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Emergency percutaneous coronary interventions for acute myocardial infarction with ST-segment elevation in a regional hospital: A quality control study

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Abstract

Background: An invasive approach of acute myocardial infarction with ST-segment elevation (STEMI) with primary percutaneous coronary intervention (PCI) is currently considered as the most efficient revascularisation strategy and is performed around-the-clock in tertiary hospitals. The present study is aimed at investigating the short term outcome of primary PCI eligible patients after STEMI in a regional institution (CHCV, Sion) in comparison to a University Hospital (CHUV, Lausanne).
Methods: From January the 1st to December the 31st 2002, all consecutive STEMI patients of both centres who had an emergency coronary arteriography were included in the analysis. Clinical and angiographic data were retrospectively collected. The primary end point was the combined incidence of in-hospital death, reinfarction, and target vessel revascularisation (TVR) at 7 days.
Results: The analysis included 58 patients in the CHVC (60±13 years, 16% of whom were female) and 160 patients in the CHUV (63±12 years, 25% were female). Both populations were identical according to the severity of coronary artery disease and distribution of risk factors, except for smokers (55% in CHCV, 39% CHUV, $p=0.04$). Most of the patients were treated by PCI in both centres (80% CHCV versus 86% CHUV, p=NS). A low proportion in both groups underwent urgent surgical treatment (3.5% CHCV versus 5.5% CHUV, p=NS). At 7 days, adverse events free survival was not statistically different.
Conclusion: These results were expected because the CHCV fulfils the international guidelines criteria for performance of emergency angioplasty. Our study demonstrates that around-the-clock primary PCI for acute STEMI can safely be done in a regional hospital (CHCV Sion) providing there is strict adherence to all aspects of international guidelines.

Keywords: Myocardial infarction; STEMI; Primary percutaneous coronary intervention

1. Introduction

Acute myocardial infarction is associated with high immediate and short term mortality. Approximately one third of the patients die in the pre-hospital phase because of arrhythmia or cardiogenic shock and the in-hospital mortality reaches 8–15% of the survivors [1]. Meyer was the first author to describe direct coronary angioplasty as a primary reperfusion therapy in 1982 [2]. Fifteen years later, a meta-analysis confirmed the superiority of primary angioplasty over thrombolysis within the same period after onset of symptoms [3]. Nowadays it is accepted that primary percutaneous coronary intervention (PCI) lowers in-hospital mortality rate, decreasing also the risk of stroke and reinfarction [4,5]. However, at the end of the 20th century, less than 10% of European hospitals and 25% of American hospitals had a

Abbreviations: CABG, coronaro-aortic bypass graft; ICU, intensive care unit; PCI, percutaneous coronary intervention; pts, patients; STEMI, ST-elevation myocardial infarction; TIMI, thrombolysis in myocardial infarction; TVR, target vessel revascularisation.

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catheterization laboratory [6]. At the beginning of the nineties, only university hospitals had around-the-clock catheterization availabilities in Switzerland. Therefore, primary care hospitals had to perform thrombolysis or transfer their patients to tertiary care centres. Due to the geographic features of the canton of Valais, located in the Swiss Alps, and the difficulty to reach the next tertiary care centre especially in winter, a 24 h/7 days a week availability for primary PCI was initiated. In 1994 the "Centre Hospitalier du Centre du Valais" (CHCV) in Sion began to offer this treatment to patients with an acute ST-segment elevation myocardial infarction (STEMI) from the whole canton.

In order to evaluate the quality and safety of emergency PCI in a primary care centre, we decided to compare the immediate and short term outcome of PCI eligible STEMI patients in this centre to a University Centre (CHUV Lausanne).

2. Materials and methods

2.1. Logistics

In 2002, six independent regional hospitals were present in the canton of Valais. The CHCV of Sion was basically a regional centre, geographically situated central to the others, with a catheterization laboratory available since 1991. Two interventional cardiologists have provided PCI availability on a 24 h/7 days a week basis since 1994, with a permanent cardiac surgery backup. In 2002, the annual volume was about 250 elective and 100 primary PCIs. The CHUV is a tertiary university centre, also providing round-the-clock catheterization laboratory facilities, with an annual volume of about 1200 elective and 300 primary PCIs in 2002. Outside of regular operating hours, the interventional cardiologist and the technician on duty are on call from home in both institutions. Patient care during the procedure is then under the responsibility of the intensive care unit (ICU) team.

2.2. Study patients

From January the 1st to December the 31st, 2002, all consecutive STEMI patients who had an emergency coronary arteriography were included in both centres. For the present analysis, STEMI was defined by acute chest pain of at least 30 minute duration and ST segment elevation of more than 1 mm in two contiguous ECG leads.

2.3. Percutaneous coronary intervention

Diagnostic angiography and percutaneous coronary interventions were performed according to international guidelines [7]. Stenting of the culprit lesion was attempted in all patients with a vessel of ≥ 2 mm diameter. Successful angioplasty was defined as TIMI (Thrombolysis in Myocardial Infarction) 3 flow and a residual lumen diameter stenosis of less than 30%. The left ventricular ejection fraction was obtained either by contrast left ventriculography or by echocardiography.

2.4. Follow-up and clinical events

Clinical and angiographical data were retrospectively collected through patients' charts. The primary end point was combined incidence of cardiovascular death, reinfarction and target vessel revascularisation (TVR) at 7 days. The two secondary end points only concern PCI patient's subgroups: 1) the composite end point of cardiovascular death, reinfarction and TVR and 2) mortality of all causes, both at 7 days. Reinfarction was defined as the occurrence of another myocardial infarction during the same hospitalisation, confirmed by new diagnostic ST- or T-wave changes and either a second elevation of cardiac enzymes >2 times the upper limit of normal or of serum troponin level above the normal cut off and higher than the previous level.

2.5. Statistical analysis

Continuous variables were expressed as mean ± standard deviation and discrete variables as counts and percentage. The chi-square test and Fischer exact *t* test were used for comparison of categorical variables, and Student *t*-test was used for continuous variables. Survival curves were constructed according to the method of Kaplan–Meier and compared by the log-rank test. A p value ≤ 0.05 was considered statistically significant.

3. Results

3.1. Population

The study populations comprised 58 patients (60 +/− 13 years; 16% female) in the CHCV and 160 patients (63 +/− 12 years; 25% female) in the CHUV. No significant difference was noted in the baseline characteristics as shown in Table 1, except for a higher percentage of current smokers

Table 1
Patients' baseline data (*$p<0.05$ significant)

	CHCV (%)	CHUV (%)	p*
	$N=58$	$N=160$	
Male	49 (84)	120 (75)	0.14
Female	9 (16)	40 (25)	
Mean age	60	63	
Cardiovascular risk factors			
None	3 (7)	14 (9)	0.3
Diabetes	8 (14)	22 (14)	1
Hypertension	24 (41)	81 (50)	0.2
Smoking	32 (55)	63 (39)	0.04*
Hyperlipidemia	30 (52)	96 (60)	0.3
Family history of coronary disease	13 (22)	20 (12)	0.07
Type of coronary disease			
Non-significant stenosis (<50%)	5 (9)	5 (3)	0.08
One vessel	24 (41)	78 (49)	0.3
Two vessels	19 (33)	44 (28)	0.4
Three vessels	10 (17)	33 (21)	0.6