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Abstracts

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Factors associated with rotational atherectomy procedural failure in patients with calcified coronary arteries

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Background: The rotational atherectomy (RA) is a well-known technique belonging to the broad spectrum of percutaneous coronary interventions. It is a complementary procedure which facilitates angioplasty and deployment of stents in complex lesions particularly those affected by heavy calcification. Therefore, RA improves short- and long-term outcome in patients with such lesions.

Aim: The aim of the work was to identify factors associated with procedural failure of rotational atherectomy.

Materials and methods: We analyzed 99 patients undergoing percutaneous coronary interventions with rotational atherectomy in our centre between 2009 and 2014. Patients were divided into two groups according to the procedural success defined as successful stent implantation with residual stenosis less than 20% diameter and TIMI flow grade 3. Clinical and angiographic characteristics of both groups was compared. Logistic regression analysis was carried out to identify independent predictors of procedural failure.

Results: Both groups were similar in respect of clinical characteristics and laboratory findings however there was a trend towards more frequent occurrence of ACS in group with RA failure. Burr to artery ratio was significantly lower in group with procedural failure as compared to patients with successful RA (0.45 vs. 0.50, $p = 0.027$). Patients with unsuccessful procedure had also higher vessel reference diameter in contrast to the second group (3.32 mm vs. 2.98 mm, $p = 0.047$). Only independent predictor of procedural failure was treated vessel diameter (OR = 1.167; 95% CI: 0.036–2.297; $p = 0.043$).

Conclusions: Rotational atherectomy procedures had low failure rate. Independent predictor of RA failure in analysed group was diameter of the treated vessel.

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Clinical and angiographic characteristics and long-term outcomes in patients undergoing rotational atherectomy according to left ventricular systolic function

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Background: Revascularization of heavily calcified coronary arteries is often a challenge for the interventional cardiologist. Calcifications can prevent the balloon catheter from full expansion and stent introduction or expansion. Rotational atherectomy (RA) is an irreplaceable method of treatment of heavily calcified lesions in current PCI era. It enables mechanical modification of the plaque to facilitate balloon and stent delivery. A low left ventricular ejection fraction is a relative contraindication to carry out the RA.

Aim: The aim of this study was a comparison of in-hospital and 12-month outcomes in patients undergoing RA with left ventricular ejection fraction > 35% and ≤ 35%.

Materials and methods: Retrospective analysis of 94 patients undergoing RA between 2009 and 2014 was performed. All patients had echocardiography before the procedure. Seventy-seven (81.9%) patients had LVEF > 35%, 17 (18.1%) patients had LVEF ≤ 35%. RA was performed using the Boston Scientific Rotablator system. The success of the procedure was defined as the effective stent delivery and deployment with a residual stenosis < 20% and TIMI-3 flow. All patients received dual antiplatelet therapy and standard doses of anticoagulants during procedure. Angiographic analyses also included additional analysis (QCA – Quantitative Coronary Angiography). After 12 months mortality rate was assessed.

Results: The success of the procedure was independent on LVEF (84.4% in group 1 vs 82.4% in group 2, $p = 0.83$), whereas patients with low LVEF had significantly higher mortality rate after 12 months (LVEF ≤ 35% – 6/17 (35.3%) patients vs. EF > 35% – 3/77 (3.9%) patients; $p < 0.001$).

Conclusions: The efficacy of RA does not depend on LVEF, while LVEF has an important impact on 12-month survival.

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In-hospital and long-term outcomes in patients with calcified lesions in coronary arteries undergoing atherectomy electively and after unsuccessful angioplasty

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Background: Coronary arteries with severe calcifications are often a challenge for interventional cardiologist. In such lesions, treatment with balloon angioplasty is unsuccessful and carries great risk of the vessel damage. Therefore, stent placement and deployment in calcified arteries can be impossible. Rotational atherectomy (RA), through the modification of the plaque, gives the opportunity for successful treatment.

Aim: The aim of the work was to compare short- and long-term outcomes in patients undergoing RA electively and after unsuccessful angioplasty.

Materials and methods: 99 consecutive patients undergoing RA between 2009 and 2014 were analysed. Group 1 comprised 71 patients in whom RA was performed after balloon inflation or stent placement failure and Group 2 comprised 28 patients who underwent elective RA. Clinical and follow-up data were extracted from hospital electronic database and National Health Fund database.

Results: Both groups were similar in respect of clinical characteristics, laboratory findings, and periprocedural complications. There were significant differences between the groups in terms of previous myocardial infarction (72.6% vs. 50.0%, $p = 0.05$), previous coronary interventions (70.4% vs. 40.0%, $p = 0.008$), and single vessel disease (50.0% vs. 16.0%, $p = 0.003$). Patients from group 2 had more often three-vessel disease compared with group 1 (68.0% vs. 38.6% respectively, $p = 0.01$). Patients undergoing elective RA had lower postprocedural creatinine clearance when compared to the second group (53.3 [ml/min/1.73 m²] ±24.6 vs. 78.0 ±27.9). There were no significant differences in terms of procedural success and 12-month mortality ($p = 0.17$ and $p = 0.26$, respectively).

