Abstracts of original contributions

18th Interventional Cardiology Workshop New Frontiers in Interventional Cardiology

December 7th, 2017, Krakow, Poland

1-P

Economic outcomes of the CAT-CAD randomised trial assessing Coronary Artery computed Tomography as the first-choice anatomic test for individuals with suspected significant Coronary Artery Disease

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Bakground: Current recommendations indicate invasive coronary angiography (ICA) as the first-line anatomic test in stable patients with high probability of significant coronary artery disease (CAD). However, this approach effects in increased proportion of non-actionable ICAs (not followed by invasive treatment). Clinical efficacy and the safety of the strategy employing coronary computed tomography angiography (CCTA) as the first-choice imaging test in this population has been recently evaluated in the CAT-CAD randomised trial. Based on prospectively collected data we aimed to evaluate its economic outcomes.
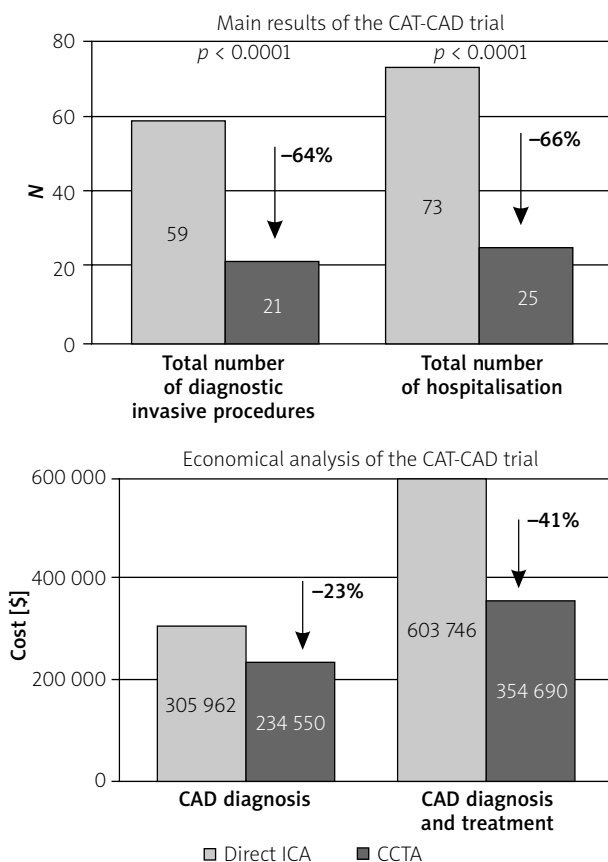
Methods: One hundred and twenty consecutive stable patients with indications to invasive CAD diagnosis were randomised 1 : 1 to undergo ICA *versus* CCTA as the first-line anatomic test. Outcomes were evaluated during the entire diagnostic and therapeutic course. Simultaneously, we counted the number of medical resources, such as: CCTAs, ICAs, percutaneous coronary interventions (PCIs), coronary artery bypass grafts (CABGs), functional tests, stents, clinical visits, hospital days. We estimated the cumulative cost for each strategy by multiplying medical resources by its standarised costs. Clinical Trials: NCT 02591992.

Results: Economic analysis showed that the total cost of CAD diagnosis was significantly higher in the direct ICA group as compared to the CCTA group ($305,962 vs. $234,550), with the median per-patient cost of $2838 (2,838–2,838) vs. $409 (409–3,247), respectively (p = 0.0001). Similarly, the entire diagnostic and therapeutic course was significantly more expensive in the direct ICA group ($603,746 vs. $354,690), with the median per-patient cost of $2,838 (2,838–16,102) vs. $409 (409–9,930), respectively (p < 0.0001) (Figure 1).

Conclusions: Application of CCTA as the first-line anatomic test in patients with suspected significant CAD decreased the total costs of diagnosis. This benefit can be achieved by reducing the number of invasive tests and hospitalisations.

Figure 1. Main results and economical analysis of the CAT-CAD trial

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2-P

Differences in fibrous cap thickness, area and pattern between stable angina patients and ST-elevation myocardial infarction patients

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Background: Thick cap fibroatheroma (TCFA) is considered as one of the features of vulnerable plaque. However, current methodology is based on measurement in arbitrary points and ignores 3-dimensional structure of coronary arteries.

Purpose: The aim of our study was to compare TCFA area using 3-demensional programming between stable angina (SA) and ST-elevation myocardial infarction (STEMI) patients using optical coherence tomography.
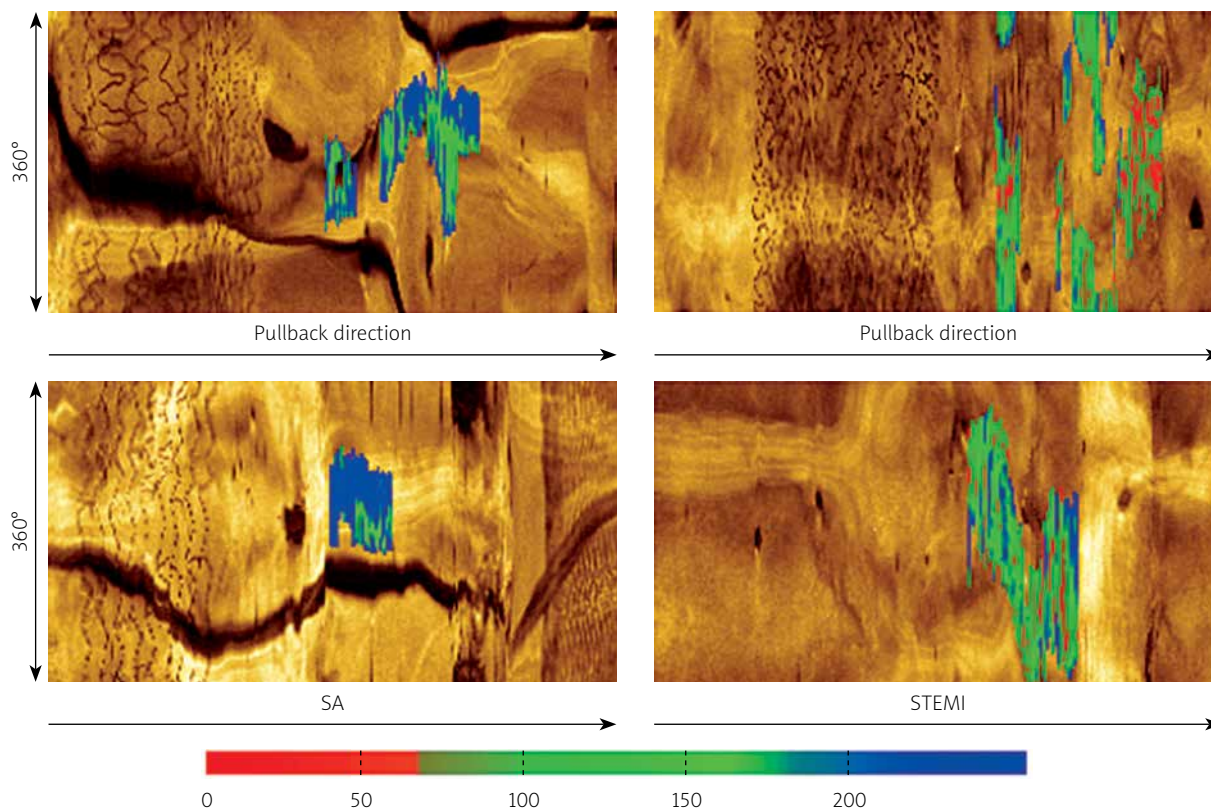
Figure 1. Optical coherence tomography example of fibrous cap thickness (FCT) of stable angina (SA) and ST elevation myocardial infarction (STEMI) patient. Red colour represents FCT lower than 80 µm, green from 80–200 µm, and blue more than 200 µm

