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Predictors of long-term outcome of percutaneous coronary intervention in octogenarians with acute coronary syndrome

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ABSTRACT

The majority of patients with acute coronary syndrome (ACS) are elderly. Limited evidence makes decision-making on the use of percutaneous coronary intervention (PCI) mainly empirical. Old age is one risk factor, but other factors than age may have an impact on mortality as well. Therefore, we investigated predictors of long-term all-cause mortality among octogenarians who have undergone PCI due to ACS. A total of 182 patients ≥ 80 years who underwent PCI during 2006–2007 at Sahlgrenska University Hospital were studied consecutively from recorded clinical data. All-cause five-year mortality of follow-up was 46.2%. Mean age was 83.7 ± 2.8, 62% were male, 76% were in sinus rhythm, and 42% had left ventricular ejection fraction < 45%. Indications for PCI were STEMI (52%), NSTEMI (36%) and unstable angina (11%). Multivariate analysis in two steps identified atrial fibrillation, moderate tricuspid valve regurgitation, moderate mitral valve regurgitation, dependency in ADL and eGFR ≤ 30 ml/min at the first step and moderate mitral valve regurgitation, atrial fibrillation and eGFR ≤ 30 ml/min at the last step, as independent predictors of all-cause mortality. Kaplan Meier analysis of positive parameters from both steps of multivariate analysis showed high significant difference in survival between patients having these parameters and those who were free from these parameters, with worst prognosis in patients with accumulation of these parameters. Accordingly, we have, in an octogenarian patient cohort who suffered from ACS, undergone PCI in daily clinical practice, identified five prognostic predictors for all-cause death after five years' follow-up.

1. Introduction

Current guidelines on the use of reperfusion therapy in acute coronary syndrome (ACS) are based on data derived from randomized clinical trials (RCTs) [1–3]. However, data regarding percutaneous coronary intervention (PCI) in octogenarians are not only very limited but also inconsistent. There are data in favor of PCI in the elderly [4–6]. However, several observational studies have demonstrated that old age is associated with both higher in-hospital mortality and frequent complications such as renal failure and bleedings after PCI [7,8]. Results from studies on mid- and long-term outcomes of PCI are more ambiguous. For example, incidence rates among elderly patients of major adverse cardiac events (MACE), defined as the combined events of death, revascularization and myocardial infarction, have been found to be both higher and similar to rates among younger patients [9–12].

The paucity and inconsistency of data on the use of PCI in the elderly have several implications. In our daily clinical practice, it is difficult for physicians to make well-grounded decisions on the use of PCI in the elderly. Elderly patients have been found to be less likely than younger patients to undergo PCI, despite adjusting for contraindications and co-morbidities that may be of relevance, partly because some of the existing data suggest that age is associated with negative outcomes [13–15]. The suggestion that elderly patients are sometimes withheld PCI solely because of their age is contrary to prevailing ethical principles. Moreover, the elderly constitute a heterogeneous group. The term 'elderly' is a broad term comprising the "young" old (65–74 years),

Abbreviations: ADL, Activities of daily living; ARBs, Angiotensin receptor blockers; ACE-I, Angiotensin converting enzyme inhibitors; AS, Aortic valve stenosis; AV-block, Atrioventricular block; CVP, Central venous pressure; CABG, Coronary artery bypass grafting; eGFR, Estimated glomerular filtration rate; MR, Mitral valve regurgitation; NSTEMI, Non-ST-segment elevation myocardial infarction; PA-P, Pulmonary atrial pressure; STEMI, ST-segment elevation myocardial infarction; TR, Tricuspid valve regurgitation.

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the "older" old (75–84 years) and the "oldest" old (≥85 years) [16] with considerable individual variation in co-morbidities and physical capabilities. In view of the heterogeneity of the elderly patient group it is likely that some of them have better prospects of gaining from PCI in the setting of ACS than others. Therefore it is essential to identify prognostic factors that indicate increased risk for death in patients with acute coronary syndrome despite PCI, which might be helpful in decision making in clinical practice.

2. Materials and methods

2.1. Study cohort

A total of 182 patients ≥ 80 years who had been treated with PCI due to acute coronary syndrome (ACS) during 2006–2007 at Sahlgrenska University Hospital, Gothenburg, were included consecutively and studied retrospectively from January 2 to May 30, 2012. All together 145 parameters covering social, functional and medical domains were entered into a database. The time-period 2006–2007 was chosen to allow a follow-up period of at least five years. PCI procedures for the specified age group and time period were identified from the hospital registry. The selection process is illustrated in Fig. 1. Three exclusion criteria for the study were applied. Firstly, since the catchment area of the Sahlgrenska University Hospital for performing PCI during emergency hours is larger than during office hours a substantial amount of the procedures were performed in individuals who are not normally patients of the hospital. These patients were excluded from the study since medical records from before and after the procedure were not accessible. Secondly, in some cases two or more PCI procedures were performed in the same patient. In these cases only the first PCI the individual patient underwent at the age of ≥80 years were studied. Thirdly, since the objective of the study was to evaluate prognosis after PCI in ACS, elective PCI procedures with the indication of stable angina pectoris were excluded (Fig. 1). This is based on the fact that current PCI-indication in the case of stable angina is to relive symptoms rather than prognostic benefit. The study protocol was approved by the Ethical Committee at the University of Gothenburg.

