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One-year outcomes of left main coronary artery stenting in patients with cardiogenic shock

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Abstract

Background: *The high in-hospital mortality of patients with cardiogenic shock is being reduced thanks to coronary interventions. The aim of the study was to evaluate the outcomes of angioplasty and stenting in patients with cardiogenic shock caused by left main coronary artery (LMCA) disease.*

Methods: *A group of 71 consecutive patients managed for LMCA disease in an emergency setting (38 patients in cardiogenic shock and 33 without shock symptoms) were followed up clinically and angiographically for one year. Periprocedural and late mortality was assessed as well as the incidence of restenosis and coronary re-interventions.*

Results: *There were 17 deaths in the study population (23.9%). One-year survival in the subgroup with cardiogenic shock was 57.9% (22 patients) with 15 periprocedural deaths and 1 death 3 months after the procedure. Restenosis and associated target lesion revascularization were documented in 5 patients (29.4%) with and 4 patients (16.0%) without cardiogenic shock. Multivariate analysis revealed the following independent predictors of cardiogenic shock in patients undergoing emergency LMCA angioplasty: STEMI as the reason for intervention (OR 14.1; 95% CI 3.71–53.7; $p < 0.0002$) and a small minimal lumen diameter before the procedure (OR 0.43; 95% CI 0.2–0.93; $p < 0.04$). The only independent predictor of the death in patients with cardiogenic shock was a small minimal lumen diameter after the procedure (OR 0.31; 95% CI 0.1–0.99, $p < 0.05$).*

Conclusions: *High mortality was observed in the study population, especially in the subgroup with cardiogenic shock. Most deaths were periprocedural. Because of the high rate of restenosis, periodical angiographic follow-up is necessary, preferably twice in the first 6 months after stent implantation.* (Cardiol J 2007; 14: 67–75)

Key words: **left main coronary artery stenosis, percutaneous coronary intervention, cardiogenic shock**

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Introduction

Between 5% and 10% of cases of myocardial infarction (MI) are complicated by cardiogenic shock and this percentage has not changed in the past 30 years. In prognosis is very serious in patients medically treated, with mortality of 70% to 80% [1]. As the SHOCK trial has demonstrated, the overall mortality in shock, thanks to interventional treatment, has been reduced by 9% and the 30-day mortality dropped by 17% [2].

According to the current recommendations of the European Society of Cardiology (ESC), immediate interventional treatment (PCTA, percutaneous transluminal coronary angioplasty or CABG, coronary artery bypass grafting) is necessary to save lives, and in its absence thrombolytic therapy must be initiated. The current ESC guidelines have placed emergency percutaneous coronary intervention (PCI) in patients with cardiogenic shock within the class of recommendation I and the level of evidence C [3]. In the case of patients with cardiogenic shock, ESC recommendations differ with respect to three vessel disease: percutaneous revascularisation in several arteries may be performed in certain situations. Also the 12-hour criterion from the onset of pain to invasive treatment does not hold in the case of patients with cardiogenic shock. Intra-aortic balloon pump (IABP) is recommended [4].

In the ACC/AHA/SCAI guidelines from 2005 [5], class I (level of evidence A) includes primary PCI for patients less than 75 years old with ST elevation or left bundle branch block who develop cardiogenic shock within 36 h of the onset of myocardial pain and are suitable for revascularization within 18 h of shock. In the case of patients over the age of 75 with cardiogenic shock who meet the above criteria, recommendations to perform primary PCI are placed in class IIA (level of evidence B). Also according to the US guidelines, it is beneficial to use IABP (if the shock cannot be pharmacologically controlled). In patients with significant left main coronary artery (LMCA) stenosis and three-vessel disease, without right ventricular MI and co-morbidities that increase the perioperative risk, such as renal failure or severe pulmonary disease, the authors of the ACC/AHA//SCAI guidelines recommend CABG (class I). If CABG cannot be performed, they recommend PCI.