Conclusions: The analysis showed that in the analysed group elective RA had no advantage over RA performer after unsuccessful angioplasty.

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Long-term outcome in patients with severe left ventricular dysfunction undergoing rotational atherectomy

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Background: Interventional cardiologists have daily more challenging procedures. Probably the most important condition that determines CV outcome is left ventricle (LV) function. Sometimes coronary findings force interventional cardiologist to perform rotational atherectomy (RA) patients with LV dysfunction (LVD).

Aim: We aim to identify the long-term outcomes of RA in this setting.

Materials and methods: We conducted a prospective single Centre registry at a hospital with onsite cardiac surgery. Analysis included 29 consecutive patients with LVD (LVDG) in which 44 RA were performed comparing with 65 pt (77 RA) without LVD (NLVDG) in the same period.

Results: Majority of pt were males (83%), mean age 76 (9) years (no differences between groups) LVD group has a extremely high-risk profile: 55% were diabetics and 65.5% had prior MI, in contrast with NLVDG ($p = 0.02$) Mean LVEF in this group was 35 (6)%. Clinical onset in LVDG was: NSTEMI (45%), STEMI (37.8%) and others – cardiac arrest, malignant arrhythmias (17.2%). NLVDG had only 26% of STEMI pt. Femoral approach was elected in around 60% of procedures. Prevalence of multivessel disease was 78.8% and 67.5% respectively in LVDG and NLVDG. Left anterior descending artery was the most diseased one (96.6%, $p = 0.002$) and also the most treated with RA (100%) followed by LM (60% of LM stenosis underwent RA) Syntax score and L-Euroscore were higher in LVD group than in NLVD: 35 and 29.7 in LVD group in contrast with 28.5 and 7.9 in NLVD ($p = 0.04$). Bivaluridin was used in almost 50% and GP inhibitors in 24%. Small burrs (≤ 1.5 mm) were the most used: 63.6% with a mean rotational speed of 139793 (8957) rpm. We performed RA in > 1 artery/procedure in 14 pt (48.3%). In 86% of rotablations a bifurcation was involved. A ratio of 1.8 stents/RA was observed with a median stent length was 66 (40) mm. Clinical and angiographic successes were 98% and 97.6% respectively. Cardiovascular death during hospitalization was 3.4% (1 pt) in LVDG and 1.5% (1 pt) in NLVDG. Regarding angiographic success we recorded an overall 0.8% slow-flow phenomenon (1RA) and 0.8% (1RA) coronary dissection solved with a non-

planned stent. There were no side-branch closures or coronary perforations reported. Neither stent thrombosis was recorded. No deaths related with rotablation were collected. Overall MACCE was 44.8% (13 pt) (median follow-up 3.74 years (ICA 2 y) in LVDG and 35.3% (23 pt) in NLVDG. In LVDG: global death rate was 31.6% (9 pt, median 3.74 years (ICA 2 y); overall CV death was 13.7% (4 pt), 1 during index hospitalization, 2 due to heart failure (10 and 18 months after PCI) and 1 sudden death; non-cardiovascular deaths (7 pt, 7.4%) were due to sepsis and oncologic status; 1 cardioembolic strokes (3.4%) and 1 NSTEMI (3.4%) were reported. In NLVDG: global death rate was 18.4% (12 pt, median 4.67 years (ICA 1.64 y); overall CV death was 6.1% (4 pt) and non-cardiovascular death 12.3% (8 pt); 3 cardioembolic strokes (4.6%) and 2 NSTEMI (3%) were reported. No threatened bleeding or bleeding requiring transfusion was reported.

Conclusions: Rotational atherectomy is a usefulness technique improving PCI results in patients with LV dysfunction. LVD determines a worse outcome with 2-fold increase in CV death. No deaths related with rotablation were collected.

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Bivaluridin improves results during rotational atherectomy in unstable patients and complex PCI

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Background: It is well known the safety and effectiveness of using bivalirudine (Biv) on percutaneous coronary interventions. However, there are no data about its uses in rotational atherectomy (RA) in high-risk cohort after switching from conventional antithrombotic therapy (unfractionated heparin ± glycoprotein IIb/IIIa) to Biv.

Aim: We report the usefulness and outcomes of using Biv during RA in high-risk patients referred to PCI.

Materials and methods: We conducted an observational prospective single centre at a hospital with on-site cardiac surgery. Analysis included 94 consecutive patients (45 Bival/49 non-Bival) in which 124 RA were (67 in Biv group, BG) and 57 in non-Bival group (N BG) performed during index PCI.