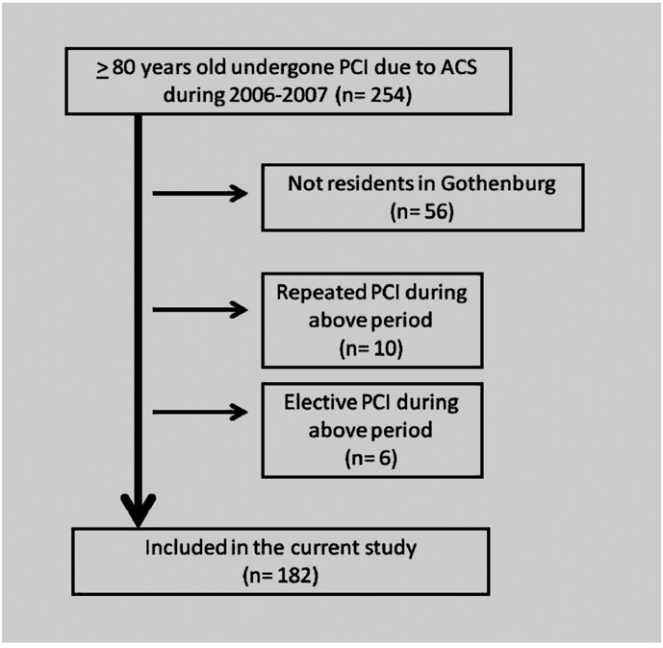

Fig. 1. Outline for patient selection process.

2.2. Laboratory analyses

All laboratory variables examined were analyzed routinely by the laboratory services provided by the Clinical Chemistry Laboratory at Sahlgrenska University Hospital. The estimated glomerular filtration rate (eGFR) was calculated using the Cockcroft–Gault formula in ml/min.

2.3. Statistics

The results are presented as percentage and mean ± standard deviation (SD) or as median and inter-quartile range (IQR) when values were not normally distributed. In the case of continuous variables, statistical analysis was performed using Student's unpaired *t*-test or the Mann–Whitney U-test for non-normally distributed variables. For discrete variables, the chi-square test was used. One-way ANCOVA or the Mann–Whitney U-test was used to assess statistical significance for non-normally distributed variables. $P < 0.05$ was regarded as statistically significant. All parameters were analyzed with Kaplan Meier analysis. Parameters with "crossing" curves were excluded from univariate analysis. Parameters with high clinical relevance and with low percentage data missing (<17%) as well as with statistical significance from univariate analysis were further tested in multivariate models (Cox proportional hazards analysis) which were done in two steps. At the first step the parameters were divided into two models, in a way to avoid multicollinearity. Then all significant parameters from the first step were further analyzed together in one multivariate model. Factors with statistical significance from all three models were further analyzed with Kaplan–Meier analysis, both in separate and in combinations. The hazard ratios (HR) with confidence intervals (CI) and P-values were presented. The PASW Statistics 18 (USA) statistical package was used for all the data analyses.

The primary endpoint was all-cause mortality based on hospital records which were available for all studied patients during time period January 2 to May 30, 2012.

3. Results

3.1. Clinical characteristics of whole study population and clinical outcome five years after undergoing percutaneous coronary intervention (PCI)

Data were selectively presented in Table 1 and explicitly presented in the supplementary Table. The primary endpoint was all-cause mortality based on hospital records and the Death Registry at the National Board for Welfare in Sweden. All-cause mortality after five years' follow-up was 46.2%. Mean age was 83.7 ± 2.8 years, 62% were male, 18% were physically inactive, 10% had urinary or bowel incontinence and 65% had a history of hypertension. Mean heart rate was 79 ± 24 beats per minute, 76% were in sinus rhythm, and 48% had ejection fraction < 45%. Indications for PCI were STEMI (52%), NSTEMI (36%) and unstable angina (11%). At discharge patients received treatment with aspirin (80%), clopidogrel (89%), beta blockers (84%), ACE-I/ARBs (59%) and statins (71%).

3.2. Clinical characteristics of those patients who died compared with those who survived five years after undergoing percutaneous coronary intervention (PCI)

In general, those who died were older, had a higher percentage of ADL-dependency, higher heart rate, more often valve diseases, more often PCI-related complications, including bleedings, cardiogenic shock, AV-block needing temporary pacemaker, different kinds of coronary artery dissections, occurred more often in those who died. However, other PCI parameters such as the number of stents, the type of stent (bare metal or drug-eluting stents), the access site (radial artery or femoral artery), one or multi-vessel disease and the indication for PCI did