Methods: We have compared non-culprit plaques in 27 SA and 27 STEMI patients undergoing percutaneous coronary intervention. The TCFA was defined as a fibrous cap thickness lower than 80 µm. Whole TCFA area, number of spots with TCFA and average area of each spot were measured.

Results: Patients characteristics between two groups were comparable. However, patients with STEMI were less frequently on statins (17% vs. 70%; $p < 0.001$) and β-blockers (4% vs. 48%; $p = 0.001$). STEMI patients had greater TCFA area (1.2 ±1.3 vs. 0.2 ±0.5 mm^2; $p < 0.001$), bigger largest TCFA spot (0.5 ±0.5 vs. 0.1 ±0.2 mm^2; $p < 0.001$), greater number of TCFA spots (10.0 ±10.1 vs. 3.2 ±4.4; $p = 0.002$), as well as greater mean spot area (0.18 ±0.36 vs. 0.05 ±0.04 mm^2; $p < 0.001$) (Figure 1).

Conclusions: The STEMI patients have greater TCFA area in non-culprit plaques, which may explain higher rate of adverse events in this groups as compared to SA patients.

3-P

Is there racial difference in coronary plaque characteristics between White versus East Asians?

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Background: Prevalence of coronary artery disease as well as cardiac mortality varies between Asians and White patients. However, the link between race and plaque characteristics among patients with coronary artery disease remains largely unexplored.

Purpose: The aim of our study was to compare the detailed culprit plaque characteristics between East

Asian and White patients with coronary artery disease using optical coherence tomography.

Methods: We performed propensity score matching between Asian and White patients at 1 : 1 ratio based on the following variables: (1) age; (2) gender; (3) clinical presentation; (4) diabetes mellitus; (5) hyperlipidemia; (6) culprit lesion location. Overall, 101 East Asian patients were matched to 101 White patients.

Results: Majority of patients were male (80.2%) and average age was 60 years. Other than higher body mass index (BMI) in White patients (29.6 ±5.1 vs. 24.2 ±3.1 kg/m^2; $p < 0.001$) baseline demographics were comparable between the two groups. In those patients presented with acute coronary syndrome (ACS) no differences in underlying pathology (rupture vs. erosion) were found between the two races (Table I). In adjusted analysis, lesion length was longer, lipid length and lipid index were greater, and mean reference area was larger in White patients compared to East Asian patients.

Conclusions: There are significant differences in plaque morphology between East Asian and White patients even after controlling for confounders. Our findings underscore key differences in atherosclerosis between East Asian and White populations and may have to be taken into consideration in interpreting the results of future research.

Table I. Optical coherence tomography findings

Parameter	White (n = 101)	East Asians (n = 101)	P-value
Underlying pathology (ACS), n:	62	50	0.935
Rupture, n (%)	32 (50.0)	33 (51.6)	
Erosion, n (%)	20 (31.3)	17 (26.6)	
Lesion length [mm]	18.0 ±6.0	14.6 ±5.4	0.002
Lipid core length [mm]	9.4 ±4.6	7.2 ±3.8	0.044
Mean lipid arc [°]	169.2 ±41.8	148.8 ±40.7	0.002
Lipid index	1635 ±987	1104 ±730	0.006
Mean reference area [mm^2]	8.1 ±3.0	6.5 ±2.4	0.021

Values are mean ± standard deviation (SD) or n (%).

Cardiac complications risk during coronary artery chronic total occlusion recanalization by antegrade approach

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Purpose: The aim of the study was to define cardiac complications risk during antegrade coronary artery chronic total occlusion (CTO) recanalization.

Methods: From 2009 to 2013 the attempt of antegrade coronary artery CTO recanalization was performed in 217 patients. Depending on success of recanalization patients were divided into: group 1 ($n = 158$) – successful procedure, group 2 ($n = 59$) – unsuccessful attempt of CTO recanalization.

Results: Occurrence of cardiac complications was noted in 57 patients (26.3% of cases) – coronary artery dissection (11.5%), perforation of a coronary artery (5.5%) and coronary artery spasm (5.1%) among them. We didn't note any cases of cardiac death, an acute myocardial infarction, and an immediate coronary artery bypass surgery. All perforation cases were induced by wire manipulation, dissections most often occurred during coronary stent implantation, coronary spasm developed at all stages of CTO recanalization. Frequency of cardiac complications was identical in both groups (25.9% in group 1 vs. 27.1 % in group 2, $p = 0.8637$). Unsuccessful CTO recanalization was associated with higher perforation rate (2.5% in group 1 vs. 13.6% in group 2, $p = 0.0266$), especially Ellis II type perforation (2.5% in group 1 vs. 10.2% in group 2, $p = 0.0039$).

Conclusions: The obtained data confirm a high safety profile of antegrade CTO recanalization emphasized by absence of "big"" cardiovascular complications and suitable outcome in coronary artery dissection and perforation cases.

5-P

Contrast medium Pd/Pa ratio in comparison to fractional flow reserve, quantitative flow ratio and instantaneous wave-free ratio – a comprehensive assessment

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Purpose: The aim of the study was to assess the accuracy of Pd/Pa ratio registered during submaximal hyperemia induced by contrast medium (CMR) in predicting of fractional flow reserve (FFR), quantitative flow ratio (QFR) and instantaneous wave-free ratio (iFR).

Methods: Resting Pd/Pa, CMR, FFR, QFR and iFR were measured in 110 intermediate coronary stenosis. CMR was obtained after intracoronary injection of contrast medium. FFR was measured after intravenous administration of adenosine. QFR was derived from fixed empiric hyperemic flow velocity based on coronary angiography. The iFR was calculated by measuring the resting pressure gradient across a coronary lesion during the portion of diastole when microvascular resistance is low and stable.

