Four-year outcomes after percutaneous coronary intervention of unprotected left main coronary artery disease in patients with stable angina and acute coronary syndrome

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Background. Percutaneous coronary intervention (PCI) of unprotected left main coronary artery disease (ULMCAD) have become a feasible and efficient alternative to coronary artery bypass surgery, especially in patients with acute coronary syndrome (ACS). There are limited data regarding early and late outcomes after ULMCAD PCI in patients with ACS and stable angina.

The aim of this study was to compare early and four-year clinical outcomes in patients with ULMCAD PCI presenting as ACS or stable angina in a high-volume PCI center.

Methods. We conducted a single center retrospective observational study, which included 146 patients with ULMCAD undergoing PCI between 2014 and 2018. Patients were divided in two groups: Group A included patients with stable angina (n = 70, 47.9%) and Group B patients with ACS (n = 76, 52.1%).

Results. 30-day mortality was 8.22% overall, lower in Group A (1.43% vs 14.47%, p = 0.02). Mortality and major adverse cardiac events (MACE) rates at 4 years were significantly lower in Group A (9.64% vs 33.25%, p = 0.001, and 24.06% vs 40.11%, p = 0.012, respectively). Target lesion revascularization (TLR) at 4 year did not differ between groups (15% in Group A vs 12.76% in Group B, p = 0.5).

Conclusions. In our study patients with ULMCAD and ACS undergoing PCI had higher early and long-term mortality and MACE rates compared to patients with stable angina, with similar TLR rate at 4-year follow-up.

Key words: acute coronary syndrome, left main stenosis, stable angina, percutaneous coronary intervention, unprotected left main coronary artery disease.

What is new?

This study confirms that patients with left main stenosis undergoing PCI presenting with acute coronary syndrome have a long-term mortality rate and major adverse cardiac events rate higher than patients presenting with stable angina.

Long-term target lesion revascularization rate didn't differ between acute and elective patients with left main PCI.

The worst outcomes are found in patients with cardiogenic shock.

INTRODUCTION

Percutaneous coronary intervention (PCI) of unprotected left main coronary artery disease (ULMCAD) have become a feasible and efficient alternative to coronary artery bypass surgery, especially in patients with acute coronary syndrome (ACS). Left main PCI in patients with ACS is a challenging situation for the interventional cardiologist. With the increasing experience, left main PCI in

ACS have become the first option in most cases because it ensures a more rapid restoration of coronary blood flow. In many cases of ACS complicated with cardiogenic shock, left main PCI remains the only therapeutic option.

There are limited data regarding early and late outcomes after ULMCAD PCI in patients with ACS compared to patients with stable angina [1, 2]. The aim of this study was to compare early and four-year clinical outcomes in patients with ULMCAD

PCI presenting as ACS or stable angina in a high-volume PCI center.

MATERIALS AND METHODS

Study population

All patients with ULMCAD treated by PCI at “Prof. Dr. C.C. Iliescu” Institute for Cardiovascular Diseases, Bucharest, Romania, between January 2014 and December 2018, were selected from the electronic hospital records. ULMCAD referred to patients with left main stenosis that was the culprit lesion for patient symptoms, without any patent bypass graft to any branches of left coronary artery. Patients with a history of CABG and occluded grafts, and patients presenting with ACS were included, also. Only patients with complete data were included in the study. This resulted in a total of 146 patients for which demographic, clinical, angiographic, procedural, post-procedural and outcome data were extracted from the hospital electronic records. Patients were divided in two groups: Group A included patients with stable angina ($n = 70$, 47.9%) and Group B patients with ACS ($n = 76$, 52.1%). In all cases the choice of stenting technique, type of stent and perioperative management was decided by the local heart team accordingly with local protocols. All patients received optimal medical treatment according current treatment guidelines besides PCI for left main stenosis. For all patients, the electronic hospital records were reviewed, including angiography imaging. Follow up was through in-hospital evaluation, telephone interviews and the National Insurance Agency Platform. The cause of death was not available in 5 out of 24 cases, and as such the outcome of all-cause mortality was used, to avoid confounding. Excluding those 5 patients, all other death were due to cardiovascular events.

