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Short and long-term outcome in very old patients with ST-elevation myocardial infarction after primary percutaneous coronary intervention☆

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ABSTRACT

Background: Although octogenarians constitute a fast-growing portion of cardiovascular patients, few data are available on the outcome of patients aged ≥85 years with ST-Elevation Myocardial Infarction (STEMI).
Methods and Results: We analyzed 126 consecutive patients aged ≥85 years (age 88 ± 2 years) with STEMI, undergoing primary percutaneous coronary intervention (pPCI) within 12 hours from symptoms onset.
Long-term follow-up (median 898 days) was obtained for the 102 patients surviving the index-hospitalization. In-hospital mortality rate was 19%. Nonagenarians, diabetes mellitus, severe left ventricular systolic dysfunction and intra-aortic balloon pumping were significantly and independently correlated to in-hospital mortality at the multivariate analysis. A low rate of complications was detected. Among patients surviving the index hospitalization, 32 (31%) patients died during follow-up. 55 patients (54%) had re-hospitalization due to cardiovascular causes. The univariate analysis identified chronic renal failure, Killip class ≥ 3, TIMI Risk Score >8 and very high risk of bleeding as predictors of long-term overall mortality. At the multivariate analysis only chronic renal failure and very high risk of bleeding were significantly and independently correlated to long-term all-cause mortality. Renal function and anterior myocardial infarction were significantly and independently associated with the combined end-point of cardiac mortality and re-hospitalization due to cardiovascular disease at the multivariate analysis.
Conclusions: PPCI in patients ≥85 years old is relatively safe. In this population, pPCI is associated with a good long-term survival, although still worse than in younger patients, despite a considerable incidence of re-hospitalization due to cardiovascular events.

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1. Introduction

The fastest growing segment of the western world population is the oldest old (age ≥ 85 years); in these subjects, the prevalence of coronary artery disease is high and age itself is a predictor of adverse events after acute coronary syndrome (ACS) [1–6]. However, elderly patients are underrepresented in clinical trials of ACS [1] or primary percutaneous coronary intervention (pPCI) [2–5,7,8]. Elderly patients with ST-segment elevation myocardial infarction (STEMI) are less likely to receive an invasive treatment due to the perception of poor outcome and often have atypical symptoms that cause longer delay to presentation and treatment, more adverse events and prolonged hospital stay [5, 9–11].

The majority of studies considered 75 years as age cut-off while the treatment and outcome of very-old patients (over 85 years old) are still poorly analyzed, especially longterm mortality and rehospitalizations.

Based on these considerations, we conducted a retrospective observational study to evaluate the short and long-term outcome of consecutive unselected patients aged ≥85 years with STEMI referred to pPCI.

2. Methods

From January 2007 to December 2013, a total of 126 patients aged ≥85 years with STEMI, admitted to the coronary care units of "Azienda

☆ All authors take responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.

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Sanitaria Universitaria Integrata" of Udine and Trieste, were registered into a local medical registry.

Diagnosis of STEMI was made on the basis of typical ECG changes and/or ischemic chest pain associated with elevation of cardiac biomarkers [12]. All patients underwent immediate coronary angiography and pPCI. Patients with contraindications to coronary angiography and pPCI, such as active bleeding and/or very severe comorbidities (e.g. known terminal illness), were not included in the study.

According to guidelines [13–15], all included patients received aspirin (250–300 mg), clopidogrel (300–600 mg) and intravenous heparin during the transport or at the arrival at the pPCI-center. Interventional strategy, stent selection and use of GPIIb/IIIa inhibitors were according to local standard practice. Post-procedural antiplatelet therapy included lifelong aspirin (100 mg/day) and clopidogrel (75 mg/day) for 1 to 12 months.

Detailed demographic, clinical, laboratory, echocardiographic, angiographic and procedural information was retrieved from the hospital databases and patient records. Follow-up data were obtained from a Regional Registry, which holds information on discharge diagnoses of all hospitalizations according to International Classification of Disease codes.

The following clinical endpoints were evaluated during the index hospitalization: death, re-infarction (defined as an increase in troponin associated to symptoms or electrocardiographic alterations) or re-revascularization (defined as the requirement for urgent repeat PCI or emergency coronary artery bypass graft), heart failure, arrhythmias, bleeding complications, cerebrovascular accident and contrast-induced nephropathy.

Global Utilization of Streptokinase and Tissue Plasminogen Activity for Occluded Coronary Arteries (GUSTO) classification for bleeding was adopted while *Thrombolysis In Myocardial Infarction* risk Score (TIMI risk Score) and *Can Rapid risk stratification of Unstable angina patients Suppress ADverse outcomes with Early implementation of the ACC/AHA Guidelines* (CRUSADE) score were utilized for risk stratification [16–18]. A cutoff of 40 (high risk) or 50 (very high risk) points for CRUSADE score, 8 points for TIMI Risk Score and 3 for the killip class were used to identify a subpopulation at high risk.