Results: BG showed higher risk profile, with more patients with prior PCI (71.1%, $p = 0.01$) and they need for more topic nitrates ($p = 0.001$). However, in N BG there were more patients whom underwent prior angiography (33.3%, $p = 0.012$). No differences regarding LVEF

dysfunction ($\leq 44\%$) was observed: 29.7% in BG versus 25% in N BG. Furthermore, in BG the preferred access site was the radial one (55.6%, $p = 0.004$) and we observed a higher prevalence of left main disease than in N BG (28.9% vs. 10.2%, $p = 0.021$). LAD was the most diseased vessel (92.7%, $p = 0.05$) with no differences in the prevalence of multivessel disease: 89.2% in BG and 82.7% in N BG ($p = 0.152$). Prevalence of complex lesions (B2C) was 96.8%. Moderate or severe coronary calcification was observed in 83.1% of stenosis. There were no differences in Syntax Score or L-Euroscore. Use of GP inhibitors was exceptional in BG comparing with N BG (2.3% vs. 36.7%, $p < 0.0001$). We employed 1.7 stent/RA in BG vs. 2.4 stent/RA in N BG ($p = 0.13$). In BG the most DES used were -limus ones (63.7%) in contrast with N BG, that were de paclitaxel ones (46.9%) ($p = 0.013$). Clinical and angiographic successes were 97.8% and 96.7%. Cardiac death during index PCI and hospitalization was 4.2% (4 pt): in BG 1 pt died (2.2%) due cardiac rupture 9 days after PPCI; in N BG 3 pt (6.1%) died: one related with procedure, one with RA and the third due to cardioembolic stroke. Angiographically, 1 pt showed coronary dissection (0.8%) after RA, solved with a second non-planned stent. One no-reflow phenomenon (0.8%), 1 content perforation (0.8%) and 1 cardiac tamponade (0.8%) due to a transient pacemaker implanted in ER. Overall MACE was 20.2% without differences between BG and N BG in overall MACE during FUP ($p = 0.289$) with a global death rate during all follow-up (FUP) of 13.8% (13 pt) (mean follow-up time 4.08 years, IC 95%: 3.38 y – 4.78 y). Four (4.2%) pt suffered a stroke (1 in BG and 3 in N BG) and 2 pt unstable anginas (2.1%). Furthermore we observed 2 cases of moderate GI bleeding (GUSTO criteria) requiring transfusion, both in no BG. Non-CV mortality (9 pt) was mainly due to sepsis or oncologic status.

Conclusions: In our cohort, BG had higher-cardiovascular risk but lower CV death rate. Bivaluridin is a safety and usefulness antithrombotic therapy that improves results and outcomes of complex PCI that is consistent during a very long follow-up. MACE rate was reasonable for this very-high risk cohort. None patients in BG required transfusion. The incidence of stent thrombosis was inexistent and the need of GP inhibitors as rescue therapy was exceptional when bivaluridin was used.

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Long-term outcomes of an octogenarian cohort whom underwent rotational atherectomy for complex PCI

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Aim: Interventional cardiologist faces daily challenging cases. Gradual aging of population difficult PCI because comorbidities and anatomical findings. Rotational atherectomy (RA) improves PCI results and outcomes in octogenarians.

Materials and methods: We conducted an observational prospective single Centre study at a hospital with onsite cardiac surgery. Analysis included 36 consecutive patients ≥ 80 years old in which 50 RA were performed during index PCI.

Results: Mean age was 84 (4) years with a very high-cardiovascular risk profile: HTA, DM and dyslipidemia were present in 94.4%, 22.2% and 76% respectively. Prior myocardial infarction and prior PCI were present in 58.3% and 50% respectively. Moderate LVEF dysfunction ($\leq 44\%$) was present in 26.2%. Majority of procedures (72.2%) were performed in unstable patients: 34.6% STEMI, 27.6% NSTEMI, 10% others. Prevalence of multivessel disease was 82%. Left anterior descending artery was the most diseased artery (91.7%, $p = 0.02$). Moderate/severe coronary calcification was observed in 86.1% pt. Mean Syntax Score and L-Euroscore were 33.7 and 26.2 respectively. Bivaluridin and GP inhibitors were used in 47.2% and 19.4% respectively. RA was performed mainly in LAD (96.9%) and in LM (60%) ($p < 0.001$) – mostly with small burrs (91% burrs were ≤ 1.5 mm). Fourteen pt (38.9%) were treated with RA > 1 artery at the index procedure. We implanted 1.8 stents/RA. Mean stent length was 52 (29) mm. Clinical and angiographic successes were 98.6% and 98% respectively. During rotablation only 1 (2%) dissection with slow-flow was recorded, solved with the planned stent, and 1 asystolia (2%) due to slow-flow flow -solved with atropine. No deaths related with PCI nor RA occurred during hospitalization. We did not recorded side-branch closures, burr entrapment nor coronary perforations. No stent thrombosis was recorded. Overall MACE was 33% (mean follow-up 4.05 years, IC 95%: 3,14 y – 4.95 y). Death rate during all F-UP was 22.2% (8 pt) (4.48 years, IC 95%: 3.7 y – 5.26 y). Cardiovascular death was 5.5% (2 pt): 1 acute pulmonary oedema secondary to hypertensive emergency (1.8 years after PCI) and 1 sudden cardiac death due to myocardial

infarction 10 months later (in a non previously treated artery). Thus, the majority of deaths (6, 16.6%) were due to sepsis or neoplasia. Furthermore, during follow-up we observed 1 cardioembolic stroke (2.7%) in a patient under DAPT. No threatened bleeding or bleeding requiring transfusion was reported.

