Hindawi Publishing Corporation
Advances in Vascular Medicine
Volume 2015, Article ID 751293, 7 pages
http://dx.doi.org/10.1155/2015/751293

Research Article

Unprotected Left-Main Coronary Angioplasty in the Elderly in a High Volume Catheterization Centre without On-Site Surgery Facilities: Immediate and Medium Term Outcome—The Old-Placet Registry

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Received 26 August 2014; Revised 4 February 2015; Accepted 11 February 2015

Academic Editor: Arnon Blum

We aim to assess clinical feasibility and efficacy of unprotected left main (ULM) percutaneous coronary intervention (PCI) in patients older than 75 years over a 6-year period and with 2-year follow-up demonstrating that PCI is a feasible revascularization strategy even in absence of on-site cardiothoracic support. Nevertheless, the outcome of these high-risk patients is still hampered by a sensible in-hospital mortality rate. Older patients have a higher mortality at follow-up (10.0 versus 0.8%, $P = 0.014$), while younger patients have a low mortality after the acute phase (15.7 versus 8.4%, $P = 0.15$).

1. Introduction

Unprotected left main (ULM) coronary disease incidence during diagnostic coronary angiography ranges between 4 and 7% [1] and increases with age [2, 3]. Even recent guidelines [4] consider coronary artery bypass graft (CABG) the preferred revascularization strategy for ULM disease, especially when distal bifurcation is involved and in presence of diffuse multivessel coronary disease [5]. Nevertheless clinical profile and age in specific can dramatically increase the surgical risk [6] and so, notwithstanding the encouraging results obtained in elective patients with ULM coronary disease treated with percutaneous coronary intervention (PCI) and drug-eluting stents (DES) [7–10], results in older population with ULM disease (generally excluded by randomized trials) are unclear. In this study, we specifically evaluated the feasibility and the efficacy of percutaneous ULM coronary disease treatment in older population (more than 75 years old) in a group of patients referred to a centre without on-site cardiothoracic surgical support in the contest of acute coronary syndrome (ACS).

2. Methods

This is a spontaneous single-centre registry; catheterization laboratory and general characteristics are described elsewhere [11]. We retrospectively enrolled all the patients with unprotected left main coronary artery disease in the contest of acute coronary syndrome (ACS) treated with percutaneous coronary angioplasty in our institution between January 2003 and January 2010; a dedicated database (Cardioplanet, EBIT-AE, IT) was used to obtain clinical and procedural data and a clinical-event committee-based study (F. Tomassini and A. Gambino) was used for end point adjudication. All angiograms were reviewed to assess primary involvement of ULM and technique and procedural details. Due to the lack of on-site cardiothoracic surgical team in our institution, the decision to proceed PCI instead of CABG was primarily dependent on hemodynamic stability of the patients, the high-surgical risk (e.g., critical ill condition, EUROSCORE), and the technical feasibility of the percutaneous procedure, so PCI was performed because of the unacceptable delay in reaching the nearest cardiac surgery for emergency bypass in an emergency setting. Nonurgent revascularization patients were excluded from the study as they were discussed with cardiosurgeon and, in absence of clinical or technical contraindication, were treated with CABG.

Cardiogenic shock was defined as systolic blood pressure persistently below 90 mmHg.

Coronary flow was defined according to Thrombolysis in Myocardial Infarction (TIMI) grade [12]. Procedural success was defined as <20% residual stenosis, TIMI 3 flow without patient's death or in-hospital target vessel failure (TVF). Significant disease in vessel different from ULM was defined as >50% stenosis. Cardiac death was defined as any death due to cardiac cause, procedure-related deaths, and death of unknown cause. Myocardial infarction (MI) was defined as any elevation of creatine-kinase level or its MB isoenzyme up to 3 times the upper normal limit [13]. Target lesion revascularization (TLR) was defined as any revascularization procedure performed because of angiographic restenosis at the site of the lesion treated associated with clinical and/or objective evidence of inducible myocardial ischemia. Procedure strategy (balloon predilatation, stent selection, use of intraaortic balloon pump, and anticoagulation or antiplatelet regimen) was left to operator discretion.

Logistic EUROSCORE was adopted to assess the cardiac surgical or percutaneous mortality risk [14, 15].