Methods

Study population

We analysed clinical and angiographic data of a group of 71 consecutive patients undergoing emergency LMCA angioplasty between August 2001 and March 2005 at the Clinic of Cardiology and Internal Medicine of the University Hospital in Bydgoszcz, Poland. All the patients received bare metal stents. Thirty-eight patients (53.5%) were in cardiogenic shock.

Following the procedure all the surviving patients were started on long-term clopidogrel or ticlopidine for 3 to 12 months and long-term acetylsalicylic acid, an angiotensin converting enzyme inhibitor, a cardioselective beta-blocker and a statin.

Fifty-four patients (including 22 patients in cardiogenic shock) who survived the procedure and the periprocedural period were followed up clinically for 1 year. They also underwent follow-up angiographies at 3, 6 and 12 months to check for restenosis.

The retrospective analysis of the treatment outcomes in this group of patients was approved by the Bioethics Committee of the Medical College in Bydgoszcz, Nicolaus Copernicus University in Toruń (KB/79/2006).

Angiographic analysis

All the patients who gave their consents underwent follow-up coronary angiographies. During the procedure and the follow-up examinations we used Integris CV Allura (Philips) with digital image processing. We selected one view which best represented the left main coronary artery. Then, using the commonly known quantitative angiography system [6] employing the Philips software Quantitative coronary analysis. Inturis for cardiology. Version 1.1, we obtained the results of quantitative analysis calculated by the computer. Restenosis was defined as a narrowing of 50% or more of the vessel lumen within the stent and 5 mm proximally or distally from the stent.

Observation and statistical analysis

During the follow-up period we analysed major adverse cardiac events (MACE), such as death, MI, emergency revascularisation and restenosis as well as the target vessel revascularisation (TVR) of the left main coronary artery. In order to evaluate the risk of death and/or MACE and the perioperative risk we used the TIMI Risk Score and the EuroSCORE.

The calculations were performed using the statistical software Statistica version 7.1 PL (StatSoft, Tulsa, USA).

The W Shapiro-Wilk test demonstrated that the distribution of the analysed quantitative variables was not normal. They were therefore presented as median values and quartile intervals. Median values of two quantitative variables were compared using the Mann-Whitney test. Qualitative variables were presented as the number of patients with a given trait and a percentage in the group. Qualitative variables were compared using the χ^2 test or the exact Fisher test, depending on the size of the groups.

The multivariate logistic regression model was used for the multivariate analysis of the effect of the qualitative and quantitative variables on the binary variable. The relationships between the increase of the quantitative variables or variants of the qualitative variables and the probability of an endpoint were presented by providing the odds ratio (OR) and the limits of its 95% confidence interval (CI).

P values of less than 0.05 were considered statistically significant. P values falling between 0.05 and 0.10, which represented a trend towards statistical significance, were provided in their exact values. P values exceeding 0.10, being not significant, were replaced by the abbreviation NS. The abbreviation UF (unfeasible) denotes the absence of possibility to perform the analysis due to failure to meet the assumptions for the test.

Results

Analysis of outcomes for all the patients undergoing emergency PCI

The characteristics of patients with cardiogenic shock versus the remaining patients undergoing emergency treatment are presented in Table 1.

In the group of 71 patients undergoing emergency treatment there were 17 deaths, 16 of which occurred in patients with cardiogenic shock. The between group differences, both in respect of the overall number of deaths and the number of periprocedural deaths, are statistically significant (Table 2).

Table 1. A comparison of clinical data for the groups of patients with and without cardiogenic shock undergoing emergency left main coronary artery angioplasty.