Conclusions: RA is a useful co-adjuvant technique that improves results during complex PCI performed in octogenarians with a low incidence of death, stroke and threatened bleedings after long follow-up.

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Role and outcomes of rotational atherectomy in acute coronary syndromes

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Background: Currently acute coronary syndromes (ACS) are the main indication for PCI. Sometimes coronary findings force interventional cardiologist to perform rotational atherectomy (RA) as the necessary tool for crossing the lesions.

Aim: We aim to identify the acute role and long-term outcomes of RA in this setting.

Materials and methods: We conducted a prospective single Centre registry at a hospital with onsite cardiac surgery. Analysis included 58 consecutive patients in which 77 RA were performed during ACS.

Results: Mean age was 77 (9) years with a very high-cardiovascular risk profile. Prior myocardial infarction and PCI were present in 58.6% and 56.9% respectively. Moderate LVEF dysfunction ($\leq 44\%$) was present in 26.2%. Clinical onset was: NSTEMI (51.7%), STEMI (36.2%) and others – cardiac arrest, malignant arrhythmias (12%). Femoral approach was elected in 63.8% of angiographies. Prevalence of multivessel disease was 70.2%. Left anterior descending artery was the most diseased one (96.6%, $p = 0.002$) and also the most treated with RA (96.4%) followed by LM (50% of LM stenosis underwent RA). B2C stenoses were present in 96.6%. Bivaluridin was used in 50% and GP inhibitors in 22.4%. Small burrs (≤ 1.5 mm) during RA were the most used: 57 (74%) with a mean rotational speed of 140315 (9339) rpm. We performed RA in > 1 artery/procedure in 17 pt (29.3%). In 76% of RA a bifurcation was involved. A ratio of 1.8 stents/RA was observed with a median stent length was 60 (37) mm. Clinical and angiographic successes were 98.6% and 98% respectively.

Cardiovascular death during hospitalization was 1.7% (1 pt) and was due to a cardiac rupture after PPCI. Regarding angiographic success we recorded only 1 slow-flow phenomenon (1.2%) and 1 coronary dissection (1.2%), requiring a non-planned stent. No side-branch closures, burr entrapment or coronary perforations were reported. No stent thrombosis was recorded. Overall MACCE was 22.4% (13 pt) (median follow-up 1.4 years (ICA 1.7 y). Global death rate was 17.2% (10 pt, median 1.53 years, ICA 1.32 y) but overall CV death was 3.1% (3 pt): 1 during index hospitalization and 2 due to heart failure (10 and 18 months after PCI). Non-cardiovascular death (7 pt, 7.4%) was due to sepsis or oncologic status. During follow-up we recorded 3 cardioembolic strokes (3.1%): 2 pt were under DAPT treatment (< 1 y since PCI) and the third was with aspirin (> 1 y after PCI). One unstable angina (0.8%) was reported, without needed of a new PCI. As we known, no threatened bleeding or bleeding requiring transfusion was reported.

Conclusions: Rotational atherectomy is a safety and feasibility technique improving complex PCI during ACS with a very low complication rate. Non-cardiac causes and comorbidities finally determine the outcome despite the very high-cardiovascular risk profile.

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Coronary rotational atherectomy during trans-catheter aortic valve implantation. Immediate and long-term results of a consecutive series

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Background: Aortic valve stenosis (AVS) in the elderly is frequently associated to coronary artery disease (CAD). In patients with significant coronary stenosis surgical valve replacement is associated to coronary bypass grafting, but whether coronary angioplasty is needed in patients receiving trans-catheter aortic valve implantation (TAVI) is unknown. Given the frequent complexity of CAD in the elderly with calcific AVS, rotational atherectomy (RA) may be needed in some cases. No data is available about feasibility and safety of RA during TAVI.

Materials and methods: After an initial experience of preventive revascularization (2010–2013), a strategy of “ad-hoc” revascularization performed during the same TAVI procedure was implemented. Between Jan 2014 and Dec 2015, 104 trans-femoral TAVI were performed.

Results: A significant CAD was detected in 48 (46.1%) patients and PCI was performed in 18 patients on 23 ves-

sels during the same interventional session. Of these, RA was used in 7 patients on 8 arteries (3 RCA, 1 LM-LCx, 4 LAD). Indications to RA were severely calcified lesions with evidence of a very severe angiographic stenosis, or a significant FFR impairment (> 0.75) after TAVI. In 6 lesions the RA procedure was planned electively, and in two it was performed after the impossibility of crossing the lesion with a balloon. All patients had preserved left ventricular function, moderate-to severe renal impairment and high clinical risk as assessed by the EuroSCORE. In all cases RA and subsequent stenting were performed after TAVI because it was assumed that any eventual ischemic complication related to the PCI procedure (slow flow or vessel occlusion) would have been better tolerated after the complete release of the pressure overload. Catheterization of the coronary ostia after the valve implantation (3 CoreValve and 4 Edwards Sapien) was possible in all cases. Anti-thrombotic therapy consisted on a pre-loading treatment with oral aspirin (100 mg) and clopidogrel (300 mg) the day before TAVI, and intravenous UFH. Heparin was reverted and the arterial sheaths were removed at the end of the procedure. No complication occurred during or after the procedures. A troponin release was observed in all cases between 6 a 24 h, without rise on CK MB above the upper limit of normal. Serum creatinin levels did not rise significantly. At follow-up (minimum 3, maximum 24 months) all patients are alive and totally asymptomatic.