Primary end point was in-hospital target vessel failure (TVF) defined as death from cardiac cause, myocardial infarction attributable to the target vessel, or clinically driven target vessel revascularization (TVR). Secondary end points were (1) *death* for any cause during hospitalization and (2) *death* for any cause at two years *follow-up* and (3) TVF at two-year follow-up.

All patients were discharged on dual antiplatelet therapy (aspirin and clopidogrel or ticlopidine) for twelve months irrespective from the selected stent.

All survived patients with no clinical contraindications were scheduled for angiographic follow-up at six months. Two-year clinical follow-up data were obtained from outpatient clinic visit or direct telephone contact. Due to the observational design of this registry ethical committee approval was waived.

2.1. Statistical Analysis. All continuous results are presented as mean ± standard deviation (SD). Chi-square and unpaired Student's t-test are used to compare, respectively, ordinal and continuous variables. A $P < 0.05$ value was considered statistically significant. 95% confidence intervals (CIs) for proportions are calculated by the Wilson method. Independent predictors of in-hospital and long-term outcomes were analysed using Cox proportional hazards regression model. The results are reported as adjusted odds ratio (OR) with associated 95% confidence intervals (CI). A two-tailed P value <0.05 was established as the level of statistical significance for all tests. A logistic regression analysis identified the variables that were significantly and independently associated with in-hospital TVF. Survival curves were constructed using the Kaplan-Meier method to analyse freedom target lesion failure (TLF); statistical analyses were carried out using SPSS-PASW 18.0 (IBM, Armonk, NY, USA) except for survival curves that were generated with R program version 3.0.2. (R Core Team, 2013, http://www.r-project.org/).

3. Results

During the observed period we have treated 200 patients with ULM disease; baseline characteristics are shown in Table 1. The high-risk profile of this cohort includes acute MI diagnosis in 34.5% with 22% with ST-elevation myocardial infarction (STEMI) presentation, multivessel coronary artery disease (CAD) in 63.0%, severely depressed ejection fraction (EF) (<35%) in 18.5%, and previous PCI in 19.5% accounting for a mean additive EuroSCORE value of 8 (interquartile range 4–13).

70 patients (35%) were older than 75 years. Older group had a smaller prevalence of normal ejection fraction at admission (28.5 versus 43.8%, $P = 0.024$, IC 0.27–0.95), higher recent or prior malignancy diagnosis prevalence (18.5 versus 6.9%, $P = 0.013$, IC 1.2 to 7.5), lower smoke habit prevalence (35.1 versus 67.6%, $P < 0.001$, IC 0.15 to 0.51), and higher clinical risk (EuroSCORE additive >13 38.5 versus 20.7, $P = 0.006$, IC 1.2 to 4.5; Logistic Euroscore 41.91 ± 26.77 versus 7.80 ± .11.25, $P < 0.0001$, IC 1.01 to 1.03). A non-ST-elevation myocardial infarction (NSTEMI) presentation was present in 14.2 versus 11.5% ($P = 0.006$, IC 1.38 to 7.7).

Main angiographic and procedural characteristics are summarized in Table 2. Pre-procedural hemodynamic instability was present in 44% of patients and 16% of patients presented in cardiogenic shock requiring inotropic support or cardiopulmonary resuscitation maneuvers (no significative differences in the two populations). Adjunctive 6% of patients experienced cardiogenic shock during the procedure with a cumulative incidence of intra-procedural cardiac arrest in 3.5%. Intra-aortic balloon pump (IABP) was used in majority of cases (75.5%) with high prevalence in both populations (81.4 versus 72.3%, $P = 0.17$, IC 0.8 to 3.4), while GP IIb/IIIa inhibitors were administered in 47.5% with higher prevalence in the younger population (53.0 versus 37.1%, $P = 0.038$, IC 0.28 to 0.94).

ULM distal bifurcation involvement was present in 88.5% (88.5 versus 88.4, $P = 1.0$, IC 0.40 to 2.5); a provisional stenting technique was used in the majority of the cases (67.5%) in both populations (75.7 versus 63.7%, $P = 0.07$, IC 0.95 to 3.5). Calcified lesions were more frequent in older population (60.0 versus 26.9%, $P < 0.0001$, IC 2.2 to 7.5).