Study outcomes

Primary study outcomes were all-cause mortality, target lesion revascularization (TLR) and major adverse cardiac events (MACEs). MACEs were defined as the occurrence of death, myocardial infarction (MI) or TLR. TLR was defined as repeated PCI for restenosis of the entire segment involving the implanted stent. Target vessel revascularization (TVR) and target vessel failure (TVF) were not included like secondary outcomes because all reinterventions were performed due to in-stent

restenosis. ACS was defined as either unstable angina, non-ST segment elevation MI or ST segment elevation MI. Angiographic success was defined as residual stenosis of $< 30\%$ with Thrombolysis in Myocardial Infarction flow (TIMI) grade 3. Complete revascularization was considered when all diseased vessel ≥ 2.5 mm in diameter were revascularized. Stent thrombosis was defined according the definition and classification proposed by an Academic Research Consortium (ARC) [3]. The diagnosis of periprocedural MI was made if after PCI there was an increase in CK-MB or troponin levels that was 5 times the upper normal level.

Statistical analysis

Frequencies are given as numbers and percentages, continuous values as median (inter-quartile range or minimum-maximum values). Population characteristics were compared using the Mann-Whitney U test, Kruskal Wallis test and Fisher’s exact test. Patients were divided into two main groups based on the PCI technique used: Group A – one-stent technique and Group B – two-stent technique.

Early outcomes are based on status at 30 days and presented as percentage. Late outcomes are estimated using the Kaplan Meier method. Late outcomes of interest are all-cause mortality, TLR and MACE.

Predictors of early outcomes were identified using univariable linear regression. Predictors of late outcomes death were identified using a combination of backward and forward stepwise multivariable Cox regression, including all variables with a univariable regression p value of less than 0.1 and less than $< 10\%$ missing values. The statistically significant variables left in the final model were considered as independent predictors.

Statistical analyses were done with STATA/SE 12.0 (StataCorp LP, College Station, TX).

RESULTS

Patient population

146 patients undergoing ULMCAD PCI were included, age ranging from 33 to 86 years (median of 63 years). Group A included patients with stable angina ($n = 70$, 47.9%) and Group B patients with ACS ($n = 76$, 52.1%). Table 1 summarize demographic and clinical characteristics of patients with ACS and

stable angina. Patients admitted with stable angina had a more frequent history of ACS (50% Group A vs 30.8% Group B, $p = 0.03$) and STEMI compared to patients admitted with ACS (77.1% vs 39.1%, $p = 0.007$). As expected, patients with ACS had a

lower left ventricular ejection fraction compared with patients presenting with stable angina (45% vs 55%, $p = 0.001$). 3% of patients admitted with stable angina were in Canadian Class (CCS) I, 40.3% in CCS II, 46.3 in CCS III and 10.4% in CCS IV.

Table 1

Demographic and baseline clinical characteristics according to the clinical presentation in patients with unprotected left main coronary artery disease treated by percutaneous coronary intervention (Group A – stable angina; Group B – acute coronary syndrome)