Conclusions: In this series, coronary RA performed during the same TAVI procedure was feasible and safe without the need for a repeated vascular access and a different hospital admission. The rational of performing complex coronary procedures after valve replacement, guided by FFR assessment in cases of angiographically intermediate severity, may prove safer and clinically more reasonable than a systematic preventive revascularization in this complex, and high-risk subset.

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Coronary rotational atherectomy – in-hospital results from single experienced center

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Background: One of the main limitations of percutaneous coronary intervention (PCI) is the presence of heavily calcified plaques. Suboptimal PCI result is the

cause of the increased incidence of restenosis and stent thrombosis. The method available to achieve an optimal outcome of PCI in such cases is rotational atherectomy (RA), which allows to modify the calcified plaque and manage proper stent apposition.

Materials and methods: A retrospective analysis of PCI results in 312 patients treated with rotational atherectomy at a single center, experienced in the use of rotablation methods. PCI with RA was performed according to generally accepted principles. The level of myocardial necrosis markers 12 h after the procedure was measured in all patients. The efficacy of treatment (TIMI 3 in target vessel, residual stenosis < 30%) and safety (death, myocardial infarction, repeat revascularization) were defined in-hospital.

Results: Clinical characteristics: study group: 312 patients, mean age 73.1 (SD 9.26) years, 199 (63.8%) men with symptomatic coronary artery disease: CCS I – 8 (2.56%), CCS II – 175 (56%), CCS III – 71 (22.7%), CCS IV – 34 (10.9%), 24 (7.7%) patients underwent PCI in myocardial infarction, history of PCI – 174 (55.8%), history of CABG – 47 (15.2%), DM – 123 (39.6%) patients, hypertension – 126 (85.7%), hyperlipidemia – 269 (86.2%), chronic kidney disease – 89 (28.6%), peripheral artery disease – 65 (21%), mean left ventricular ejection fraction – 46.1% (SD 12.2). Angiographic characteristics: radial approach – 187 (60.1%), 1-vessel disease (VD) – 91 (29.1%), 2VD – 114 (36.5%), 3VD – 56 (18.1%), more than 3VD – 51 (16.5%), the number of coronary arteries treated per patient – 1.125, the type of AHA lesions – B2/C – 100%; target vessel: LM – 25 (8.4%), LAD – 175 (58.5%), Cx – 35 (11.7%), RCA – 75 (25.1%), other – 10 (3.4%), 8 cases RA in more than 1 vessel. Mean amount of burr per patient – 1.1 (SD 0.331), mean burr diameter – 1.47 mm (SD 0.226), 94.1% had implanted DES, the average number of stents per patient – 1.73 (SD 0.73); the average length of the stent – 45.7 mm (SD 20.5); the average stent diameter – 3.18 mm (SD 0.4). Slow flow phenomenon – 8 (2.56%). Mean radiation dose – 2219.47 mGy (SD 1247.2). The efficacy of treatment: 96.1%. Medical therapy: GP IIb/IIIa infusion – 57 (18.26%), aspirin – 100%, clopidogrel – 291 (93.3%), prasugrel – 16 (5.12%), ticagrelor – 5 (1.6%), β -blocker – 97%, ACE inhibitor – 82.8%, sartan – 12.5%, diuretic – 50.5%, MRA – 30.3%, statin – 96.3%, PPI – 79.8%, OHA – 23.9%, insulin – 11.8%, NOAC – 1.3%, VKA – 11.1%. In-hospital observation: death – 2 patient (one surgically operated because of burr entrapment, one vessel rupture and cardiac tamponade); 4a ESC myocardial infarction (troponin > 5 \times URL) – 58 (18.6%) patients; stroke – 2 (0.64%) patients.

Conclusions: Percutaneous coronary intervention with rotational atherectomy in selected patients with heavily calcified lesions in the coronary arteries is an effective method of revascularization with relatively low and acceptable number of complications.

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Sex-dependent early outcomes in patients with severely calcified coronary lesions treated with rotational atherectomy

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Background: Rotational atherectomy (RA) is a well-known method of treating heavily calcified coronary lesions. RA modifies the calcified plaque, thus allowing execution of percutaneous interventions (PCI) in most difficult cases. Previous studies have shown an increased risk of adverse events in females in comparison to males undergoing percutaneous coronary intervention.

Aim: The aim of this analysis was to evaluate possible gender-based differences in terms of clinical characteristics and in-hospital major adverse cardiac events (MACE) in patients with calcified coronary lesions treated with rotational atherectomy.

Materials and methods: A total of 312 consecutive patients treated with rotational atherectomy between 2008–2015 were enrolled in our study. We compared clinical characteristics and in-hospital major adverse cardiac events between sexes.