Parameter	Patients with cardiogenic shock (n = 38)	Patients without cardiogenic shock (n = 33)	p
Age [years]	65.0 (55.0–75.0)	63.0 (53.0–70.0)	NS
Gender:			NS
female	15 (39.5%)	10 (30.3%)	
male	23 (60.5%)	23 (69.7%)	
Diabetes	19 (50.0%)	12 (36.4%)	NS
Hypertension	23 (85.4%)	22 (66.7%)	NS
Hyperlipidaemia	34 (89.5%)	31 (93.9%)	NS
Smoking status:			
current smoker	13 (34.2%)	4 (12.1%)	0.058
current or past smoker	24 (63.2%)	19 (57.6%)	NS
Positive family history	7 (18.4%)	8 (24.2%)	NS
Peripheral artery disease	7 (18.4%)	7 (21.2%)	NS
History of stroke	6 (15.8%)	6 (18.2%)	NS
Creatinine [mg/dl]	1.2 (1.1–1.4)	1.2 (1.0–1.3)	NS
Left ventricular ejection fraction [%]	40.0 (30.0–45.0) (n = 29)	45.0 (35.0–51.0) (n = 33)	NS
EuroSCORE	9.0 (7.0–11.0)	7.0 (5.0–11.0)	0.060
TIMI Risk Score UA/NSTEMI	4.0 (3.5–4.5)	4.0 (3.0–4.0)	NS
TIMI Risk Score STEMI	6.0 (5.0–9.0)	4.0 (3.0–5.0)	< 0.0002

Angioplasty of distal *vs.* other stenoses; UA — unstable angina; STEMI — ST-elevation myocardial infarction; NSTEMI — non-ST-elevation myocardial infarction; NS — not significant

Table 2. Deaths in the groups of patients with cardiogenic shock and the other patients receiving emergency treatment.

Parameter	Patients with cardiogenic shock (n = 38)	Patients without cardiogenic shock (n = 33)	p
All deaths	16 (42.1%)	1 (3.0%)	< 0.0005
Periprocedural deaths	15 (39.5%)	1 (3.0%)	< 0.0008
Deaths during follow-up	1 (2.6%)	0 (0%)	Unfeasible

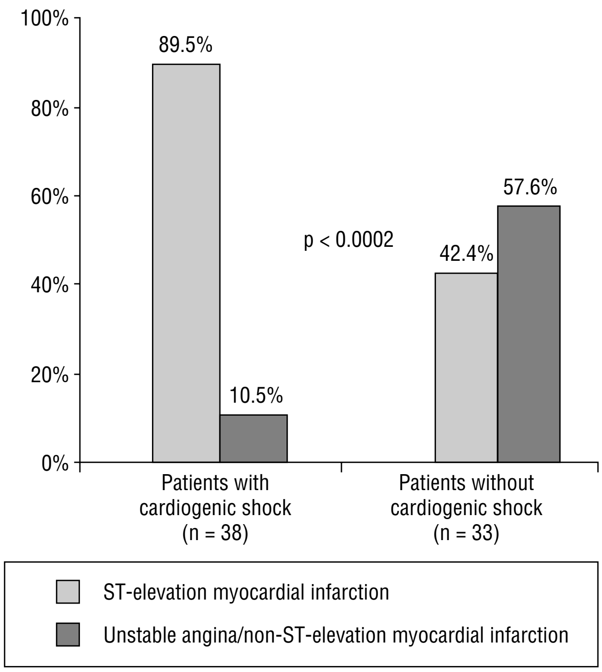

Figure 1. Reason for left main coronary artery angioplasty and cardiogenic shock.

Of the 38 patients undergoing LMCA angioplasty in cardiogenic shock, 22 (57.9%) survived 12 months. There were 15 periprocedural deaths and one death during the follow-up period (3 months after the procedure, due to respiratory failure).

Among the patients with cardiogenic shock, the reason for LMCA angioplasty was non-ST-elevation acute coronary syndrome in 4 cases (10.5%) and ST-elevation myocardial infarction (STEMI) in 34 cases (89.5%). In the group without cardiogenic shock, 19 patients (57.6%) were managed for unstable angina (UA) or non-ST-elevation myocardial infarction (NSTEMI) and 14 patients (42.4%) received treatment for STEMI. Patients managed for non-ST--elevation acute coronary syndromes were patients ineligible for cardiac surgery due to co-morbidities or serious general condition and patients who refused surgery. The larger number of patients with STEMI in the group with cardiogenic shock is not statistically significant versus the group of patients without cardiogenic shock: $p < 0.0002$ (Fig. 1). Of note is the fact that among the patients with STEMI, the group with cardiogenic shock revealed a significantly higher TIMI Risk Score (median 6.0, range 5.0–9.0) than the group without cardiogenic shock (median 4.0, range 3.0–5.0, $p < 0.0002$).