Results: Forty four patients with 110 intermediate coronary stenosis were enrolled. Mean baseline Pd/Pa was 0.93 ±0.05. Mean CMR value was similar to FFR value (0.83 ±0.09 vs. 0.81 ±0.09, $p = 0.13$) and QFR (0.81 ±0.1, $p = 0.69$) and iFR (0.9 ±0.07, $p = 0.1$). Forty-six vessels (41.8%) had FFR ≤ 0.80. Fifty (45.5%) vessels had CMR ≤ 0.83. Forty-four (40.0%) vessels had QFR ≤ 0.80. Thirty-eight (34.5%) vessels had iFR ≤ 0.89. Resting Pd/Pa, FFR, QFR and iFR correlated with CMR ($r = 0.83$, $r = 0.98$, $r = 0.96$, $r = 0.81$, respectively, $p < 0.001$ for all). The optimal cutoff value of CMR was 0.83 for prediction of FFR ≤ 0.80 with sensitivity, specificity, and accuracy of 96.9%, 97.8%, and 97.3% respectively. A 100% sensitivity was observed for cutoff value of 0.82 and a 100% specificity for cutoff value of 0.84; AUC = 0.998 (0.995–1.00); $p < 0.001$.

Conclusions: CMR seems to be accurate in predicting the functional significance of coronary stenosis assessed with FFR, iFR and QFR.

6-P

Radial versus femoral access in patients undergoing percutaneous coronary intervention with rotational atherectomy – the results of early and one-year observation

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Background: Rotational atherectomy (RA) is a method of treatment of highly calcified lesions that cannot be treated with traditional percutaneous coronary intervention (PCI). Despite higher access site complication rates, transfemoral approach (TFA) may be preferred to obtain proper backup, facilitate atherectomy and achieve procedural success. In this study we compare transradial (TRA) and TFA in RA patients.

Methods: We retrospectively analysed data in 177 patients who underwent RA using either TFA ($n = 54$) or TRA ($n = 123$).

Results: Patients with TRA were more likely to be males (73% vs. 57%, $p < 0.05$) with no difference in age (71 ±10 years). The prevalence of risk factors and comorbidities was similar in groups, however EuroSCORE II mortality risk was higher in the TFA group (3.15% vs. 2.1%, $p < 0.05$). Procedural success was achieved in 93% cases with no inter-group difference. TFA was associated with higher rates of major bleeding (13% vs. 1%), more frequent usage of pacing (30% vs. 3%), higher contrast volume (280 ml vs. 250 ml), and longer hospital stay (3 vs. 2 days, all $p < 0.05$). There was no difference in total in-hospital or 1-year stroke, acute coronary syndrome, decompensated heart failure or mortality rates.

Conclusions: Rotational atherectomy is a challenging and demanding technique and TFA may seem to be optimal approach to achieve optimal effect, however our data show that TRA is associated with lower bleeding rates with the same success as compared with TFA. It is necessary to include TRA in complex coronary procedures training to achieve best results and minimize the risk of complications.

Treatment of left main coronary artery stenosis with the STENTYS self-expandable drug-eluting stent – a multicenter registry

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Background: There paucity of real-life data on left main (LM) therapy with self-expandable drug eluting stent (DES). The following Stentys Left Main registry aimed to assess clinical outcomes of LM percutaneous coronary intervention (PCI) using such self-expandable platform (Stentys).

Methods: A multicenter registry consists of 154 consecutive patients treated with Stentys implanted to LM. Major adverse cardiac and cerebral events (MACCE) such as composite of death, myocardial infarction (MI) and stroke were recorded at 30-days and 12-months.

Results: Patients' mean age was 69 ±10.5 years. Acute coronary syndrome was diagnosed in 40 (26.5%) cases including NSTE-ACS ($n = 28$, 18.1%) and STEMI ($n = 12$, 7.8%). Median EuroSCORE II was 2.2% (IQR: 1.0–4.5). Prior CABG were performed in 40 (25.9%) patients. Mean LVEF was 46.0 ±11.9%. Distal LM bifurcation lesions were present in 152 (98.7%) patients (Medina: 1,1,1 ($n = 59$, 38.3%), 1-1-0 ($n = 62$, 40.2%), 1-0-1 ($n = 16$, 10.4%), 1-0-0 ($n = 17$, 11.1%)). There was a significant difference between proximal and distal reference diameter of the lesions (4.0 (IQR: 3.9–4.1) vs. 2.9 (IQR: 2.8–3.0), $p < 0.001$). Stentys DES was implanted in the sequence LM to LAD in 107 (69.4%) cases. Stentys strut disconnection for SB access were done in 94 (61.2%) patients, because of

angiographically significant stenosis of SB. Final kissing balloon inflation was performed in 25 (16%) cases. Six patients required ventricular assist devices during procedure. One patient had an acute stent thrombosis (ST) and 1 patient had late ST post PCI, there were 7 (4.5%) cardiac death, 2 (1.2%) target lesion revascularization (TLR), 3 (1.9%) MI and 9 (5.8%) MACCE during 30 days follow-up. At 12-month follow-up there were 9 (5.8%) cardiac death, 9 (5.8%) TLR, 7 (4.5%) MI and 19 (12.3%) MACCE. In 2 cases, TLR was the cause of MI.

Conclusions: The real-life multicenter registry showed that the use of Stentys DES self-expanding coronary stent is associated with acceptable short and midterm outcomes in all-comer population of patients including ACS with significant LM stenosis.

Acute myocardial infarction as a first time presentation of coronary artery disease – demographics, comorbidities and interventional treatment in Poland in 2014–2016

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Background: Acute myocardial infarction may be the first manifestation of coronary artery disease (CAD). The aim of this study was to compare demographics, past

Table I. Baseline characteristics

Parameter	First manifestation of CAD	Subsequent manifestation of CAD	*P*-value
Age [years]	66 ±12	69 ±11	< 0.001
Gender – females	34%	30%	< 0.001
Time from pain onset till angiography [min] – median	390	538	< 0.001
Diabetes mellitus	19%	33%	< 0.001
Smoking	28%	20%	< 0.001
Arterial hypertension	61%	77%	< 0.001
COPD	2%	4%	< 0.001
Femoral access site	27%	36%	< 0.001
1-vessel disease in angiography	46%	30%	< 0.001

medical history and angiographic presentation of patients with myocardial infarction as a first or subsequent manifestation of CAD.

Methods: Patient with STEMI or NSTEMI treated with PCI were enrolled to this registry study in Poland in 2014–2016 (the national ORPKI registry).

Results: There were 123 965 patients who fulfilled inclusion criteria. Acute myocardial infarction as first CAD presentation was diagnosed in 77% of cases (Table I).

Conclusions: Patients with acute myocardial infarction as first CAD manifestation constitute ca. 75% of all cases and are characterized by lower mean age, more frequent female gender and cigarette smokers. These patients are also prone to more frequent use of radial approach and are characterized by single vessel disease in angiography. The time from pain onset to angiography was significantly (by ca. 2 h) lower in patients with first CAD manifestation.