Results: The majority of the study population were males 68.3% ($n = 199$). Females were significantly older (75.9 vs. 71.5 years; $p = 0.000$), more often with diabetes (52% vs. 32%; $p = 0.000$) and chronic kidney disease (37% vs. 24%; $p = 0.016$). Estimated glomerular filtration rate (57.4 vs. 78.8 ml/min; $p = 0.000$) and hemoglobin level (12.7 vs. 13.3 g/dl; $p = 0.001$) were lower and platelet count (220.5 vs. 199.3×10^3 /ml; $p = 0.005$) higher in female group. Left ventricular ejection fraction was significantly higher in females (48.8% vs. 44.7%; $p = 0.022$). More often RA was performed in acute phase of myocardial infarction or in unstable angina (25.5% vs. 13%; $p = 0.006$), also periprocedural myocardial infarction (IVa) was more frequent (26.5% vs. 16.5%; $p = 0.042$) in female group. There were no statistically significant differences in medical therapy as well as in angiographic details such as lesions location, number of stents, stents' length, burr diameter, rate of successful stent delivery in both sexes. In-hospital mortality, stroke and bleeding complications rates did not differ between groups.

Conclusions: Women treated with rotational atherectomy are older and have more risk factors for coronary artery disease. Procedures during acute phase of MI or unstable angina and periprocedural MI (IVa) were more

frequent in females. On the other hand, there are no statistically significant differences in mortality, the occurrence of stroke, and bleeding complications during in-hospital observation in both groups.

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Optimization of rotational atherectomy procedure: clinical outcomes according to burr size

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Background: Rotational atherectomy (RA) is increasingly used for percutaneous coronary intervention (PCI) of calcified lesions, however some technical aspects of the procedure are not well established.

Aim: The aim was to compare short and long-term results after RA according to burr size.

Materials and methods: 186 consecutive patients after RA were divided into 2 groups: small burr group (burr to artery ratio < 0.5) and large burr group (burr to artery ratio > 0.5). Primary endpoints were in-hospital and 1-year mortality, secondary endpoint was procedural success and complications.

Results: Small burr group consisted of 151 (81%) patients (age 71 ± 10, 66% male) and large burr group consisted of 35 (19%) patients (age 72 ± 9, 57% male). Clinical characteristics were similar in both groups, with no differences in demographics, comorbidities (previous myocardial infarction, previous PCI, heart failure, diabetes mellitus, stroke) and essential laboratory parameters. There were no differences in procedural success (99% vs. 97%; $p = 0.26$), but the number of utilized burrs was higher in large burr group ($p = 0.003$). Procedural complications rates were similar in both groups (no-flow phenomenon, side-branch occlusion, vessel perforation; $p = \text{NS}$). There was no difference in in-hospital mortality (1 (1%) vs. 1 (3%); $p = 0.82$), however 1-year mortality was significantly higher in large burr group as compared to small burr group (7 (20%) vs. 11 (7%); $p = 0.022$). Additionally, in multivariate analysis burr to artery ratio > 0.5 were independent predictors of 1-year mortality (HR = 4.2, 95% CI: 1.6–10.9; $p = 0.004$).

Conclusions: RA strategy with the use of small burr (burr to artery ratio < 0.5) is associated with better 1-year survival as compared to large burr (burr to artery ratio > 0.5).

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Outcomes and clinical predictors of mortality of patients treated with rotational atherectomy: a single center registry

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Background: In many patients rotational atherectomy (RA) is the last resort for successful percutaneous coronary interventions (PCI) of highly calcified lesions.

Aim: The aims were outcomes evaluation and clinical predictors of mortality determination after RA of calcified coronary lesions.

Materials and methods: 204 consecutive patients after RA were included in a single center registry.

Results: Primary endpoints were in-hospital and 1-year mortality, secondary endpoints were procedural success and complications. Mean age of the patients was 71 ± 9.5 years, 128 (63%) were male, diabetes was present in 89 (44%), symptomatic heart failure with ejection fraction < 50% in 66 (32%), previous acute coronary syndrome in 128 (63%), previous PCI in 154 (75%) and previous coronary artery bypass grafting (CABG) in 31 (15%). 50% of patients underwent RA because of undilatable lesion, 24% because of uncrossable lesion and in 21% of patients 'direct' RA was performed. In 32 (16%) of patients acute coronary syndrome was recognized and radial access was used in 131 (64%) of patients. 108 (52%) of patients were not suitable for CABG (disqualified or no consent). Procedural success was 93.2%. In 8 (4%) patients procedural complications occurred (1 no-flow, 3 vessel perforations, 4 side-branch occlusions). In-hospital mortality amounted 1.5% (3 patients) and 1-year all-cause mortality 10% (19 patients). Heart failure (HR = 3.45, 95% CI: 1.37–8.7; $p = 0.009$), 'off-label' indication to RA (myocardial infarction, last remaining vessel; HR = 5.9, 95% CI: 1.7–20.4; $p = 0.005$) and burr to artery ratio > 0.5 (HR = 4.2, 95% CI: 1.6–10.9; $p = 0.004$) were

independent predictors of 1-year mortality in multivariate analysis.