	Group A	Group B	Total	p value
Age, y (median, IQR)	62 (54–67)	64.5 (55.5–72)	63 (55–71)	0.2
Male	50 (71.4)	52 (68.4)	102 (69.9)	0.7
Cardiovascular Risk factors				
Hypertension	60 (85.7)	63 (82.9)	122 (84.1)	0.6
Dyslipidemia	65 (92.9)	61 (81.3)	126 (86.9)	0.05
Diabetes mellitus	18 (25.7)	24 (32)	42 (29)	0.5
Obesity	20 (28.6)	18 (23.7)	38 (26)	0.5
Smoking status				
Active smoker	23 (32.9)	22 (29)	43 (29.9)	0.2
Former smoker	16 (22.9)	10 (13.2)	26 (18.1)	0.2
Patient history				
ACS	35 (50)	23 (30.8)	58 (40)	0.03
Unstable angina	1 (2.9)	5 (21.7)	6 (10.3)	
NSTEMI	7 (20)	9 (39.1)	16 (27.6)	
STEMI	27 (77.1)	9 (39.1)	36 (62.1)	0.007
PCI	20 (28.6)	14 (18.4)	34 (23.3)	0.2
Atrial Fibrillation	8 (11.4)	11 (14.7)	19 (13.1)	0.6
Stroke/TIA	7 (10)	8 (10.5)	15 (10.3)	0.6
Bleeding	4 (5.7)	1 (1.3)	5 (3.4)	0.2
COPD	2 (2.9)	0 (0)	2 (1.4)	0.2
PAD	15 (21.4)	10 (13.3)	25 (17.2)	0.3
Neoplasm	6 (8.6)	3 (4)	9 (6.2)	0.3
Clinical presentation				
Stable angina	70 (100)	n/a	70 (47.9)	
Unstable angina	n/a	30 (39.5)	30 (20.5)	
NSTEMI	n/a	16 (21)	16 (11)	
STEMI	n/a	18 (23.7)	18 (12.3)	n/a
Cardiogenic shock	n/a	12 (15.8)	12 (8.2)	
Atrial Fibrillation	4 (5.8)	8 (10.8)	12 (8.4)	0.4
LVEF, % (median, IQR)	55 (45–60)	45 (34–55)	50 (35–57.5)	0.001
LV systolic dysfunction				
None ($\geq 50\%$)	42 (61.8)	32 (42.1)	74 (51.4)	
Mild (40–49%)	15 (22)	14 (18.5)	29 (20.1)	
Moderate (30–39%)	10 (14.7)	15 (19.7)	25 (17.4)	
Severe ($< 30\%$)	1 (1.5)	15 (19.7)	16 (11.1)	0.003
Blood samples pre-PCI				
HB, g/dl (median, IQR)	13.5 (12.5–14.5)	13.6 (11.9–14.9)	13.5 (12.3–14.7)	0.8
Troponin, ng/ml (median, IQR)	0.005 (0.002–0.02)	0.4 (–0.04–3.1)	0.3 (0.03–2.9)	0.003
Creatinine clearance, ml/min/1.73 m ² (median, IQR)	81 (70–95)	80 (48–97)	80 (64–96)	0.1

ACS – acute coronary syndrome; NSTEMI – nonST segment elevation myocardial infarction; STEMI – ST segment elevation myocardial infarction; PCI – percutaneous coronary intervention; TIA – transient ischemic attack; COPD – chronic obstructive pulmonary disease; PAD – peripheral artery disease; LVEF – left ventricular ejection fraction; HB – hemoglobin.

Angiographic characteristics

Table 2 shows the main angiographic findings by type of clinical presentation. Diagnostic coronary angiogram was performed using radial

approach mainly in patients with stable angina (35.7% Group A vs 11.8% Group B, $p = 0.001$). Complex left main lesions (calcified and ulcerated) were more frequent among patients with ACS. Although SYNTAX score was similar between

groups (18 in Group A vs 23 in Group B, $p = 0.09$), SYNTAX II score was higher in patients

with ACS (30 in Group A vs 35.9 in Group B, $p = 0.006$).

Table 2

Angiographic findings in patients with unprotected left main coronary artery disease treated by percutaneous coronary intervention (Group A – stable angina; Group B – acute coronary syndrome)