Guidelines for secondary prevention of cardiovascular disease and their realization in clinical practice

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Background: Secondary prevention of cardiovascular disease (CVD) aims to prevent the recurrence of cardiovascular events in patients already diagnosed with CVD. It involves the optimal pharmacotherapy and modification of the risk factors, understood as lifestyle changes in the area of physical activity, diet and addiction habits like smoking.

Purpose: The aim of the study was to analyze the realization of guidelines for secondary prevention of CVD in clinical practice.

Methods: We included 320 consecutive patients (92 women) with a mean age of 64.8 ±9.0 years hospitalized at the 2nd Department of Cardiology and Cardiovascular Interventions, University Hospital in Krakow. Patients had a history of acute myocardial infarction and/or had undergone percutaneous coronary interventions, coronary artery bypass grafting, or pharmacologically treated CVD.

Results: The mean body mass index (BMI) was 28.7 ±4.5 kg/m^2 (45.6% of patients were overweight, 34.3% were obese). At the time of hospitalization, 16.3% of patients were active smokers; 43.8% smoked cigarettes for 28.2 ±12.4 years, 20.2 ±10.8 cigarettes per day. Only 15.4% of patients with acute myocardial infarction had cardiac rehabilitation after hospital discharge. In laboratory tests, mean level of total cholesterol 4.2 ±1.4 mmol/l; LDL 2.2 ±1.0 mmol/l; HDL 1.2 ±0.4 mmol/l; triglyceride 1.7 ±1.7 mmol/l. The mean fasting glucose in people without diabetes was 5.6 ±0.8 mmol/l; HbA$_{1c}$ in diabetics 7.1 ±1.2%. Furthermore, diet was assessed using study-dedicated questionnaire and level of physical activity was evaluated by The International Physical Activity Questionnaire.

Conclusions: In the studied group, there were differences from the recommendations for secondary prevention of CVD. There is a necessity to improve the care of patients with CVD. Adherence to recommendations may reduce the risk of recurrent cardiac events.

Predictors of radial artery occlusion after various percutaneous coronary interventions

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Background: Radial artery (RA) access for percutaneous coronary interventions (PCI) is gaining more supporters each year. It is considered safer than commonly used femoral access, however it also has its drawbacks. One of the major complications of radial access is radial artery occlusion (RAO).

Purpose: The aim of the study was to assess the predicting factors of RAO in patients undergoing various coronary interventions.

Methods: We prospectively evaluated clinical and laboratory data of 351 consecutive patients. Presence of blood flow in radial artery was evaluated in all patients by plethysmography on the next day after the procedure.

Results: RAO was observed in 52 (15%) patients. Differences between patients with and without RAO are presented in table below. Univariate logistic regression models showed compression time (OR = 1.6; 95% CI: 1.3–1.9; $p < 0.001$) female sex (OR = 2.8; 95% CI: 1.5–5.2; $p < 0.001$), coronary angiography as the only procedure (OR = 2.3; 95% CI: 1.2–4.6; $p = 0.02$), height (OR = 0.94; 95% CI: 0.91–0.98; $p = 0.002$), weight (OR = 0.97; 95% CI: 0.95–0.99; $p = 0.02$), and eGFR (OR = 0.98; 95% CI: 0.97–0, $p = 0.006$) to be predictors of RAO. In multivariate model time of RA compression (OR = 1.8, 95% CI: 1.4–2.2;

Table I. Clinical and procedural characteristics

Parameter	RAO +	RAO −	All patients	P-value
N (%)	52 (15)	299 (85)	351 (100)	
Female sex, n (%)	29 (56)	92 (31)	121 (34)	< 0.001
Age [years]	66 ±9	66 ±11	66 ±11	0.83
Height [cm]	165 ±9	170 ±8	169 ±9	0.001
Weight [kg]	78 ±16	82 ±14	82 ±15	0.005
Diabetes, n (%)	13 (25)	78 (26)	91 (26)	0.86
Hypertension, n (%)	49 (94)	271 (91)	320 (91)	0.39
Prior CABG, n (%)	4 (8)	27 (9)	31 (9)	0.75
Prior MI, n (%)	19 (37)	130 (43)	149 (42)	0.35
HFrEF, n (%)	10 (19)	64 (21)	74 (21)	0.72
Current smoker, n (%)	17 (33)	70 (23)	87 (25)	0.15
eGFR [ml/min/1.73 m²]	80 ±28	90 ±22	88 ±23	0.004
Compression time [h]	4.3 ±1.9	3.0 ±1.2	3.2 ±1.4	< 0.001
Coronary angiography only, n (%)	40 (77)	176 (59)	216 (62)	0.01
Coronary angiography + PCI, n (%)	11 (21)	100 (33)	111 (32)	0.08
PCI only, n (%)	1 (2)	23 (8)	24 (7)	0.12
5 Fr sheath only, n (%)	0	7 (2)	7 (2)	0.56
5 Fr catheter only, n (%)	28 (54)	146 (49)	174 (41)	0.5
GP2b3a inhibitors, n (%)	7 (13)	38 (13)	45 (13)	0.8
Urgent procedure, n (%)	25 (48)	102 (34)	127 (36)	0.05
UFH dose [× 1000 U]	4.1 ±1	5.1 ±1.6	4.9 ±1.6	0.07

$p < 0.001$) and coronary angiography as the only performed procedure (OR = 3.8; 95% CI: 1.7–8.7; $p = 0.001$) remained independent predicting factors of RAO (Table I).

Conclusions: RAO is not uncommon after PCI. Its clinical significance is still unknown. Higher incidence of RAO after coronary angiography in our population may be attributed to lower doses of heparin administered during this procedure which may need to be increased. Compression times after all procedures should be limited to minimum.

A long-term outcome of balloon pulmonary angioplasty in chronic thromboembolic pulmonary hypertension

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Purpose: The aim of the study was to assess survival in CTEPH patients treated with balloon pulmonary angioplasty (BPA) in comparison to pulmonary endarterectomy (PEA) and conservative treatment (CON).

Methods: We enrolled 68 patients with the diagnose of inoperable or persistent CTEPH confirmed by CTEPH-team treated with BPA from 2013 to 2017. The survival of this population was compared to historical control group ($n = 112$) CTEPH patients which have undergone PEA ($n = 46$) or been treated conservatively ($n = 66$).