Conclusions: RA was performed in patients with high peri-procedural risk. RA remains necessary for PCI of calcified lesions without other therapy options, with satisfactory success and complication rates and acceptable long-term result.

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Long term outcomes of patients undergoing rotational atherectomy due to failed percutaneous coronary intervention depend on the reason of primary intervention failure

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Background: Rotational atherectomy is often used as a bailout technique after unsuccessful PCI.

Aim: This study was created to evaluate outcomes of patients undergoing rotational atherectomy depending on reason of previous PCI failure.

Materials and methods: We retrospectively evaluated data of 210 consecutive patients undergoing rotational atherectomy in our tertiary center. Treatment was conducted due to current standards and was left at operator's discretion.

Results: From our analysis we excluded patients undergoing rotational atherectomy without previous PCI attempt ($n = 42$), those referred from other centers without description of PCI failure cause ($n = 10$) or lacking complete clinical data ($n = 6$). Remaining patients ($n = 152$) were divided into two groups: those with uncrossable (32%) or undilatable lesions (68%). Follow-up data concerning death from any cause was acquired from the Polish National Health Found. Patients with uncrossable lesions were older (72 vs. 69 years, $p = 0.03$) and more often suffered from stroke or transient ischemic attack in anamnesis (20% vs. 8%, $p = 0.04$). The groups did not differ in any other clinical characteristics. We also did not show any differences in procedure characteristics, success and complications rates or in-hospital adverse events. Patients with uncrossable lesions had higher all-cause mortality after one year (18% vs. 8%, $p = 0.05$),

2 years (24% vs. 10%, $p = 0.02$) and three years (29% vs. 14%, $p = 0.03$). Multivariate Cox regression model showed uncrossable heavily calcified coronary lesions as indication to rotational atherectomy to be an independent predicting factor of all-cause mortality 2 years after procedure (HR = 2.8; CI 1.13–7.15; $p = 0.03$).

Conclusions: Patients undergoing rotational atherectomy after failed PCI due to uncrossable lesions have poorer prognosis in long term follow up. Underlying pathophysiological mechanism is yet to be determined. Further studies evaluating causes of higher mortality in this population are needed.

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Severe calcifications in target lesions of patients with acute myocardial infarction undergoing percutaneous coronary intervention predict adverse cardiac events in long term follow-up

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Background: Contemporary data concerning the impact of coronary artery calcification on the prognosis of patients undergoing percutaneous coronary interventions (PCI) is based on pooled analyses from large randomized trials. We still lack the knowledge on how coronary artery calcification in target lesions affect prognosis of patients with acute myocardial infarction undergoing PCI in everyday practice.

Aim: This study was created to assess the frequency and influence of severe coronary artery calcification in target lesions on adverse cardiac events in patients undergoing PCI due to acute myocardial infarction in a "real life" scenario.

Materials and methods: We prospectively evaluated clinical and laboratory data of 206 consecutive patients who underwent coronary angiography and PCI due to acute myocardial infarction diagnosed according to the third universal definition of myocardial infarction. Treatment was conducted according to current standards and was left to the operators discretion. Each coronary angiography was separately evaluated by 3 experienced interventionalists who assessed the presence and extent of coronary artery calcifications. The pre-specified angiographic definition of severe calcifications in target lesions was the presence of radiopaque densities visible

without heart motion and affecting both sides of the treated lesion. Follow-up data concerning primary end points: recurrent hospitalizations due to acute coronary syndrome (ACS), stroke or death from any cause was acquired from the Polish National Health Found.

Results: Severe coronary artery calcifications in target lesions were present in 35 (17%) patients. These patients were older (71 vs. 65 years, $p = 0.02$), were more often diagnosed with Non-ST Segment Elevation Myocardial Infarction (NSTEMI) (77% vs. 58%, $p = 0.03$) and had higher levels of N-terminal pro-brain natriuretic peptide at admission (2006 vs. 745 pg/ml, $p = 0.01$). Full revascularization during index procedure was achieved less often in patients with severe coronary artery calcifications in target lesions (14% vs. 41%, $p = 0.003$). During 30 months of follow-up patients with severe coronary artery calcifications in target lesion more often suffered from another ACS (37% vs. 13%, $p = 0.0005$) and had higher all-cause mortality (31% vs. 16%, $p = 0.04$). Multivariate Cox regression model showed severe coronary artery calcifications in target lesions to be the only independent predicting factor of another ACS in studied population (hazard ratio 2.78; confidence interval: 1.39–5.56; $p = 0.004$). Severe coronary artery calcifications in target lesions also predict occurrence of pre-determined composite secondary end point (death + ACS + stroke) (hazard ratio 1.74; confidence interval: 1.02–2.97; $p = 0.04$).

