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Quality of life after percutaneous coronary intervention in the elderly with acute coronary syndrome

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ABSTRACT

Background: Health-related quality of life (HRQoL) is an important but often neglected outcome measure in acute coronary syndrome (ACS) management. The prevalence of elderly presenting with ACS and undergoing percutaneous coronary intervention (PCI) is rising. We aimed to explore the impact of PCI on health status in elderly ACS patients.
Methods: We prospectively enrolled 624 patients admitted to our institution with ACS from February 2006 to May 2008. Short Form (SF)-36 health survey was used to assess HRQoL at baseline and 6 months. Baseline characteristics and HRQoL were compared for patients treated with PCI within 30 days of index ACS admission vs. medical therapy across 3 age groups (<60, 60–79 and ≥80 years).
Results: PCI was performed in 73.6%, 55.7% and 21.3% in patients aged <60, 60–79 and older than 80 years, respectively ($p<0.01$). Elderly patients were more likely to be female (16.9 vs. 35.4 vs. 54.6%, $p<0.01$) and had more co-morbidities ($p<0.01$). Older patients were less likely to undergo angiography (84.8 vs. 65.2 vs. 24.8%, $p<0.01$). Baseline HRQoL decreased with advancing age ($p<0.01$). However, elderly patients who underwent PCI experienced the most improvement in physical health than younger age groups. PCI was an independent predictor (Odds Ratio = 1.79, 95% CI: 1.10–2.92) of better physical health status at 6 months.
Conclusion: Elderly ACS patients who underwent PCI experienced the most improvement in physical health compared to younger patients. Our findings suggest that age *per se* should not deter against revascularization because of potential benefits in HRQOL.

1. Introduction

The prevalence of elderly patients presenting with acute coronary syndrome (ACS) is on the rise with an ageing population and their management remains a major therapeutic challenge. Advanced age is an important determinant of outcomes for patients with ACS. However, community practice reveals a disproportionately lower use of cardiovascular medications and invasive treatment among elderly patients with ACS who would stand to benefit. Reasons include limited trial data to guide the care of the elderly and uncertainty about benefits and risks of newer medications and invasive treatments. This population is often referred late for revascularization and is at the highest risk of procedural complications owing to the high prevalence of associated co-morbidities [1]. However, the elderly have the potential to gain the most clinical benefit from an early invasive approach (compared with conservative management) because of their higher baseline risk [2].

A disease orientated approach to ACS management focusing on the reduction of mortality, morbidity and the risk of subsequent events has lead to neglect of health-related quality of life (HRQoL) as an important outcome measure in ACS management. HRQoL is increasingly more relevant in the management of ACS patients as survival increases and the population ages. Studies have shown that health status in terms of extent of angina symptoms strongly predicts long-term clinical outcomes in patients with coronary artery disease (CAD) [3–5]. In one study, physical limitation was a significant and independent predictor of 1-year mortality while angina frequency was a predictor of 1-year ACS readmission [4]. In another study, early PCI provided greater gains in HRQoL compared with conservative therapy, mainly due to improvements in angina symptoms [5]. As a

Abbreviations: ACS, Acute coronary syndrome; CABG, Coronary arteries bypass graft; HRQoL, Health related quality of life; MCS, Mental component summary; MOS SF-36, Medical outcome survey short form-36; NSTEMI, Non ST segment elevation myocardial infarction; PCI, Percutaneous coronary intervention; PCS, Physical component summary; STEMIST, segment elevation myocardial infarction; UA, Unstable angina.

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result, HRQoL is increasingly used as an endpoint in clinical trials and in cost-effectiveness analysis.

Furthermore, racial differences on HRQoL have been shown in a study by Spertus et al where African Americans had more angina, worse HRQoL and worse physical function one year after an ACS than do whites [6]. The majority of studies on HRQoL and CAD were performed in Caucasians and there is a paucity of data on HRQoL after ACS in an Asian population. The aim of this study is to evaluate the impact of PCI on HRQoL in patients of different age groups presenting with ACS.