Results: The median survival duration observed in BPA population was 22.1 ±14.8 months. The cumulated survival index was 94.2% (95% CI: 88–100%) in the 50th month. In the historical control group the cumulated index of survival after PEA was 90.9% (95% CI: 84–97%) after 50 months (log-rank test vs. the BPA-treated group; 0.31) and
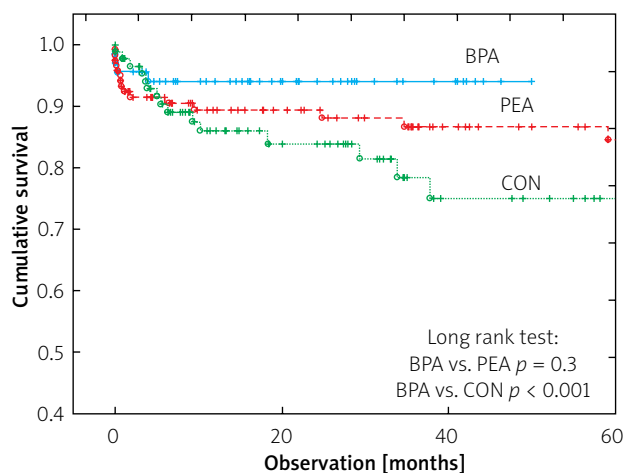

Figure 1. Cumulative survival in CTEPH patients treated with different methods

BPA – treated with balloon pulmonary angioplasty, PEA – treated with pulmonary endarterectomy, CON – treated conservatively.

in the patients receiving conservative treatment the survival rates were 70.1% (95% CI: 56–84%) after 50 months, respectively. The survival rate of patients treated with BPA was better than that of the historical CTEPH patients (Figure 1) only on pharmacotherapy ($p < 0.001$), and was similar to that of the patients treated with PEA ($p = 0.31$).

Conclusions: The survival rate in patients with CTEPH treated with BPA is better than that in patients receiving pharmacotherapy and similar to that in the group of patients subjected PEA.

12-P

Comparison of tip and side placement of excision blades in atherectoms

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Purpose: The aim of the study was to compare long-term outcomes after PAD endovascular revascularization with two types of atherectomy with tip(tAT) (Phoenix® Philips) and side(sAT) (SilverHawk® Medtronic) based excision blades.

Methods: This was a single center, retrospective registry of obstructive and symptomatic PAD patients who underwent revascularization with atherectomy. The endpoints were considered as target lesion revascularization (TLR), death, amputations and bailout stenting (BS).

Results: In tAT group was 97 patients, whereas 85 was in sAT group. There were no significant differences between group in baseline characteristics except for increased CLI prevalence in tAT group. The mean follow
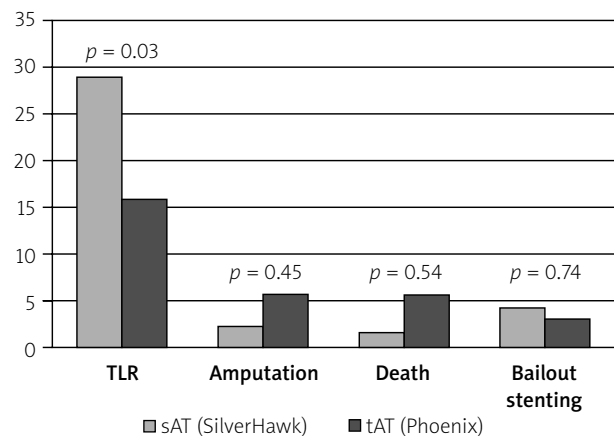

Figure 1. Results

up was 282.6 ±147.4 and 255.7 ±186.1, sAT and tAT, respectively ($p = 0.44$). The TLR was more frequent in sAT group than in tAT (sAT: 25 (29.0%) vs. tAT: 15 (15.9%) $p = 0.03$). There were no significant differences in death (sAT: 1 (1.7%) vs. tAT: 5 (5.7%); $p = 0.54$), amputations (sAT: 2 (2.3%) vs. tAT: 5 (5.7%); $p = 0.45$) and bailout stenting (sAT: 2 (2.3%) vs. tAT: 3 (3.2%); $p = 0.74$). Kaplan-Mayer analysis showed no significant differences between groups in time to TLR, amputation and death (Figure 1).

Conclusions: This study is hypothesis generating that plaque modification with tip based excision blades in directional atherectomy is more efficient than with blades placed on the side of the catheter.

13-P

Hybrid carotid and coronary revascularization. Safety and feasibility study

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Background: Concurrent carotid and coronary disease affects an increasing number of patients eligible for surgical coronary revascularization. Assuredly, higher perioperative risk is observed in these individuals. Combined 1-day intervention may reduce the postoperative major cardiac and cerebrovascular events (MACCE) rate; however, bleeding and renal complications can be observed more frequently.

Purpose: The aim of the study was to asses safety and feasibility of hybrid carotid and coronary revascularization.

Methods: Retrospective cohort study including 57 consecutive patients (42 males, 15 females; mean age: 70.8 ±6.9 years) with median EuroSCORE II of 2.4% (1.7–3.0) who underwent hybrid one-day carotid and coronary revascularization.

Results: No 30-day mortality or MACCE were observed and patients were usually discharged on postoperative day 8. Postoperative chest-tube output significantly increased after receiving Clopidogrel (0.2 vs. 0.4 ml/kg/h; $p < 0.001$).

Bleeding events, including re-exploration for bleeding, pleural hematoma, cardiac tamponade, active bleeding (> 1.5 ml/kg/h), massive blood product transfusions (≥ 5 units of PRBC or FFP), and gastrointestinal bleeding occurred in 19.3% of individuals. Platelet count ≤ 110 000 at the cessation of extracorporeal circulation increased the risk of bleeding event (OR = 5.7 (1.39–23.36); p = 0.016). Acute kidney injury was observed in 22.8% of patients and the risk increased with the duration of extracorporeal circulation (OR = 1.41 (1.06–1.88); p = 0.02 for every 10 min). At the median follow-up of 28 (12.5–61) months MACCE occurred with 21.1% rate and was predicted by EuroSCORE II in a Cox-regression model (HR 1.71 (1.11–2.64); p = 0.016).

Conclusions: Hybrid carotid and coronary revascularization may be performed with acceptable outcome in a specialized cardiac center.

14-P

Circulating miRNAs levels differ with respect to carotid plaque characteristics and symptom occurrence in patients with carotid artery stenosis and provide information on future cardiovascular events

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Background: This prospective study investigated associations between circulating microRNAs (miRNAs) and symptomatic, asymptomatic internal carotid artery stenosis (ICAS), carotid plaque morphology and future cardiovascular events.

Methods: Circulating miRNAs (miR-1-3p, miR-16-5p, miR-34a-5p, miR-124-3p, miR-133a-3p, miR-133b, miR-134-5p, miR-208b-3p, miR-375 and miR-499-5p) were analyzed in 92 consecutive patients with significant ICAS referred to revascularization. Group I comprised 65 subjects (41 M, age: 69.3 ±9.7 y.o.) with recent cerebral ischemic event (CIE). Group II comprised 27 patients (15 M, age: 68.2 ±8.4 y.o.) with asymptomatic ICAS. The ICAS degree and plaque morphology was assessed by ultrasonography. The incidences of cardiovascular death (CVD), myocardial infarction (MI) and recurrent CIE (CVD/MI/CIE) were recorded prospectively (mean: 38.7 ±3.8 months).