Conclusions: In everyday practice, almost every sixth patient with myocardial infarction has severe coronary artery calcifications in target lesions. This group has poorer prognosis than the rest of the population. Presence of severe coronary artery calcifications in target lesions independently predicts recurrent ACS. Underlying pathophysiological mechanism is yet to be determined. Our study shows that patients with severe coronary artery calcifications in target lesions should be treated with special concern and different treatment options should be applied in this population.

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Early and late clinical outcomes of patients with heavily calcified coronary artery lesions treated with coronary artery bypass grafting

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Background: Heavily calcified coronary lesions (HCCL) may be a cause of percutaneous coronary intervention (PCI) failure caused by inability to cross the lesion or fully dilate balloon catheters. There is data that proved coronary calcifications to increase adverse event rates in patients undergoing coronary artery bypass grafting (CABG) surgery.

Aim: The aim of this study was to assess early and late outcomes in patients undergoing CABG with regard to presence of severe calcified coronary arteries.

Materials and methods: From total number of 321 patients with coronary artery disease (CAD) who were qualified for CABG according to current guidelines, we selected a group of 278 patients with available angiographic and 2-year follow-up data. Severity of coronary artery calcification was independently assessed by two investigators. Severe coronary artery calcifications were described as radiopaque densities visible without heart motion and present on both sides of any vessel. Clinical data and outcomes in subjects with and without severe calcifications in target vessel was evaluated.

Results: HCCL was present in target vessel in 83 (30%) of patients. The only predictor of severe calcification in target vessel was age (OR = 1.06, CI: 1.03–1.1, $p < 0.001$). The prevalence of traditional cardiovascular risk factors and comorbidities was similar in both groups, patients with severe calcifications were older (67 ± 8 vs. 64 ± 8 , $p < 0.001$). There was no difference in procedural aspects of surgery. We found no difference in adverse events (death, stroke, acute coronary syndromes or reoperation) between groups. 2-year total mortality was 6% with no difference between groups. In multivariate analysis of Cox proportional hazard risk model age, periprocedural myocardial infarction (MI) and presence of peripheral artery disease (PAD) were factors of poor prognosis in whole studied population.

Conclusions: Almost one-third of patients had severe calcification in target vessel. Age, alone being acknowledged risk factor of adverse events in patients undergoing CABG, was positively correlated with occurrence of calcification, however in our studied group, we found no difference in terms of prognosis depending on coronary calcification in patients undergoing CABG. Trials with large number of patients are required to determine whether calcification itself worsens prognosis.

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Predictors of severe coronary artery calcifications in patients undergoing coronary angiography due to myocardial infarction

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Background: Multiple trials showed that presence of coronary artery calcifications (CAC) is connected with poorer prognosis. In previous studies correlation between inflammatory biomarkers and extent of CAD was shown. Up to date no study concentrated on defining predictors and biomarkers of CAC in patients with myocardial infarction (MI).

Aim: To assess the predicting factors and biomarkers of severe CAC in patients undergoing coronary angiography due to acute myocardial infarction.

Materials and methods: We prospectively evaluated clinical and laboratory data of 283 consecutive patients who underwent coronary angiography due to MI diagnosed according to the third universal definition of myocardial infarction. Coronary angiograms were evaluated by three experienced interventionalists. Severe CAC were described as radiopaque densities visible without heart motion and present on both sides of any vessel.

Results: Severe CAC were present in 28 % of patients. These patients were older (72 vs. 64 years, $p = 0.0004$), were more often diagnosed with NSTEMI (84% vs. 65%, $p = 0.002$) and heart failure with reduced ejection fraction (25% vs. 11%, $p = 0.004$). Patients with severe CAC had higher levels of Nt-proBNP at admission (1654 vs. 851 pg/ml, $p = 0.004$) and lower maximal concentration of Troponin I (3.48 vs. 5.21 ng/ml, $p = 0.03$). Univariate logistic regression models showed age (OR = 1.27; CI: 1.11–1.44; $p = 0.0003$), left ventricle ejection fraction (OR = 0.97; CI: 0.95–0.99; $p = 0.01$), NT-pro BNP at admis-

sion (OR = 1.28; CI: 1.08–1.51; $p = 0.005$), maximal level of Troponin I (OR = 0.84; CI: 0.7–0.99; $p = 0.03$), diagnosis of STEMI (OR = 0.36; CI: 0.19–0.7; $p = 0.002$), renal disease (OR = 2.1; CI: 1.1–3.98; $p = 0.03$) and heart failure with reduced ejection fraction (OR = 2.6; CI: 1.34–5.1; $p = 0.005$) to be predictors of severe CAC in patients undergoing coronary angiography due to MI. However only age remained an independent predicting factor in multivariate model (OR = 1.29; CI: 1.1–1.5; $p = 0.001$). Well known inflammatory biomarkers such as hs CRP, CD 40 ligand and interleukin 6 showed no usefulness in predicting coronary artery calcifications in patients with myocardial infarction.

Conclusions: Over one fourth of patients undergoing coronary angiography due to myocardial infarction has severe coronary artery calcifications. Age is the only independent predicting factor of severe CAC in this population. Inflammatory biomarkers do not predict the presence of severe CAC. Further studies are needed to evaluate other probable biomarkers of severe CAC.