	Group A	Group B	Total	p value
Arterial access site				
Radial	25 (35.7)	9 (11.8)	34 (23.3)	
Femoral	45 (64.3)	67 (88.2)	112 (76.6)	0.001
Left main lesion localization				
Ostium	4 (5.7)	6 (7.9)	10 (6.9)	
Mid shaft	1 (1.4)	0 (0)	1 (0.7)	
Distal	55 (78.6)	57 (75)	112 (76.7)	
Ostial and distal	3 (4.3)	1 (1.3)	4 (2.7)	
Whole length	7 (10)	12 (15.8)	19 (13)	0.5
Bifurcation	3 (4.3)	1 (1.3)	4 (2.7)	
Trifurcation	7 (10)	12 (15.8)	19 (13)	0.5
Other lesions				
None	19 (27.1)	30 (39.5)	49 (33.6)	
One vessel	22 (31.4)	22 (29)	44 (30.1)	
Two vessels	24 (34.3)	15 (19.7)	39 (26.7)	
Three vessels	5 (7.2)	9 (11.8)	14 (9.6)	0.2
Chronic total obstruction	17 (24.3)	14 (18.4)	31 (21.2)	0.4
LAD ostium involved	40 (57.1)	55 (72.4)	95 (65.1)	0.06
LCX ostium involved	29 (41.4)	31 (40.8)	60 (41.1)	0.5
LAD non-ostial lesion	33 (47.1)	31 (40.8)	64 (43.8)	0.5
LCX non-ostial lesion	22 (31.4)	18 (23.7)	40 (27.4)	0.3
RCA lesion	27 (38.6)	21 (27.6)	48 (32.9)	0.2
Left main lesion characteristics				
Diffuse lesion	39 (55.7)	37 (46.7)	76 (52.1)	0.4
Eccentric lesion	53 (75.7)	54 (71.1)	107 (73.3)	0.6
Calcified lesion	15 (21.4)	28 (36.8)	43 (29.4)	0.05
Ulcerated lesion	4 (5.7)	32 (42.1)	26 (25.7)	< 0.001
Carina involvement	1 (1.4)	8 (10.5)	9 (6.2)	0.04
Medina classification				
1/1/1	15 (23.1)	19 (27.1)	34 (25.2)	
1/0/0	15 (23.1)	8 (11.4)	23 (17.1)	
1/1/0	2 (3)	14 (20)	16 (11.8)	
1/0/1	6 (9.2)	3 (4.3)	6 (6.7)	
0/1/0	20 (30.8)	17 (24.3)	37 (27.4)	
0/1/1	4 (6.2)	6 (8.6)	10 (7.4)	
0/0/1	3 (4.6)	3 (4.3)	6 (4.4)	0.04
True bifurcation (1/1/1, 0/1/1)*	19 (29.2)	25 (35.7)	44 (32.6)	0.5
LM take-off angle < 70 degrees	19 (31.2)	25 (39.1)	44 (35.2)	0.4
Bifurcation angle				
>90 degrees	4 (6.8)	8 (13.1)	12 (10)	
70-90	24 (40.7)	24 (39.2)	48 (40)	
45-69	9 (15.3)	12 (19.7)	21 (17.5)	
< 45	22 (37.3)	17 (27.9)	39 (32.5)	0.5
LM stenosis, % (median, IQR)	50 (20-72)	56 (20-90)	55 (20-80)	0.2
LAD stenosis, % (median, IQR)	80 (57-90)	87.5 (75-93)	85 (66-92)	0.01
CX stenosis, % (median, IQR)	63 (25-80)	75 (43-90)	70 (30-86)	0.1

LM – left main; LAD – left anterior descending artery; LCX – left circumflex artery; RCA – right coronary artery.

Procedural data

Procedural characteristics and post-procedural complications are summarized in Table 3. PCI was done using a 7 French guiding catheter more often

in patients with stable angina (55.7% Group A vs 35.5% Group B, $p = 0.005$). There were no differences between the two groups regarding the use of proximal optimization technique (POT), kissing balloon post-dilatation (KBPD) and type

of two stent technique. Although, intracoronary imaging was used less in ACS patients, it didn't reach the statistical significance.

All patients in Group A had TIMI 3 flow at the end of procedure compared to only 89.4% of cases in Group B ($p = 0.02$). Peri-procedural

complication were similar between the two groups, except for more bradyarrhythmias in Group B (1.4% Group A vs 11.8% Group B, $p = 0.02$). Procedural success and complete revascularization were achieved in similar percentage in both groups.

Table 3

Procedural characteristics according to the clinical presentation in patients with unprotected left main coronary artery disease treated by percutaneous coronary intervention (Group A – stable angina; Group B – acute coronary syndrome)