Eleven patients (28.9%) with cardiogenic shock and 1 patient (3.0%) without cardiogenic shock were resuscitated prior to admission to the Invasive Cardiology Suite. The difference between the groups was statistically significant ($p < 0.01$). Nine patients (23.7%) with cardiogenic shock and only 1 patient (3.0%) without cardiogenic shock were unconscious during LMCA angioplasty. This difference was also significant ($p < 0.04$).

Eight patients with cardiogenic shock (21.0%) and none without cardiogenic shock underwent intra-aortic balloon pumping. The statistical analysis was not performed because of the failure to meet the test assumptions.

An inhibitor of platelet GP IIb/IIIa receptors was administered significantly more frequently to patients in cardiogenic shock ($p < 0.004$) and was received by 30 patients with cardiogenic shock (78.9%) and 15 patients without cardiogenic shock (45.4%). The analysis included angiographic data for groups of patients with and without cardiogenic shock who received emergency treatment (Table 3).

Restenosis was analysed in the group of patients who survived and gave consent for follow-up coronary angiography. Follow-up coronary angiography was performed in 17 patients with cardiogenic shock. One of the patients in this group, who previously refused consent for elective examinations, underwent emergency angiography at 3 months and was also included in the analysis. Follow-up coronary angiography was performed in 25 patients without cardiogenic shock. Restenosis and target lesion revascularization occurred in 5 patients (29.4%) with cardiogenic shock and in 4 patients (16.0%) without cardiogenic shock. The difference was not significant. Restenosis was observed in at 3 months in 7 cases, at 6 months in 1 case and at 7 months in 1 patient who did not attend the earlier follow-up angiography.

The group of patients with cardiogenic shock was characterised by a significantly lower LMCA minimal lumen diameter (MLD) before the procedure than the group without shock (Table 3). The difference was statistically significant ($p < 0.005$).

In multivariate analysis, STEMI as the reason for the procedure and low MLD before the procedure were revealed as independent predictors of cardiogenic shock in patients undergoing emergency LMCA angioplasty (Table 4).

Analysis of deaths in patients with cardiogenic shock

The group of patients who survived the follow-up period and the group of patients who died did not differ significantly in terms of age, gender and cause of shock (Table 5).

The analysis of ischaemic heart disease risk factors present in patients with cardiogenic shock

Table 3. Angiographic characteristics of patients managed in cardiogenic shock and the remaining patients receiving emergency treatment.

Parameter	Patients with cardiogenic shock (n = 38)	Patients without cardiogenic shock (n = 33)	P
Location of the stenosis within LMCA:			
proximal	10 (26.3%)	5 (15.2%)	
middle	5 (13.2%)	7 (21.2%)	
distal	22 (57.9%)	21 (63.6%)	NS*
diffuse	1 (2.6%)	0 (0%)	
Coronary arteries affected:			
LMCA only	5 (13.2%)	3 (9.0%)	NS
LMCA + 1 vessel	9 (23.7%)	7 (21.3%)	NS
LMCA + multiple vessels	24 (63.1%)	23 (69.7)	NS
Drug eluting stent	0 (0%)	0 (0%)	Unfeasible
Angiographic restenosis	5 (29.4%) (n = 17)	4 (16.0%) (n = 25)	NS
No consent for angiographic follow-up**	6 (27.3%)	7 (21.9%)	NS
Interventions in another artery during the follow-up**	5 (22.7%) (n = 22)	10 (31.2%) (n=32)	NS
Reference diameter [mm]	3.53 (3.17–4.36)	3.99 (3.17–4.34)	NS
Reference area [mm^2]	9.61 (7.75–14.94)	12.50 (7.90–14.82)	NS
MLD before the procedure [mm]	0.77 (0.28–1.15)	1.29 (0.62–1.87)	< 0,005
MLA before the procedure [mm^2]	0.46 (0.06–1.03)	1.30 (0.31–2.76)	< 0,005
MLD after the procedure [mm]	3.42 (3.20–3.96)	3.67 (3.24–4.03)	NS
MLA after the procedure [mm^2]	9.18 (8.04–12.31)	10.60 (8.24–12.73)	NS