Drug eluting stent (DES) was used in the majority of cases (86.0%, 82.8 versus 87.6%, $P = 0.39$, IC 0.3 to 1.5) with the exclusion of patients with known contraindications. Intravascular ultrasound (IVUS) guidance was adopted only in 12.5% of procedures and was mostly reserved to younger patients (16.1 versus 5.7%, $P = 0.04$, IC 0.10 to 0.95). Routine high pressure postdilatation with noncompliant balloon was performed in 76.5% (82.8 versus 73.0%, $P = 0.16$, IC 0.85 to 3.7). Angiographic follow-up was more frequent in younger population (76.1 versus 55.7%, $P = 0.003$, OR 0.3, IC 0.21 to 0.73).

Angiographic success was obtained in 95.0% of patients (95.7 versus 95.5%, $P = 0.73$, IC 0.31 to 5.0), but procedural success was sensibly lower with a cumulative in-hospital TVF

Table 1: Baseline characteristics; *creatinine >2.0 mg/dL. Numbers are values and percentages or mean and standard deviation (SD) as appropriate. PCI percutaneous coronary angioplasty STEMI: ST-elevation myocardial infarction; NSTEMI: non-ST-elevation myocardial infarction; CAD: coronary artery disease.

	Overall (200)	>75 Y.OLD (70)	<75 Y.OLD (130)	OR (CI 95%)	*P* value
Clinical characteristics					
Age (years)	69.7 ± 9.6	79.49 ± 3.72	64.47 ± 7.56		**<0.0001**
Male gender	157 (78.5)	51 (72.8)	106 (81.5)	0.6 (0.3 to 1.2)	0.15
Left ventricle ejection fraction >55%	77 (38.5)	20 (28.5)	57 (43.8)	0.5 (0.27 to 0.95)	**0.02**
Left ventricle ejection fraction <35%	37 (18.5)	17 (24.2)	20 (15.3)	1.7 (0.85 to 3.60)	0.08
Chronic kidney disease*	26 (13.0)	11 (15.7)	15 (11.5)	1.4 (0.61 to 3.3)	0.26
Prior PCI	39 (19.5)	12 (17.1)	27 (20.7)	0.78 (0.37 to 1.6)	0.33
Malignancy	22 (11.0)	13 (18.5)	9 (6.9)	3.0 (1.2 to 7.5)	0.01
Cardiac risk factors					
Hypertension	140 (70.0)	50 (71.4)	90 (69.2)	1.1 (0.58 to 2.1)	0.43
Hypercholesterolemia	87 (43.5)	25 (35.7)	62 (47.6)	0.61 (0.33 to 1.10)	0.69
Smoke habit	114 (57.0)	25 (35.1)	88 (67.6)	0.28 (0.15 to 0.51)	**<0.001**
Family history of CAD	14 (7.0)	2 (2.8)	12 (9.2)	0.28 (0.06 to 1.3)	0.76
Diabetes	48 (24.0)	15 (21.4)	33 (25.3)	0.8 (0.40 to 1.6)	0.32
Severity of coronary artery disease					
Single vessel disease	37 (18.5)	16 (22.8)	21 (16.1)	1.5 (0.74 to 3.1)	0.16
Double vessel disease	54 (27.0)	19 (27.1)	35 (26.9)	1.0 (0.52 to 1.9)	0.55
Triple vessel disease	72 (36.0)	26 (37.1)	46 (35.3)	1.07 (0.59 to 1.9)	0.46
Isolated left main disease	37 (18.5)	9 (12.8)	28 (21.5)	0.53 (0.23 to 1.2)	0.18
Admission diagnosis					
Unstable angina	131 (65.5)	43 (61.4)	88 (67.6)	0.76 (0.41 to 1.39)	0.23
Myocardial infarction	69 (34.5)	27 (38.5)	42 (32.3)	1.3 (0.71 to 2.4)	0.23
NSTEMI	25 (12.5)	10 (14.2)	15 (11.5)	3.2 (1.38 to 7.7)	**0.006**
STEMI	44 (22.0)	12 (17.1)	32 (24.6)	0.63 (0.30 to 1.32)	0.14
EuroSCORE					
Additive >6	112 (56.0)	56 (0.8)	56 (43.0)	5.2 (2.6 to 10.4)	**<0.001**
Additive >13	54 (27.0)	27 (38.5)	27 (20.7)	2.3 (1.2 to 4.5)	**0.006**
Logistic	22.9 ± 25.9	41.9 ± 26.8	7.8 ± 11.3	1.02 (1.01 to 1.03)	**<0.0001**