	Group A	Group B	Total	p value
Arterial access site				
Femoral	60 (85.7)	71 (93.4)	131 (89.7)	
Radial	10 (14.3)	5 (6.6)	15 (10.3)	0.2
Pre-PCI IABP	0 (0)	6 (7.9)	6 (4.1)	0.03
Rotablation	2 (2.9)	1 (1.3)	3 (2.1)	0.6
Two-stent technique	31 (22.3)	29 (38.2)		0.5
Type of two-stent technique				
Provisional T stenting	0 (0)	1 (3.4)	1 (1.7)	0 (0)
TAP	10 (35.7)	10 (34.5)	20 (35.1)	10 (35.7)
Mini-crush	9 (32.1)	9 (31)	18 (31.6)	9 (32.1)
DK-crush	2 (7.1)	1 (3.4)	3 (5.3)	2 (7.1)
Culotte	5 (17.9)	8 (27.6)	13 (22.8)	5 (17.9)
V stenting	2 (7.1)	0 (0)	2 (3.5)	2 (7.1)
POT	45 (69.2)	42 (60)	87 (64.4)	0.3
POT after stent	33 (50.8)	35 (50)	68 (50.4)	0.5
POT after KBPD	22 (33.9)	16 (22.9)	38 (28.2)	0.2
KBPD	32 (49.2)	30 (42.9)	62 (45.9)	0.6
TKBPD	3 (4.6)	2 (2.9)	5 (3.7)	0.7
Stent underexpansion of >30%	4 (5.7)	10 (13.2)	14 (9.6)	0.2
IFR used before PCI	5 (7.1)	1 (1.3)	6 (4.1)	0.1
IFR used after PCI	3 (4.4)	1 (1.3)	4 (2.8)	0.3
IVUS used before PCI	2 (2.9)	0 (0)	2 (1.4)	0.2
IVUS used after PCI	16 (22.9)	10 (13.2)	26 (17.8)	0.13
SB residual stenosis				
None	42 (65.6)	41 (59.4)	83 (62.4)	
< 50%	19 (29.7)	19 (27.5)	38 (28.6)	
>50%	3 (4.7)	9 (13.1)	12 (9)	0.3
Procedural success	68 (97.1)	70 (92.1)	138 (94.5)	0.3
Complete revascularization	55 (78.6)	54 (71.1)	109 (74.7)	0.3
TIMI				
1	0 (0)	4 (5.3)	4 (2.7)	
2	0 (0)	4 (5.3)	4 (2.7)	
3	70 (100)	68 (89.4)	138 (94.5)	0.02
Peri-procedural complications				
Hematoma	3 (4.3)	3 (4)	6 (4.1)	0.6
Stroke/TIA	1 (1.4)	0 (0)	1 (0.7)	0.5
Myocardial infarction	3 (4.3)	1 (1.3)	4 (2.7)	0.4
Atrial fibrillation	0 (0)	2 (2.6)	2 (1.5)	0.1
Need for external electric shock	1 (1.4)	3 (4)	4 (2.7)	0.6
Bradi-arrhythmia	1 (1.4)	9 (11.8)	10 (6.9)	0.02
Death during PCI	0 (0)	3 (4)	3 (2)	0.2
CIN*	7 (18.9)	7 (12.5)	14 (15.1)	0.6

PCI – percutaneous coronary intervention; IABP – intra-aortic balloon pump; LAD – left anterior descending artery; LCX – left circumflex artery; POT – proximal optimization technique; KBPD – kissing balloon post dilatation; TKBPD – triple kissing balloon post dilatation; MV – main vessel; SB – side branch; iFR – instantaneous wave-free ratio; IVUS – intravascular ultrasound; CIN – contrast induced nephropathy.

Early outcomes

30 days mortality rate was 14.47% in Group B compared to 1.43% in Group A ($p = 0.02$). Patients with ACS had a risk 11.67 times higher than patients with stable angina. Most deaths occurred in patients presenting with cardiogenic shock ($n = 8$). Three patients presenting with ACS underwent urgent coronary angiogram during the same hospitalization due to acute in stent thrombosis.

Intra-aortic balloon pump (IABP) was used only in patients with ACS, but in a small number of patients (7.9% of ACS patients).

Predictors of early mortality after univariable analysis are summarized in Table 4. The most important predictors of early mortality were cardiogenic shock (OR 65, 95% CI 13.67–309.01, $P < 0.001$), left ventricular ejection fraction $< 30\%$ (OR 19.44, 95% CI 5.13–73.67, $P < 0.001$), use of IABP (OR 14.55, 95% CI 2.56–82.67, $P = 0.003$) and atrial fibrillation at diagnosis (OR 7.68, 95% CI 1.9–31.08, $P = 0.004$).