*Angioplasty of distal *vs.* other stenoses; **The percentage was calculated in the group of patients who survived until at least the first follow-up coronary arteriography; LMCA — left main coronary artery; MLD — minimal lumen diameter; MLA — minimal lumen area; NS — not significant

Table 4. Predictors of cardiogenic shock.

Trait	Variant of the trait	Odds ratio	95% confidence interval	P
Reason for the procedure	STEMI NSTEMI/UA	14.11 1	3.71–53.70	< 0.0002
MLD before the procedure	MLD increase before the procedure by 1 mm	0.43	0.20–0.93	< 0.04

MLD — minimal lumen diameter; STEMI — ST-elevation myocardial infarction, NSTEMI — non-ST-elevation myocardial infarction, UA — unstable angina

did not reveal any significant effect on death in this group of patients.

We then analysed angiographic data of patients who survived and of patients who died (Table 6). In the group of patients who died, dimensions in the reference segment and the LMCA MLD before and after the procedure were lower. Statistical significance was, however, present only in the case of the reference segment dimension and the postprocedural MLD.

In multivariate analysis, the only independent predictor of death in patients with cardiogenic shock was low postprocedural MLD (OR 0.31; 95% CI 0.1–0.99; $p < 0.05$).

Discussion

The SHOCK trial has proved that revascularisation in patients with cardiogenic shock reduces in-hospital mortality [7, 8]. Still, however, despite the interventional treatment, in-hospital mortality in this group of patients remains high [9].

Multivariate analysis demonstrated that the independent predictors of cardiogenic shock in patients undergoing emergency LMCA angioplasty were STEMI as the reason for the procedure and low MLD in coronary angiography performed before the procedure. Reduced LMCA lumen diameter is responsible for impaired myocardial perfusion.

Table 5. Clinical characteristics of the patients undergoing left main coronary artery angioplasty in cardiogenic shock.

Parameter	Patients who survived (n = 22)	Patients who died (n = 16)	p
Age [years]	64.0 (55.0–75.0)	65.0 (54.5–75.5)	NS
Gender:			
female	10 (45.5%)	5 (31.2%)	NS
male	12 (54.5%)	11 (68.7%)	
Cause of shock:			
UA/NSTEMI	2 (9.1%)	2 (12.5%)	NS
STEMI	20 (90.9%)	14 (87.5%)	
TIMI Risk Score UA/NSTEMI	3 and 4	4 and 5	UF
TIMI Risk Score STEMI	5.5 (5.0–7.5)	7.5 (6.0–9.0)	0.060
EuroSCORE	9.0 (8.0–10.0)	8.5 (7.0–11.5)	NS
After resuscitation	5 (22.7%)	6 (37.5%)	NS
Unconscious during PCI	3 (13.6%)	6 (37.5%)	NS
Intra-aortic balloon pump	2 (9.1%)	6 (37.5%)	0.086
Use of GP IIb/IIIa antagonist	15 (68.2%)	15 (93.7%)	NS
Protected LMCA	0 (0%)	1 (6.2%)	UF
Location of the stenosis within LMCA:			
proximal	4 (18.2%)	6 (37.5%)	
middle	2 (9.1%)	3 (18.7%)	
distal	15 (68.2%)	7 (43.8%)	0.071*
diffuse	1 (4.5%)	0 (0%)	

*Angioplasty of distal *vs.* other stenoses; LMCA — left main coronary artery; PCI — percutaneous coronary intervention; UA — unstable angina; STEMI — ST-elevation myocardial infarction; NSTEMI — non-ST-elevation myocardial infarction; NS — not significant, UF — unfeasible

Table 6. Parameters of quantitative angiography in patients with cardiogenic shock who survived and who died.