rate of 13% (17.1 versus 10.7%, $P = 0.27$, IC 0.74 to 3.9), mainly due to a high cardiac death rate (11%, 15.7 versus 8.4, $P = 0.15$, IC 0.82 to 4.9). At 2-year follow-up a major prevalence of death was evident in older population (10.0 versus 0.8%, $P = 0.014$, OR 14.3 with IC 1.7 to 119.0) but with a smaller prevalence of TLR (2.9 versus 10.0%, $P = 0.067$, OR 0.2, IC 0.58 to 1.20) resulting in similar TVF at follow-up (10.0 versus 10.8% $P = 0.866$, OR 0.92, IC 0.35 to 2.39). There were no differences in cumulative outcome (in-hospital and two-year follow-up) in TLF (23.5%; 27.1 versus 21.5%; $P = 0.374$; OR 1.3; IC 0.69 to 2.65), myocardial infarction (6.0%; 7.1 versus 5.4%; $P = 0.619$; OR 1.35; IC 0.41 to 4.42), TLR (9.5%; 7.1 versus 10.8%; $P = 0.407$; OR 0.63; IC 0.2 to 1.8), stent thrombosis (3.5%, 5.7 versus 2.3%; $P = 0.24$; OR 2.5; IC 0.55 to 11.8), and cerebral ischaemic events (1.0%; 1.4 versus $0.0''$; $P = 0.35$) with a higher cardiac death rate in the older population (15.0%; 25.7 versus 9.2%; $P = 0.003$; OR 3.4; IC 1.52 to 7.57). All in-hospital cardiac deaths were related to clinical presentation (ACS with cardiogenic shock at presentation without clinical improvement after PCI) while follow-up deaths were for unknown cause or sudden death (Table 3).

At univariate analysis the significant predictors of in-hospital TVF in older population were EuroSCORE additive >13, STEMI at presentation, severely depressed ventricular function, and cardiogenic shock at presentation while after multiple regression adjustment only cardiogenic shock maintained statistical significance ($P = 0.04$, OR 8.9; IC 1.04–77.22) (Table 4). Freedom from TLF is depicted in Figure 1 without showing significant differences among groups in long-term follow-up (Log-Rank P value = 0.9).

4. Discussion

CABG is considered the standard of care for patients with ULM disease [4, 5] but PCI is technically feasible by expert operators with a very high percentage of angiographic immediate success [9, 16, 17]. Recently, the SYNTAX trial [18], despite being unable to reach the end point of noninferiority of PCI versus CABG, has shown very promising results in less complex coronary anatomy, substantially confirming data from previous registry [19]; on the other hand the studies that historically gave rise to these recommendations excluded elderly patients and it is well known that age can

Table 2: IABP: aortic balloon pump; BMS: bare metal stent; DES: drug-eluting stent; IVUS: intravascular ultrasound; PCI: percutaneous coronary intervention.