Table 4

Predictors of 30-day mortality according to the clinical presentation in patients with unprotected left main coronary artery disease treated by percutaneous coronary intervention

30-day mortality	Univariable analysis		
	OR	CI	p value
ACS at presentation	11.93	1.49;95.26	0.02
History of atrial fibrillation	4.44	1.15;17.13	0.03
ACS with cardiogenic shock	59.49	12.5;283.11	< 0.001
IABP	13.33	2.34;75.79	0.003
Atrial fibrillation	7.06	1.74;28.58	0.006
LVEF $< 50\%$	5.61	1.18;26.7	0.03
LVEF $< 30\%$	19.77	5.1;76.52	< 0.001
Severe mitral regurgitation	6.1	1.32;28.22	0.02
Hb before PCI value	0.63/g/dl	0.43;0.94	0.02
CK-MB before PCI value	1.28/100U	1.02;1566	0.04
Creatinine clearance before PCI	0.97/ml/min/1.73 m ²	0.94;0.99	0.015
CIN*	8.87	1.52;51.55	0.02
LM stenosis degree	1.02/%	1;1.04	0.03
Predilatation at nominal diameter	5.46	1.05;28.36	0.04
POT	0.24	0.06;0.84	0.03
KBPD	0.22	0.46;1.08	0.06
Post-PCI LM diameter	0.22/mm	0.05;1.05	0.06
Post-PCI LAD diameter	0.007/mm	0.0006;0.09	< 0.001
Post-PCI CX diameter	0.37	0.19;0.69	0.002
Stent underexpansion of $> 30\%$	3.39	0.79;14.41	0.1
SB residual stenosis $< 50\%$	2.03	0.97;4.25	0.06
Complete revascularization	0.08	0.02;0.32	0.001
TIMI flow	0.04/level	0.006;0.22	< 0.001

ACS – acute coronary syndrome; IABP – intra-aortic balloon pump; PCI – percutaneous coronary intervention; LVEF – left ventricular ejection fraction; Hb – hemoglobin; CIN – contrast induced nephropathy; LM – left main; POT – proximal optimization technique; KBPD – kissing balloon post dilatation; LAD – left anterior descending artery; LCX – left circumflex artery; SB – side branch; TIMI – Thrombolysis In Myocardial Infarction.

Late outcomes

All-cause mortality, TLR and MACE rates at 4-year follow-up were 21.88%, 14.03% and 32.45% overall. Unadjusted comparisons of mortality, TLR and MACE at 4 years between Group A and Group B are shown in Figure 1. In univariable analysis, mortality and MACE rates at 4-year follow-up were lower in Group A compared to Group B (HR 4.5, 95% CI, 1.83–11.04, $p = 0.001$ and HR 2.34, 95% CI 1.2–4.55, $P = 0.012$, respectively), but not in multivariable analysis. TLR rate at 4-year follow-up

was similar between groups (Table 5). All-cause mortality and TLR rates at 4-year follow-up were 9.64% and 15%, respectively, in Group A and 33.25% and 12.76%, respectively, in Group B.

Cardiogenic shock (HR 6.98, 95% CI, 2.44–19.88, $p < 0.001$), severe left ventricular systolic dysfunction (HR 11.61, 95% CI, 5.56–24.24, $P < 0.001$), hemoglobin level below 12 g/dl (HR 3.66, 95% CI, 1.73–7.72, $P = 0.001$), diffuse left main plaque (HR 2.69, 95% CI, 1.17–6.2, $P = 0.02$) were independent predictors of late mortality in multivariable analysis (Table 5).

Figure 1. Unadjusted comparisons of all-cause mortality, TLR and MACE at 4 years according to the clinical presentation in patients with unprotected left main coronary artery disease treated by percutaneous coronary intervention (Group A – stable angina; Group B – acute coronary syndrome). Curves represent Kaplan-Meier failure function (TLR – target lesion revascularization; MACE – major adverse cardiac event).