Results: Group II and group I differed significantly in levels of miR-124-3p (p = 0.036), miR-133a-3p (p = 0.043) and miR-134-5p (p = 0.02). Hypoechogenic, as compared to echogenic plaques differed in levels of miR-124-3p (p = 0.038), miR-34a-5p (p = 0.006), miR-133b (p = 0.048), miR-134-5p (p = 0.045), and miR-375 (p = 0.016), while calcifiedinmiR-16-5p (p = 0.023). Ulcerated plaques showed higher levels of miR-1-3p (p = 0.04) and miR-16-5p (p = 0.003), while thrombotic lower levels of miR-1-3p (p = 0.032). CVD/MI/CIE occurred in 14 (15.5%) out of 90 follow-up patients. Multivariate Cox and ROC analysis showed associations between miR-1-3p and CVD (AUC = 0.634; HR = 4.84; 95% CI: 1.62–14.5; p = 0.005), MI (AUC = 0.743; HR = 7.8; 95% CI: 2.01–30.0; p = 0.003), CVD/MI/CIE (AUC = 0.560; HR = 4.6; 95% CI: 1.61–13.1; p = 0.004), while miR-133b with recurrent CIE (AUC = 0.581; HR = 2.25; 95% CI: 1.01–5.02; p = 0.047).

Conclusions: The significant difference in levels of selected miRNAs is observed in symptomatic vs. asymptomatic ICAS. Plaque morphology and structure is associated with miRNAs levels change. The expression of miR-1-3p may be potentially prognostic factor for future cardiovascular events.

15-P

Impact of pre-procedural cerebrovascular events on clinical outcomes after transcatheter aortic valve implantation in patients with severe aortic stenosis

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Background: Transcatheter aortic valve implantation (TAVI) is an increasingly common treatment of symptomatic severe aortic valve stenosis (AS). Thus, it is reasonable to carefully investigate the impact of individual clinical factors on outcomes after TAVI.

Purpose: We aimed to investigate the impact of the previous cerebro-vascular events (CVEs) on outcomes of patients with severe AS undergoing TAVI.

Methods: A total of 148 consecutive patients scheduled for TAVI were included and stratified as with and

without a history of CVEs (stroke or transient ischemic attack). Frailty features were also assessed. The primary endpoint was 12-month all-cause mortality.

Results: Seventeen (11.5%) patients had a history of CVEs (the CVE group). At 30 days and 12 months all-cause mortality was higher in the CVE group (30-day: 5 (29.4%) vs. 7 (5.3%); $p = 0.005$; 12-month: 9 (52.9%) vs. 13 (9.9%); $p = 0.001$). Similarly, at the longest available follow-up mortality was higher in the CVE group (10 (58.8%) vs. 23 (17.6%); $p = 0.001$). Similar rates of other complications after TAVI were noted, apart from in-hospital acute kidney injury (AKI) grade 3 (3 (17.6%) vs. 5 (3.8%); $p = 0.049$) and blood transfusions (9 (52.9%) vs. 35 (26.7%); $p = 0.026$). Results of 5MWT and Katz index assessment indicated a greater level of frailty in the CVE group. There were no differences in subsequent events including CVEs, bleeding, myocardial infarction, and new-onset of atrial fibrillation (AF) at 12 months between groups.

Conclusions: We showed that a history of CVEs in patients with severe AS undergoing TAVI is associated with a higher long-term mortality.

16-P

Anatomy of the mitral sub-valvular apparatus

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Purpose: The aim of the study was to characterize morphological variations in the papillary muscles and tendinous cords of the left ventricle and ventricular zones of the mitral valve leaflets.

Methods: A total of 100 autopsied human hearts from healthy donors with classical mitral valve type were investigated.

Results: In one heart, only one group of papillary muscles was found, and in the remaining 99%, we could distinguish two groups of muscles: superolateral (SLPM) and inferoseptal papillary muscle (ISPM) groups. The SLPM group had one papillary muscle (75.8%), two in 20.2%, and > three in 4.0%. In the ISPM group, the muscle percentages were 38.4%, 36.4%, and 25.2%, re-

spectively. The apex of at least one papillary muscle was situated higher than the plane of the opened anterior leaflet (AML) in 47.5% and 50.5% for the SLPM and ISPM groups, respectively. The number of strut cords arising from the SLPM group was 0 (2.0%), 1 (50.5%), 2 (33.3%), 3 (12.1%), and 4 (2.0%), and from the ISPM group was 0 (6.1%), 1 (52.5%), 2 (35.4%), or 3 (6.1%). Cords to left ventricular outflow tract were present in 14 specimens. Muscular cords were found in eight hearts. In all hearts specimens AML had rough and clear zones. The classical zones (rough, clear, and basal) in the posterior mitral leaflet were observed in 38.4%.

Conclusions: There is a high variability in the papillary muscles and tendinous cords in the mitral valve complex. The ventricular surface of AML always has two zones while PML has an inconsistent zone number.

17-P

Temporal vascular response to novel, long, thin strut bioresorbable scaffold in the porcine coronary restenosis model

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Background: Treatment of long coronary lesions with bioresorbable scaffolds is currently limited to overlapping implantations only due to the lack of long devices. Additionally, vascular response to long versus regular scaffolds is unknown. Therefore, we compare long vs. regular scaffolds with 100 μm struts (MeRes100) in the porcine coronary restenosis model.

Methods and results: In total 35 scaffolds, including 23 regular (3.0 × 16 mm) and 12 long (3.0 × 33 mm) were implanted with 120% overstretch with optical coherence tomography (OCT) guidance in 12 domestic animals for 1, 7, 28, 90 and 180 days. At terminal follow-up, terminal imaging with OCT was performed and long scaffolds evaluated in pathology. Stent areas and the neointimal hyperplasia as expressed as % Area Stenosis were comparable at all time points between long and regular scaffolds (Figure 1). Healing and endothelialisation were already complete at 28 days in the long scaffold group.

Conclusions: Implantation of long bioresorbable scaffolds was feasible. At mid-term their integrity remained intact and neointimal response comparable to regular
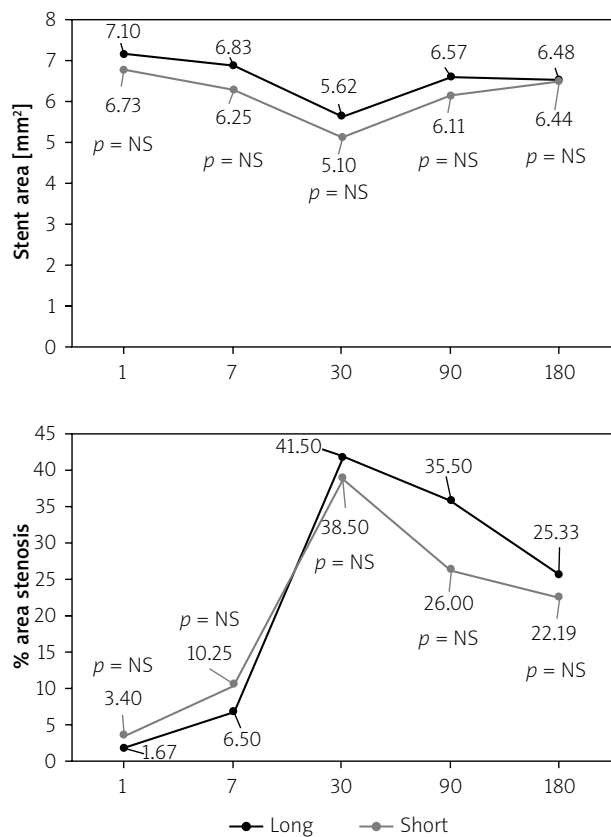
Figure 1. Stent area and % areas stenosis for long and regular scaffolds

size scaffolds, which is contrary to historical data with metallic stents.