	Overall (200)	>75 Y.OLD (70)	<75 Y.OLD (130)	OR (CI 95%)	*P* value
Procedural complexity					
Pre-procedural hemodynamic instability	88 (44.0)	37 (52.8)	51 (39.2)	1.7 (0.96 to 3.1)	0.07
Pre-procedural cardiogenic shock	32 (16.0)	12 (17.1)	20 (15.3)	1.1 (0.52 to 2.49)	0.84
Peri-procedural cardiogenic shock	44 (22.0)	17 (24.2)	27 (20.7)	1.2 (0.61 to 2.44)	0.59
Cardiac arrest during or pre procedure	7 (3.5)	3 (7.9)	4 (3.0)	1.4 (0.30 to 6.48)	0.69
Orotracheal intubation during or pre procedure	18 (9.0)	9 (12.8)	9 (6.9)	1.9 (−0.29 to 1.6)	0.12
IABP use	151 (75.5)	57 (81.4)	94 (72.3)	1.6 (0.80 to 3.4)	0.17
Glycoprotein inhibitors IIb/IIIa	95 (47.5)	26 (37.1)	69 (53.0)	0.52 (0.28 to −0.94)	**0.038**
Target lesion					
Ostial left main	17 (8.5)	6 (8.5)	11 (8.4)	1.0 (0.35 to 2.8)	1.0
Mid left main	6 (3.0)	2 (2.8)	4 (3.0)	0.9 (0.16 to 5.1)	1.0
Distal left main	177 (88.5)	62 (88.5)	115 (88.4)	1.0 (0.40 to 2.5)	1.0
Lesion complexity					
Tortuosity	6 (3.0)	3 (4.2)	3 (2.3)	1.8 (0.37 to 9.60)	0.42
Irregular	38 (19.0)	14 (20.0)	24 (18.4)	1.1 (0.53 to 2.30)	0.85
Calcified	77 (38.5)	42 (60.0)	35 (26.9)	4.0 (2.20 to 7.50)	<**0.0001**
Thrombotic	19 (9.5)	5 (7.1)	14 (10.7)	0.6 (0.20 to 1.80)	0.46
Eccentric	67 (33.5)	23 (32.8)	44 (33.8)	0.9 (0.51 to 1.70)	1.0
In-stent restenosis treatment	5 (2.5)	2 (2.8)	3 (2.3)	1.2 (0.20 to 7.60)	1.0
Bifurcation angle >90°	9 (4.5)	3 (4.2)	6 (4.6)	0.9 (0.22 to 3.8)	1.0
Reference vessel diameter (mm)	3.68 ± 0.51	3.66 ± 0.48	3.69 ± 0.46	1.1 (0.62 to 1.90)	0.75
Lesion length (mm)	20.99 ± 8.11	20.8 ± 8.4	21.0 ± 7.9		0.81
Diameter stenosis	80.26 ± 13.96	80.19 ± 13.8	80.31 ± 14.06	1.09 (0.62 to 1.90)	0.75
Procedural characteristics					
Single stent	135 (67.5)	53 (75.7)	82 (63.7)	1.8 (0.95 to 3.50)	0.07
BMS implantation	28 (14.0)	12 (17.1)	16 (12.3)	1.4 (0.65 to 3.30)	0.39
DES implantation	172 (86.0)	58 (82.8)	114 (87.6)	0.6 (0.30 to 1.50)	0.39
Total stent length per patient (mm)	20.99 ± 8.12	20.80 ± 8.41	21.08 ± 7.97		0.50
IVUS guided PCI	25 (12.5)	4 (5.7)	21 (16.1)	0.3 (0.10 to 0.95)	**0.04**
Direct stenting	57 (28.5)	15 (21.4)	42 (32.3)	0.5 (0.29 to 1.12)	0.14
High pressure stent post-dilation	153 (76.5)	58 (82.8)	95 (73.0)	1.7 (0.85 to 3.70)	0.16
Angiographic Success	190 (95.0)	67 (95.7)	123 (94.6)	1.2 (0.31 to 5.00)	0.73
Complete revascularization	153 (76.5)	53 (75.7)	100 (76.9)	0.9 (0.47 to 1.80)	0.80
Dye (mL; mean ± SD)	268.4 ± 94.0	261.9 ± 93.5	271.9 ± 94.4	0.9 (0.99 to 1.03)	0.47
Follow-up angio	138 (0.69)	39 (55.7)	99 (76.1)	0.3 (0.21 to 0.73)	**0.003**

increase dramatically surgical risk (four-time mortality in over 80 years old group compared with 65–75 years old patients; 13.5% versus 3.4%, $P = 0.0004$) [6], so, despite the fact that clinical features associated with favourable angioplasty outcomes include younger age, older patients are often considered for ULM PCI [20]. Some nonrandomized data hypothesized that in this subgroup of patients PCI can even offer some advantage in short- and mid-term mortality [21, 22].

Our data refers to a single-centre experience, with high activity volume (more than 900 angioplasties (PCI) and 220 primary angioplasties (PPCI) per year [23]), three dedicated operators, and without cardiac surgery on site but with surgical bake-up by 30 minutes ambulance travel. Due to geographical and economical reason, with a very diffuse distribution of catheterization laboratories and a high concentration of cardiac surgery in our territory, most of PCI and PPCI in our region are treated in centres without on-site cardiac surgery [23].