Parameter	Patients who survived (n = 22)	Patients who died (n = 16)	p
Reference diameter [mm]	3.57 (3.41–4.35)	3.41 (2.02–4.60)	< 0.05
Reference area [mm^2]	9.80 (8.17–14.89)	9.15 (3.22–16.70)	< 0.05
MLD before the procedure [mm]	0.86 (0.29–1.18)	0.50 (0.16–0.96)	NS
MLA before the procedure [mm^2]	0.57 (0.07–1.10)	0.19 (0.02–0.73)	NS
MLD after the procedure [mm]	3.76 (3.38–3.99)	3.06 (2.58–3.44)	< 0.02
MLA after the procedure [mm^2]	11.12 (8.98–12.47)	7.40 (5.26–9.29)	< 0.02

MLD — minimal lumen diameter; MLA — minimal lumen area

The lower the diameter, the more ischaemic the myocardium and the critical stenosis or total occlusion of LMCA leads to death or cardiogenic shock. It is therefore obvious that a low MLD before the procedure is an independent predictor of cardiogenic shock in patients undergoing emergency treatment for left main disease.

STEMI occurred in 89.5% of patients with cardiogenic shock, while in the group of patients undergoing emergency treatment without cardiogenic shock, non-ST-elevation acute coronary syndromes prevailed (57.6%). This is consistent with the following regularity established a long time ago: in most cases of acute LMCA occlusion, if the patient does not die a sudden death, he develops cardiogenic shock. Prognosis in such situations is very grave: 94% of patients managed conservatively die [10]. Initiation of interventional treatment improves the prognosis.

In the group of patients with cardiogenic shock, compared to the remaining patients receiving emergency treatment, there were significantly more patients who had been resuscitated before or during admission to the Invasive Cardiology Suite and patients who were unconscious during PCI. These circumstances, however, did not affect the incidence of death in this group of patients, which supports the importance of rapid PCI as a life-saving procedure.

The TIMI Risk Score provides information on the severity of prognosis in shock [11, 12]. In the study population, the median score in the group with STEMI and cardiogenic shock was 6.0 (range: 5.0–9.0) and, quite understandably, was significantly higher than the median score in MI patients without cardiogenic shock (median: 4.0, range: 3.0–5.0). The difference in the TIMI score between the patients who had died and those who had survived was nearly significant ($p = 0.06$). This points to the possible usefulness of this scale in prognosing the risk in patients with STEMI and cardiogenic shock. No similar relationships could be demonstrated in the group with cardiogenic shock in the course of non-ST-elevation acute coronary syndromes, which is a result of the very small sample size. According to the predicted operative risk scale EuroSCORE [13], all patients receiving emergency treatment were at a high operative risk. Although the difference in the score between the groups with and without cardiogenic shock demonstrated a trend towards statistical significance, the groups of patients with shock who had died and who had survived did not differ significantly. It therefore seems that this scale is difficult to use for prognosis in this group of patients.

The in-hospital mortality rate was 39.5% in the study group of patients with cardiogenic shock and 3% in the group of patients with acute coronary syndromes without cardiogenic shock. During the 12 months of follow-up there was 1 non-cardiac death in the group of patients with shock and no deaths in the group of patients without cardiogenic shock. The one-year survival in the group of patients with cardiogenic shock undergoing LMCA angioplasty was therefore 57.9%. This result is comparable to or slightly better than the few results published by other centres, concerning treatment of small groups of patients with cardiogenic shock managed for LMCA disease with angioplasty and stenting [14–17]. In the ULTIMA register [18], the one-year mortality rate in patients managed during cardiogenic shock was as much as 67.6%. One should, however, remember that not all of the 37 analysed patients underwent stenting during PCI.