The use of direct heart hypothermia (DHH) by METcooler reduces infarct area, area at risk and left ventricular systolic function impairment in animal experimental model of myocardial infarction – ongoing study

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Background: The reduction of heart damage and improvement of patient outcome are the main goals in the treatment of myocardial infarction. For both crucial are the shortening of time to reperfusion and use of appropriate pharmacological treatment. Restrain of myocardial metabolic activity seems to be possible third way, which may have an impact on myocardial damage especially during the critical ischemia.

Methods: The study is conducted using an animal model. We compare 20 domestic swine (Polish Landrace Pig's), 10 in the study group (SG) and 10 in the control group (CG). The animals in both groups were randomly paired by age, sex and body mass. Animals in the CG are sequentially given analgesia, sedation and respiratory therapy. After that an arterial access (femoral artery) is obtained, then coronary angiography and POBA LAD (by using balloon catheters (BC) inflation in proximal part of LAD (POBA) (target prox /mid LAD with a diameter of 2.5–4.0 mm behind ostium DG1)) is performed. After 45 min the BC is removed from the LAD. The animal is observed, monitored (if necessary appropriate medication is given). Past 48-hours since POBA the EF assessment (ejection fraction) of LV is performed. Then the subject is euthanized and staining of heart tissue is perforemd with quantitative assessment (computed planimetric assessment) of infarct area (IA) and area at risk (AAR). Similarly in SG the coronary angiography is performed with POBA LAD. After removal of BC from the LAD, a dry puncture of pericardium (pericardial catheter inserted to the pericardial sac) is performed, with subsequent, a 12 h procedure of direct hypothermia of heart (saline 30°C). Forty-eight hours since POBA, the evaluation of EF is made, subject is euthanized, then same staining procedures as in con-
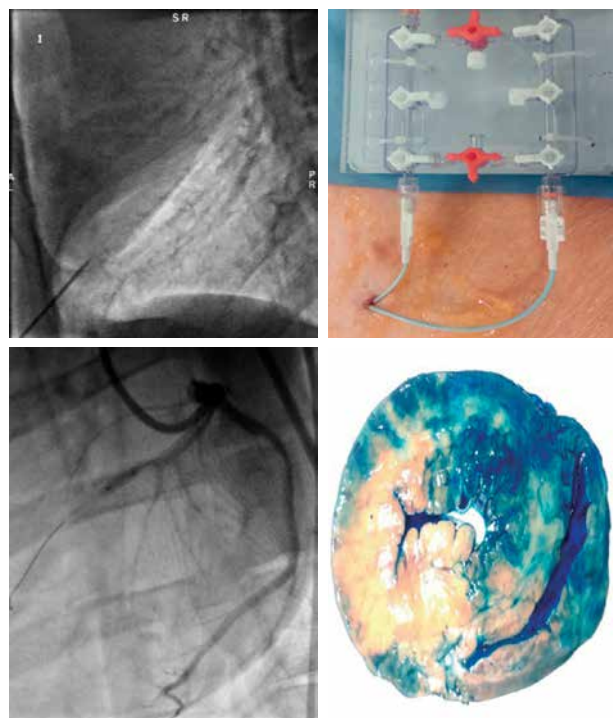
EF SG – 40.75 ±9.2% vs. EF CG – 32 ±8.8%   Up of 21.56%
IA SG – 6.7 ±0.71 g vs. IA CG – 7.4 ±0.85 g   Down of 10.44%
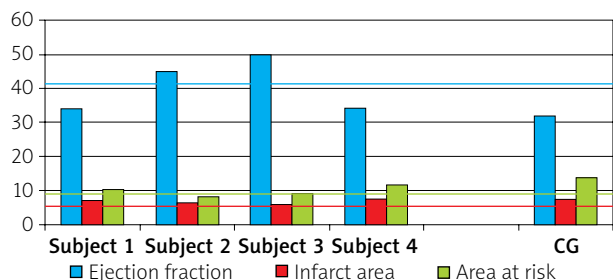AAR SG – 9.8 ±1.46 g vs. AAR CG – 13.7 ±1.82 g   Down of 25.25%
All $p < 0.001$

Figure 1. Preliminary results in four animals

trol group performed with quantitative assessment od IA and AAR (Figure 1).

Conclusions: Direct heart hypothermia (DHH) method by METcooler in acute experimental heart ischemia is a viable and safe method in an animal model. Dry pericardial puncture and lowering the temperature in the pericardial sac by applying a closed refrigerant circuit are relatively simple procedures that can be performed if necessary in a regular cathlab/cardiology department. Preliminary results demonstrate that the DHH may be considered in the future as an additional method to reduce cardiac damage in the course of myocardial infarction.

NOGA-based electromechanical assessment of the left ventricle in patient undergoing left anterior descending artery chronic total occlusion intervention

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Relevant history and physical exam: 66-year-old Caucasian male patient with congestive heart failure following acute myocardial infarction was hospitalized to undergo cardiac resynchronization therapy (CRT). Past medical history was notable for hypertension, hypercholesterolemia and atrial fibrillation.

Relevant test results prior to catheterization: Transthoracic echocardiogram demonstrated left ventricle ejection fraction of 29%. Magnetic resonance revealed end-diastolic and end-systolic volume of 272 ml and 197 ml, respectively. An initial 12-lead ECG revealed left ventricle branch block (QRS duration 140 ms) and persistent ST elevation in V3 (3 mm).

Relevant catheterization findings: PCI of (1) left circumflex artery (LCx) with drug eluting stent implantation (DES), Feb 2016; and (2) left anterior descending artery (LAD) chronic total occlusion (CTO) with DES, Oct 2016.

Interventional management: Percutaneous catheter-based NOGA (Biosense Webster) electro-mechanical assessment of the left ventricle was performed prior to (Oct 2016) and 10 months after (Aug 2017) LAD CTO intervention. Procedure was performed through right femoral approach with 8 Fr sheath. Reference points were obtained to create a full 3D map. Unipolar (UnP) and bipolar (BiP) potentials as well as regional wall motion (local linear shortening, LLS) data analysis was performed postprocedurally (Figure 1). The periprocedural and hospitalization course was uneventful.