The major findings of this monocentric registry is that our data confirm the high clinical risk (24.2% EF < 35%, 21.4% diabetes mellitus, 38.5% myocardial infarction at presentation, Logistic Euroscore 41.9 ± 26.7) and angiographic complexity (37.1% with three vessel disease associated with ULM) of ULM disease in an aged population with a relatively high percentage (24.2%) of periprocedural cardiogenic shock and cardiac arrest requiring resuscitation (7.9%) at presentation. These data could partially explain the very high IABP utilization (81.4%), higher than previously reported [16, 24]. Notably, in our registry IABP use in the context of ULM

Table 3: In-hospital and follow-up clinical outcomes. Numbers are values and percentages.

	Overall (200)	>75 Y.OLD (70)	<75 Y.OLD (130)	OR (CI 95)	*P* value
In-hospital outcome					
Target lesion failure	26 (13.0)	12 (17.1)	14 (10.7)	1.7 (0.74 to 3.90)	0.27
Cardiac death	22 (11.0)	11 (15.7)	11 (8.4)	2.0 (0.82 to 4.91)	0.15
Myocardial infarction	8 (4.0)	3 (4.2)	5 (3.8)	1.1 (0.25 to 4.81)	1.00
Target lesion revascularization	4 (2.0)	3 (3.4)	1 (0.9)	5.7 (0.58 to 56.6)	0.12
Stent thrombosis	5 (2.5)	3 (3.4)	2 (1.8)	2.8 (0.46 to 17.50)	0.34
Definite	5 (2.5)	3 (3.4)	2 (1.8)		0.65
Probable	0 (0.0)	0 (0.0)	0 (0.0)		1.00
Cerebral ischemic event	0 (0.0)	0 (0.0)	0 (0.0)		1.00
2-year follow-up outcome					
Target lesion failure	21 (10.5)	7 (10.0)	14 (10.8)	0.9 (0.35 to 2.39)	0.86
Cardiac death	8 (4.0)	7 (10.0)	1 (0.8)	14.3 (1.72 to 119.03)	0.01
Myocardial infarction	4 (2.0)	2 (2.9)	2 (1.5)	1.8 (0.25 to 13.6)	0.53
Target lesion revascularization	15 (7.5)	2 (2.9)	13 (10.0)	0.2 (0.58 to 1.20)	0.06
Stent thrombosis	2 (1.0)	1 (1.4)	1 (0.7)	1.8 (0.11 to 30.3)	1.0
Definite	1 (0.5)	0 (0.0)	1 (0.7)		0.44
Probable	1 (0.5)	1 (1.1)	0 (0.0)		1.00
Cerebral ischemic event	1 (0.5)	1 (1.4)	0 (0.0)		0.35
Cumulative outcome (in-hospital and follow-up)					
Target lesion failure	47 (23.5)	19 (27.1)	28 (21.5)	1.3 (0.69 to 2.65)	0.37
Cardiac death	30 (15.0)	18 (25.7)	12 (9.2)	3.4 (1.52 to 7.57)	**0.003**
Myocardial infarction	12 (6.0)	5 (7.1)	7 (5.4)	1.3 (0.41 to 4.42)	0.61
Target lesion revascularization	19 (9.5)	5 (7.1)	14 (10.8)	0.6 (0.20 to 1.80)	0.40
Stent thrombosis	7 (3.5)	4 (5.7)	3 (2.3)	2.5 (0.55 to 11.80)	0.24
Definite	6 (3.0)	3 (4.2)	3 (2.3)		0.42
Probable	1 (0.5)	1 (1.4)	0 (0.0)		0.35
Cerebral ischemic event	1 (0.5)	1 (1.4)	0 (0.0)		0.35

Table 4: Multiple regression analysis for in-hospital TVF in older population.

	P	OR	95% CI	
			LCI	UCI
Primary PCI	0.136	4,992	0,603	41,296
LVEF <35%	0.988	0,985	0,143	6,807
EuroSCORE additive >13	0.861	0,808	0,074	8,757
Shock	0.046	8,961	1,040	77,229

PCI: percutaneous coronary angioplasty.
LVEF: left ventricular ejection fraction.
LCI: lower confidence interval.
UCI: upper confidence interval.
OR: odds ratio.