Diabetes mellitus (HR 3.48, 95% CI, 1.13–10.68, $P = 0.03$) and the use of self-apposing stents (HR 4.37, 95% CI, 1.33–14.35, $P = 0.01$) were independent predictors of TLR at 4 years (Table 5). There were two cases of definite stent thrombosis, but the lack of clear data coming from anatomic pathology report makes it difficult to accurately assess the rate of stent thrombosis.

DISCUSSION

Significant ULMCAD is found in 3%–10% of patients undergoing coronary angiography [4]. Around 4% of patients with ACS have a severe left main stenosis [4, 5]. Only 0.8% of patients presenting as ACS have a left main occlusion [6]. In such high-risk cases, the principle goal of treatment is the rapid restoration of coronary blood flow. This is the reason why ULMCAD PCI in ACS became the preferred treatment option.

However, the evidence for emergency ULMCAD PCI in patients with ACS is scarce. Most reports of ULMCAD PCI referred to patients with stable angina, ACS patients representing a small percentage [4, 7–11]. So, we compared in

our study the early and four-year clinical outcomes in patients with ULMCAD PCI presenting as ACS or stable angina in a high-volume PCI center.

Although there were no significant differences in clinical and demographic characteristics between patients with stable angina and patients with ACS, the latter represented a group at higher risk due to lower left ventricular ejection fraction and higher SYNTAX II score.

Regarding procedural characteristics, ACS patients were treated more often by femoral approach, mainly because local expertise and the severity of clinical status. A key finding is that general principles that guides PCI technique in stable patients applied to ACS patients, also. We didn't identify any difference regarding the use of POT, KBPD, two-stent techniques, intravascular ultrasound between acute and elective ULMCAD PCIs.

The main finding of this study is that 30 days and 4-year mortality rates after ULMCAD PCI are higher in patients suffering from ACS compared to those with stable angina. So, the risk of patients with ACS is higher at diagnosis and remains higher despite aggressive therapy. All patients received optimal medical therapy accordingly to the current

European treatment guidelines [12]. Patients with cardiogenic shock had the worst prognosis. Interestingly, the TLR rates at 4-year follow up were similar between groups. This reflects the fact

that the PCI technique did not differed in ACS patients from those with stable angina and the interventional cardiologist aimed for a good final angiographic result.

Table 5

Predictors of late all-cause mortality and target lesion revascularization according to the clinical presentation in patients with unprotected left main coronary artery disease treated by percutaneous coronary intervention

Long term mortality	Univariable analysis			Multivariable analysis		
	HR	CI	p value	HR	CI	p value
Age	1.03/y	0.99-1.06	0.14			
Male gender	1.89	0.72;4.96	0.19			
Hypertension	0.48	0.21;1.09	0.08			
Former smoker	0.3	0.07;1.32	0.11			
History of stroke	2.33	0.95;5.74	0.06			
SYNTAX	1.05/unit	1.02-1.1	0.002			
SYNTAX-2 PCI	1.07/unit	1.04-1.1	< 0.001			
SYNTAX-2 CABG	1.04/unit	1.02-1.08	0.003			
EUROSCORE II	1.16/unit	1.11-1.22	< 0.001			
ACS	4.37	1.77;10.75	0.001			
ACS with cardiogenic shock	13.74	6.15;30.68	< 0.001	6.09	2.08;17.75	0.001
Atrial Fibrillation at presentation	2.67	1.01;7.04	0.05			
LVEF (%)	0.93/%	0.9-0.96	< 0.001			
LVEF < 30%	12.52	5.93;26.43	< 0.001	5.77	2.26;14.75	< 0.001
Severe mitral regurgitation	3.42	1.3;9.02	0.01			
Pulmonary hypertension*	1.83	0.68;4.94	0.23			
Hb < 12 g/dl	5.13	2.45;10.72	< 0.001	3.52	1.61;7.67	0.002
Creatinine clearance at PCI	0.97	0.96-0.98	< 0.001			
CIN*	5.33	1.95;14.52	0.001			
Associated two/three vessel disease	1.62	1.02;2.58	0.04			
Diffuse LM plaques	2.19	0.99;4.82	0.05	2.57	1.1;6.01	0.03
Ulcerated LM lesion	3.07	1.48;6.38	0.003			
LM stenosis (%)	1.01/%	1.005-1.03	0.004			
Post PCI LCX diameter (mm)	0.53/mm	0.37;0.75	< 0.001			
Pre-PCI IABP	8.65	3.21;23.31	< 0.001			
Post-PCI IABP	4.15	1.57;10.94	0.004			
Predilation at nominal diameter	2.98	1.3;6.81	0.01			
POT used	0.48	0.23;1.007	0.05			
Residual SB stenosis >50%	1.8	1.15;2.83	0.01			
Procedural succes	0.17	0.06-0.45	< 0.001			
Complete revascularisation	0.26	0.13-0.55	< 0.001			
TLR	Univariable analysis			Multivariable analysis		
	HR	CI	p value	HR	CI	p value
Diabetes	4.85	1.67;14.09	0.004	3.88	1.24;12.12	0.02
History of Atrial Fibrillation	3.23	1.01;10.34	0.05			
Associated two/three vessel disease	3.49	0.94;12.93	0.06			
Non ostial LCX lesion	5.23	1.75;15.63	0.003	5.52	1.78;17.15	0.003
Calcified LM lesion	2.77	0.97;7.93	0.06			
LAD stenosis (%)	1.01/%	0.99-1.04	0.1			
Self-apposing stent used	3.07	0.96;9.8	0.06	3.61	1.11;11.74	0.03
MV stent diameter (mm)	0.27	0.04;1.98	0.2			
Stent underexpansion of >30%	2.75	0.76;9.89	0.12			

