prior to ablation, sustained ventricular tachycardia (VT) / ventricular fibrillation (VF) could be induced by programmed ventricular stimulation (PVS) in three patients (33%). Epicardial ablation targeted at abnormal electrograms located over the right ventricular outflow tract. No complications were noted. The mean follow-up was 25 ± 30 months. In one patient (11%), reablation was required to suppress ventricular arrhythmias (VA) successfully. After the last ablation, no recurrence of VT/VF was observed in any patient.
Conclusions: Epicardial ablation is an effective method that leads to the suppression of VA in patients with a diagnosis of BrS and repeated ICD interventions. Despite the malignant arrhythmic phenotype, patients in our cohort had a rather low prevalence of signs associated with a high risk of VT/VF, such as spontaneous ECG pattern of BrS, inducibility of VT/VF during PVS, or the presence of a causative genetic mutation.

HAS THE CRANIAL EXTENSION OF THE SMALL SAPHENOUS VEIN GOT SIMILAR PARAMETERS IN YOUNG HEALTHY POPULATION AS IN ELDERLY POLYMORBID POPULATION? IS IT A SUITABLE ALTERNATIVE FOR VENOUS GRAFTS?

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Topic: Varia

Has the cranial extension of the small saphenous vein got similar parameters in young healthy population as in elderly polymorbid population? Is it a suitable alternative for venous grafts?
Michaela Veselá, Karel Brabec, Gabriela Dostálová, Aleš Linhart, David Kachlík
The cranial extension of the small saphenous vein (CESSV) is a proximal continuation of the small saphenous vein exteding from the saphenopopliteal junction onto to the posterior aspect of the thigh. The CESSV occurs in in 6 out 7 types of the saphenopopliteal junction arragement. Hence due to its high prevalence and topographical relationships within the popliteal fossa, we could consider it an alternative source of venous graft for surgeries in this region. As the population is getting older, the typical venous grafts as a great and small saphenous veins can feature an inadequate morphology due to the chronic venous insufficiency or had been used for previous surgeries and thus we assume a further need of new venous grafts in the future.
In ultrasonographic study we screened the saphenopopliteal junction in young healthy population in 244 cases be linear sonde in B mode. The ECVSP was detected in 210 cases (86%), the average length was 18.72 cm. In polymorbid elderly population we detected ECVSP in 83% (25/30). The average length was 20.3 cm and average calibre was 2.62 mm.
If the average length of venous bypass is generally required to between 10 cm and 20 cm, the ECVSP could be a suitable variant in young population as well as in elderly. The difference between length of ECVSP in young and in elderly population is according to the required length insignificant. The most suitable usage of ECVPS as a venous graft can be as a femoropoliteal bypass, typically used for treatment of aneurysm of the popliteal artery.

HEART RATE VARIABILITY IN PATIENTS UNDERGOING PULMONARY VEIN ISOLATION USING PULSED FIELD AND RADIOFREQUENCY ENERGY

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Topic: Heart rhythm disorders

Aim: Pulmonary vein isolation (PVI) using radiofrequency (RF) energy, in addition to electrical isolation of the veins, leads to the ablation of collateral ganglion plexuses and thus to the influence of the autonomic nervous system. Data on the effect of pulsed field (PF) ablation are very limited. The aim was to compare heart rate variability (HRV) in patients undergoing PVI using RF and PF energy.
Methodology: Forty-eight patients who underwent PVI were included in the study. 26 patients underwent PVI with PF (PFA) and 22 with RF energy (RFA). All patients had a 24-hour Holter ECG recorded the day before the procedure and 1 month after the procedure. Parameters from the time, frequency, and non-linear domains were analyzed.
Results: The mean age was 58 ± 9 years in the PFA and 64 ± 12 years in the RFA group (p = NS). 7 patients in the PFA group and 9 in the RFA did not have an evaluable Holter before the procedure due to a large temporal representation of atrial fibrillation or SVES. Mean heart rate increased after 1 month in both groups, in PFA from 63 ± 9 to 69 ± 10 bpm (p = 0.001), in RFA from 56 ± 9 to 67 ±

10 bpm (p = 0.0005). Of the frequency parameters, there have been changes in the area of very low frequencies (VLF). Power in the VLF decreased from 178 ± 90 ms^2 to 133 ± 91 ms^2 (p = 0.005) in the PFA group and from 224 ms2 to 55 ± 53 (p = 0.002) in the RFA group. Power values in the VLF region at 1-month control were significantly lower in the RF group (69 ± 74) compared to PF patients (123 ± 85, p = 0.005). Of the non-linear parameters, the SD2 parameter decreased from 38 ± 14 ms to 32 ± 14 ms (p = 0.002) in the PF group and from 41 ± 32 to 23 ± 17 (p = 0.048).

Conclusion: When isolating the pulmonary veins, the autonomic system is affected by both RF and PF energy. Changes after radiofrequency ablation are more pronounced than after pulsed field ablation.