Case description: LAD CTO procedure has improved left ventricle anterior and later wall viability mirrored by increased UnP and BiP segmental voltage values. Presented case illustrates clinical application of the electro-mechanical mapping system as a tool for analysis of myocardial viability and electrical properties in patients undergoing percutaneous coronary artery interventions.
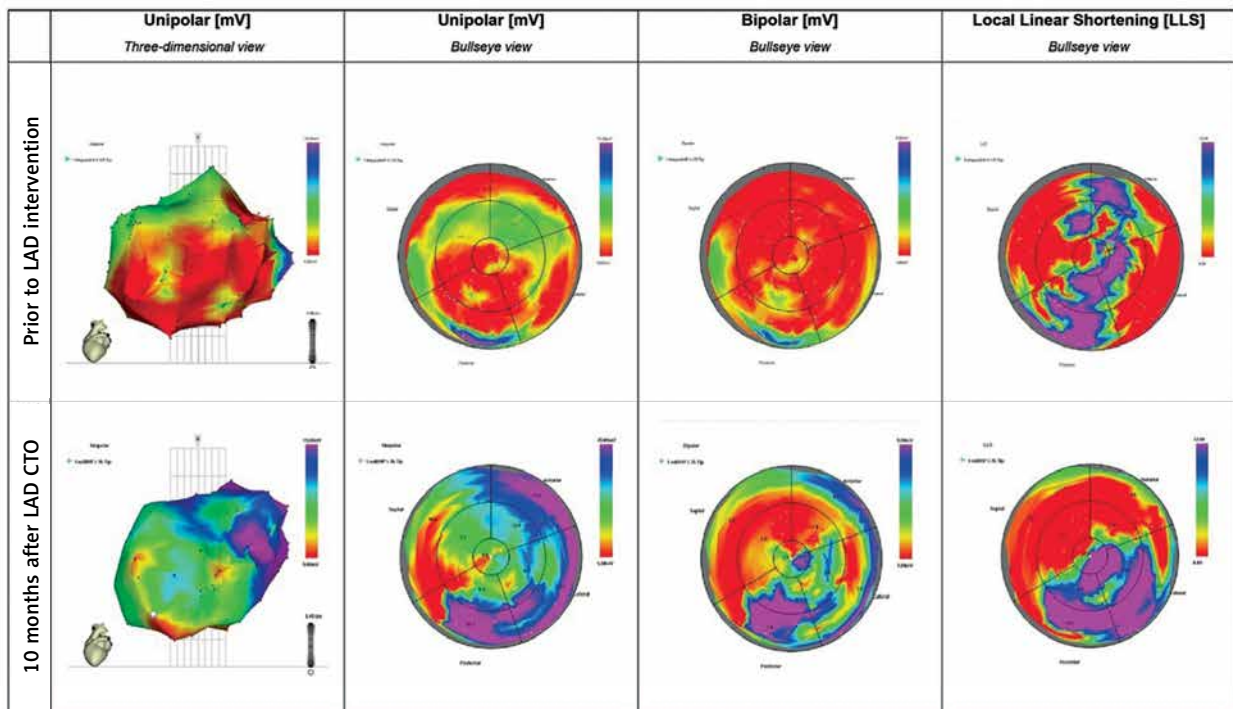
Figure 1. Standard NOGA three-dimensional and Bullseye view of the left ventricle – unipolar (UnP), bipolar (BiP) and local linear shortening (LLS). UnP: Purple areas indicate highly viable areas (> 15 mV), red indicates scar tissue (< 5 mV). PiP: purple areas indicate highly viable areas (> 8 mV), red indicates scar tissue (< 1 mV)

20-P

Kidney injury molecule type 1 is associated with 12-month adverse cardiovascular events in patients with coronary artery disease

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Purpose: The aim of the study was to establish the clinical utility of urinary biomarkers and peri-procedural variables for the prediction of major adverse cardiac and cerebrovascular events (MACCE) in patients undergoing coronary angiography (CA).

Methods: In this prospective study 95 consecutive patients with stable and unstable coronary artery disease (69.5% men; median age: 65 (59; 71)) were referred for coronary angiography and followed up for 12 month in order to disclose MACCE defined as onset of cardiovascular death, myocardial infarction, myocardial revascularization or stroke. Urine samples were collected 24-hours before and 6 h following CA and assayed

for kidney injury molecule type 1 (KIM-1) interleukin 18 (IL-18), renalase and liver fatty acid-binding protein (L-FABP) using ELISA method and adjusted to urinary creatinine concentration.

Results: MACCE occurred in 10 (10.5%) patients. Patients with MACCE had higher rate of post-procedural CI-AKI (30.0% vs. 7.1%, $p = 0.019$), higher median SYNTAX
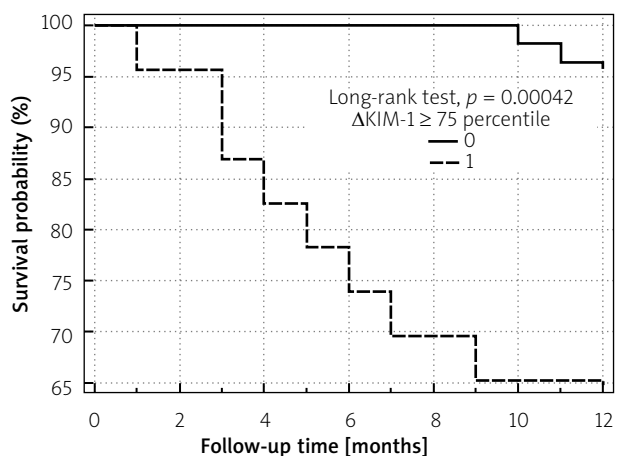

Figure 1. Kaplan-Meier survival curve of MACCE occurrence in 12-month observation depending on the increase of post-procedural urinary KIM-1 concentration: ≥ and < 75 percentile

MACCE – major adverse cerebral and cardiovascular events, KIM-1 – kidney injury molecule type 1.

score (25.5 vs. 11.5 points, p = 0.04) and higher post-procedural KIM-1 concentration (0.45 vs. 0.21 ng/mg, p = 0.028), as well as absolute (Δ; 0.41 vs. 0.10 ng/mg, p = 0.013) increase of urinary KIM-1 level. Pre-procedural KIM-1 values and other biomarker values were comparable in both groups. The Kaplan-Meier curve revealed that patients with absolute increase of KIM-1 above 75-percentile (Figure 1; log-rank p = 0.00042) and patients with contrast nephropathy after CA (log-rank p = 0.023) had significantly worse 12-month prognosis. Cox proportional hazards model revealed that absolute ΔKIM-1 was an independent predictor of 12-month MACCE (p = 0.001), while ROC curve analysis revealed that MACCE was accurately predicted by absolute increase of ΔKIM-1 > 0.093 ng/mg (AUC = 0.752, p = 0.0001).

Conclusions: Excessive increase of urinary KIM-1 after CA may help identify patients with impaired 12-month prognosis.