*>10% missing value, not used in multivariable analysis

ACS – acute coronary syndrome; IABP – intra-aortic balloon pump; PCI – percutaneous coronary intervention; LVEF – left ventricular ejection fraction; Hb – hemoglobin; CIN – contrast induced nephropathy; LM – left main; POT – proximal optimization technique; KBPD – kissing balloon post dilatation; LAD – left anterior descending artery; LCX – left circumflex artery; TLR – target lesion revascularization; SB – side branch.

This study was a nonrandomized study in which operator bias may have influenced the final

conclusion. Routine angiographic reevaluation was not performed because it is no longer recommended.

CONCLUSION

Patients with ULMCAD undergoing PCI presenting with ACS had a 4-year mortality rate

and MACE rate higher than patients presenting with stable angina. 4-year TLR rate didn't differ according to clinical presentation.

Introducere. *Intervenția percutană coronariană (PCI) a arterei coronare stângi (ULMCAD) a devenit o alternativă fezabilă și eficientă a chirurgiei by-pass la pacienții cu sindrom coronarian acut. Sunt date limitate privind prognosticul precoce și tardiv după ULMCAD PCI la pacienții cu ACS și angină stabilă. Scopul studiului a fost de a compara prognosticul precoce și la 4 ani la pacienții cu ULMCAD PCI cu prezentare cu ACS sau angină stabilă la pacienții dintr-un centru cu un rulaj mare PCI.*

Metode. *A fost realizat un studiu monocentric, observațional și retrospectiv, ce a inclus 146 de pacienți cu ULMCAD ce au suferit PCI între 2014–2018. Grupul A a avut pacienți cu angină stabilă (n = 70, 47,9%), iar grupul B pacienți cu ACS (n = 76, 52,1%).*

Rezultate. *Mortalitatea la 30 zile a fost de 8,22%, mai mică în grupul A (1,43% versus 14,47%, p = 0,02). Mortalitatea și evenimentele majore adverse cardiace (MACE) la 4 ani au fost semnificativ mai mici la grupul A (9,64% vs 33,25%, p = 0,001, și 24,06% vs 40,11%, p = 0,012). Leziunile de revascularizare (TLR) nu au diferit între cele două grupuri la 4 ani (15% grup A vs 12,76% grup B, p = 0,5).*

Concluzii. *În acest studiu pacienții cu ULMCAD și ACS ce au suferit PCI au avut mortalitate mai mare și rate ale MACE mai mari comparativ cu pacienții cu angină stabilă cu rate similare ale TLR la 4 ani de urmărire.*

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