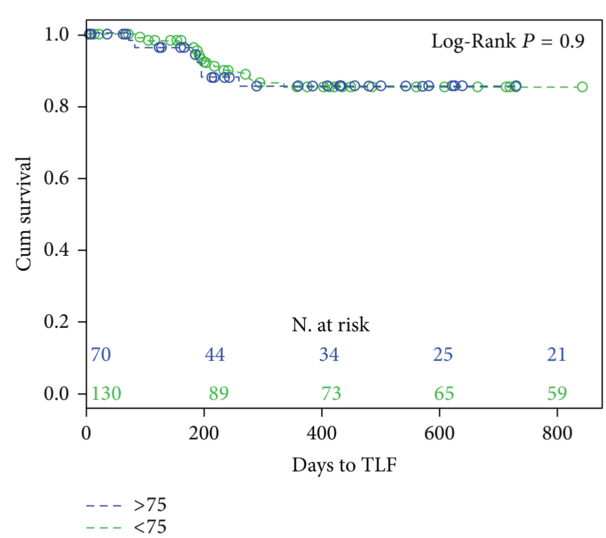

Figure 1

stenting resulted higher as usually reported in contemporary registry. This reflects the attitude in our center in prophylactic use of IABP in high risk PCI. However vascular complications were minor and we did not report a significant influence of IABP use in the main endpoint of the study even after statistical adjustment.

As previously reported [24] the majority of patients presented with distal left main bifurcation involvement (88.5%), characteristic related with an adverse prognosis at follow-up [25] but in the higher majority of patients it was possible to obtain an adequate final result with a single stent implantation (75.7%), strategy related with better outcome at follow-up [26]. Severe left main calcification has been identified as an independent predictor of mortality [27] and was more prevalent in the older population (60.0 versus 26.9%, $P < 0.0001$) but some preparation of the plaque (only 21.4 versus 32.3% of direct stenting implantation) was obtained in the majority of patients; despite the known prognostic value of ultrasound examination in ULM PCI [28] IVUS was underused in our general (12.5%) and older (5.7%) population, but the device was not available in catheterization laboratory until 2008; this fact could be considered less important by the high prevalence of aggressive noncompliant balloon postdilatation obtained in both populations.

Despite general concerning about long term dual antiplatelet therapy adherence and increased bleeding risk profile, DES have been largely used in the absence of known contraindications; these data are in line with reported of evident advantage in terms of mortality, myocardial infarction, and repeated revascularization at follow-up given by these devices [29].

In agreement with other studies [9, 16, 19, 21, 30] most of the deaths occur during in-hospital phase with a trend favouring the younger population during in-hospital phase; at follow-up differences in cardiac death rate diverge in a more significant way with a worse prognosis for older patients. Probably due to the higher prevalence of elective angiographic follow-up, time dependent TLR is higher in younger population and comparable with previous report; notwithstanding the greater attention paid to these patients in postdischarge period TLR rate remains acceptable and consistent with previous literature [16, 31, 32].

In the older population several characteristics seemed to be related with adverse event at follow-up, but, after multivariate analysis, only cardiogenic shock at presentation maintained an independent prognostic role.

5. Study Limitations

This is a retrospective nonrandomized study, with a very selected population and a relative small sample size. Another limitation is the lack of collegial discussion with surgical team in urgent cases or in high-risk patients that might have forced the selection for PCI treatment. Nevertheless, this registry reflects the real current practice in most centres offering 24 h PCI availability without on-site surgical backup.

6. Conclusions

Despite the high clinical risk and the angiographic complexity, ULM PCI in a population older than 75 years old seems to be technically feasible and a good alternative to surgical revascularization particularly in a centre with a high-volume catheterization laboratory and experienced operators with a very large personal case-load per year without in-hospital surgical facilitation. Mortality in this group of patients tends to be quite high but lesser than mortality of untreated patients and the vaster majority of events is concentrated in in-hospital phase. At follow-up older patients prognosis remains worse when compared with a younger population. Cardiogenic shock at presentation is related to adverse events during acute phase and at follow-up.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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