Also with respect to mortality in patients with cardiogenic shock who underwent CABG [8] the results obtained in the study are favourable. There is a need for large randomised trials comparing the outcomes of PCI and CABG in patients with LMCA disease who are in cardiogenic shock. Cardiac surgery may be superior to angioplasty in cardiogenic shock because of the protection of ischaemic myocardium provided by cardioplegia, reduced ventricular workload during the procedure and revascularisation in the non-infarct areas. Immediate access to the operating theatre is, however, not always possible. As demonstrated in the SHOCK trial [8], time since MI pain to the beginning of PCI was significantly shorter ($p < 0.001$) with the median of 11.0 h (range: 6.1–21.4 h) than time to CABG (median: 19.1 h, range: 10.4–30.5 h).

It therefore seems that coronary angioplasty and stenting, where the cause of shock is LMCA disease, is the treatment of choice due to the higher availability and shorter time to treatment. In the case of patients during resuscitation, this is the only option of interventional treatment.

In the study group, pharmacological treatment of shock (dopamine, dobutamine or adrenaline in continuous intravenous infusion) was used in all patients. Intra-aortic balloon pumping was used in 21% of patients in cardiogenic shock (8 patients) and was not found to reduce mortality in this group of patients: 2 patients who underwent IABP survived and 6 died. It is hard to evaluate this result, as the group in which IABP was used was small due to the periodic limitation of availability of the device, especially between 2001 and 2003. In their study, Yamane et al. [16] used IABP in all the 25 patients, in addition to drug therapy of shock. The 30-day mortality was lower (32%) than the mortality we observed, but the 12-month mortality was comparable (40%). With the currently more frequent use of counterpulsation, the immediate outcomes of patients with LMCA stenosis in cardiogenic shock may improve.

Several studies of small groups of patients with cardiogenic shock have been published that suggest the presence of beneficial effect of a platelet GP IIb/IIIa receptor antagonist on mortality in these patients [19–21]. In our study, however, the significantly more frequent use of a platelet GP IIb/IIIa receptor antagonist did not significantly reduce mortality in this group of patients. This may result from the fact that most of the deaths in patients with shock occurred within a short time of initiation of treatment, still at the Invasive Cardiology Suite, and the duration of action of the drug was too short. Furthermore, not all the patients with and without shock were managed in this way, which makes it even more difficult to perform the comparison and draw conclusions.

The analysis of quantitative angiography results for patients treated in cardiogenic shock demonstrated significant differences in the reference segment diameter and MLD after the procedure: in the group of patients who had died, they were lower than in the group of patients who had survived. Multivariate analysis demonstrated low MLD after the procedure to be the only independent predictor of death in patients with cardiogenic shock, similarly to the patient groups previously presented by Black et al. [22] and Park et al. [23], although these studies did not include patients with cardiogenic shock. The outcome of coronary angioplasty does affect the prognosis. It is important to achieve a lumen increase, over a short period of time, which largely depends on the anatomy of the vessels, the operator's experience and techniques of plaque decompression and stenting.

Limitations of the study

The study is an analysis of 71 patients without randomisation. The evaluation is impeded by the lack of patient consent for the follow-up coronary arteriography, which the patients justified by the absence of anginal symptoms and good well being. For this reason one cannot estimate the exact angiographic restenosis rate. It was also impossible to take a full history form some of the patients due to the grave condition of many of them on admission (unconscious patients, patients after resuscitation, patients with seriously impaired consciousness) and the considerable number of periprocedural deaths.

Conclusions

Despite the routine use of stents, LMCA angioplasties in patients undergoing emergency treatment for acute coronary syndromes continue to be associated with high mortality with patients in cardiogenic shock being at the highest risk. Deaths most frequently occur periprocedurally. Due to the continuing high restenosis rate it is necessary to perform periodic follow-up angiographies, preferably twice in the first 6 months after the procedure.

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