Cardiogenic shock was determined to be present using conventional clinical criteria of hypotension and signs of peripheral hypoperfusion that did not rapidly resolve. Successful percutaneous coronary intervention (PCI) was defined as the achievement of *Thrombolysis In Myocardial Infarction* (TIMI) grade 3 flow with <30% residual stenosis. The estimated glomerular filtration rate (eGFR) was calculated using the abbreviated *Modification of Diet in Renal Disease* formula (MDRD) [19] and the creatinine level measured on admission. A cutoff of eGFR ≤60 mL/min/1.73 mq was used to identify patients with relevant chronic renal failure.

Contrast induced nefropathy (CIN) was defined as acute kidney injury occurring after intravenous contrast administration, measured as a 25% increase in serum creatinine from baseline or 0.5 mg/dL increase in absolute value.

Severe left ventricular dysfunction was defined as ejection fraction ≤35%.

The primary follow-up clinical endpoint was defined as the occurrence of death. The secondary follow-up clinical endpoint was defined as a composite of cardiac death and re-hospitalization for cardiovascular causes (recurrent myocardial ischemic events, heart failure and cerebrovascular accident).

2.1. Statistical methods

Continuous variables are expressed as mean and standard deviation (SD) or median and interquartile range (IQR) as appropriate. Categorical data are presented as absolute numbers and percentages.

Chi-square test or Mann-Whitney test were used as appropriate to compare the two groups for categorical and continuous variables respectively.

Univariate and multivariate Cox proportional hazards analyses were used to test the association between the primary and secondary follow-up clinical endpoint and baseline covariates. Clinically relevant variables or those associated with a univariate $p < 0.1$ were included in multivariate models. Backward stepwise regression method was used. Survival curves were generated by the Kaplan–Meier method. Two-tailed tests were considered statistically significant at the 0.05 level.

All statistical analyses were performed using SPSS 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.)

3. Results

Demographic and clinical characteristics, angiographic and procedural data and mortality of the study population in comparison with younger contemporary cohort are presented in Table 1. In very-old patients, a higher prevalence of female gender, hypertension, chronic renal failure and minor use of radial approach and Glycoprotein IIb/IIIa inhibitors were observed. Moreover, very-old patients were significantly less likely to be smokers than younger ones but with more prevalence of diabetes, severe left ventricular dysfunction and killip class ≥ 3 at admission. In addition, Door-to-balloon time and ischemia time were slightly longer in very elderly patients compared to younger patients. The rates of in-hospital and longterm mortality were significantly superior for very-elderly patients compared to younger patients.

Table 2 describes the in-hospital outcome and the discharge medical therapy. Median length of hospital stay was 7 days (interquartile range 5 to 11). Twenty-four (19%) patients died during the index hospitalization. Vascular access-related complications occurred in 12 (10%) patients: three patients required surgical repair (due to intestinal ischemia or severe bleeding) and died during the index hospitalization, while the remaining patients had small groin hematomas without hemodynamic compromise. None had intracranial hemorrhage or cardiac tamponade. Moderate bleeding requiring haemotransfusion occurred in 2 patients (2%). 3 (2%) patients experienced a cerebrovascular accident during the index hospitalization: 2 patients had an ischemic stroke while one patient had a transient ischemic attack. Contrast-induced nephropathy after PCI occurred in 12 (10%) patients and one of them required dialysis. Stent thrombosis was observed in one patient (0,8%).

Table 3 shows the results of the univariate and multivariate Cox proportional Hazards Analyses performed to determine predictors of in-hospital mortality, of the primary and secondary follow-up clinical endpoint (i.e. all-cause mortality and cardiac mortality & re-hospitalization for cardiovascular causes).

Age ≥ 90 years ($p = 0.015$), Killip class ≥ 3 at admission ($p = 0.021$), time from symptoms onset to PCI ($p = 0.045$), TIMI Risk Score > 8 ($p = 0.008$), high risk of bleeding ($p = 0.047$), left ventricular function ($p < 0.001$), intra-aortic balloon pumping ($p = 0.005$) and PCI failure ($p = 0.007$) were all significantly related to in-hospital mortality at the univariate analysis. Nonagenarians, diabetes mellitus, severe left ventricular systolic dysfunction and intra-aortic balloon pumping were significantly and independently correlated to in-hospital mortality at the multivariate analysis.

The median duration of follow-up of patients who survived at index hospitalization was 898 days (IQR 436–1427 day). Among the 102 patients surviving the index hospitalization, the overall mortality rate was 31% (32 patients) while the cardiac mortality rate was 16.7% (17 patients). A total of 55 (53,9%) patients had at least one hospitalization for cardiovascular causes during follow-up: 19 patients had recurrent myocardial ischemic events (i.e. unstable angina or myocardial infarction), 30 patients had ≥1 hospitalization for heart failure, 4 patients were re-admitted because of a stroke and 2 patient had arrhytmias.

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