2. Methods

2.1. Patient population

Consecutive patients presenting with ACS were prospectively enrolled into a Registry from February 2006 to May 2008 at a university affiliated teaching hospital. Patients who underwent PCI within 30 days of index ACS presentation (PCI group) were compared to patients who received conservative therapy (non-PCI group).

ACS encompasses unstable angina (UA), non-ST elevation myocardial infarction (NSTEMI) and ST-elevation myocardial infarction (STEMI), respectively and was defined as having symptoms considered as consistent with acute cardiac ischemia plus one of the followings: 1) ECG changes, including transient ST segment elevations or new T wave inversions of ≥1 mm or pseudo-normalization of previously inverted T waves or new Q-wave in two or more contiguous leads, ST segment depressions of ≥1 mm and new left bundle branch block; 2) increase in cardiac enzymes (Creatinine phosphokinase>twice upper limit of the hospital's normal range or troponin T>0.1 mg/dl) and 3) documented coronary artery disease on coronary angiography [7,8].

Demographic, clinical and procedural characteristics were prospectively recorded on case report forms using standardized definitions for all fields. The study protocol was approved by the ethics committee of the institution and written informed consent was obtained in all patients.

2.2. Health related quality of life assessment

Health status assessment was performed at baseline and follow-up using the Medical Outcome Survey Short Form 36 (MOS SF-36, traditional Chinese version), a 36-item questionnaire that measures eight health constructs including physical functioning, role-limitation due to physical problems, role limitation due to emotional problems, vitality, emotional well-being, social functioning, bodily pain, and general health[5,9,10]. Score for each domain range from 0 to 100, with higher scores reflecting better health status. The SF-36 has been previously validated in patients with ischemic disease [11–13] and our general population [14].

The physical component summary (PCS) and mental component summary (MCS) scores, which reflect overall physical and mental health status, are derived from the eight original scales of SF-36. Both summary scores were standardized to the local general population of interest [9] to allow population-specific interpretation.

2.3. Follow-up

In-hospital complications were recorded at the time of discharge. Six-month follow-up was conducted by interview or telephone to assess HRQoL. Cardiac events were retrieved from review of patient medical records though the dedicated electronic system which recorded patient events, hospitalizations and details of clinic follow up. Death included all cause mortality and cause of death outside hospital was confirmed with the patient's primary care physician.

2.4. Statistical analysis

Categorical data were expressed as percentages, and continuous variables expressed as mean ± SD and/or median with inter-quartile ranges (IQR). Continuous variables were compared using Student's *t*-tests. Categorical variables were compared using Fisher exact or Pearson chi-square tests as appropriate.

Primary analyses were conducted with the PCS and MCS derived from SF-36 as outcome variables. Secondary analyses were conducted using the scores from the 8 domains of SF-36 as outcome variables. Mean SF-36 domain scores, PCS and MCS between groups at baseline and follow-up were compared with unpaired t-tests.

A propensity score of probability in undergoing PCI was used to adjust for potential bias in treatment selection. This was accomplished by performing a multivariable logistic regression analysis using PCI as the dependent outcome variable and entering all demographics, physical examination findings, clinical presentation and medications that were likely to affect the probability of PCI. Stepwise backward elimination was employed and the resultant independent predictors of undergoing PCI were then used to calculate the probability of undergoing PCI (propensity score). By introducing the propensity score into regression adjustment, the effect of PCI is estimated by adjustment for the impact of background covariates. The bias in the background covariates between PCI and non-PCI groups could be removed by adjustments made with the propensity score.[15,16].

Multivariate analysis was then performed to determine independent predictors of changes in PCS and MCS. Adjustment was made with regression models developed in backward selection mode using variables in Table 1 ($p<0.1$ to remain in model), and then adding the management strategy (i.e. PCI or non-PCI) to the selected models. Further analyses were performed including all variables in Table 1 as covariates in the models to maximize control of confounding. The propensity score was forced into all the models as covariate to balance the potential bias due to treatment selection. The results of selected and overall models were similar. Therefore, results from the backward selected models were presented in this study.

Missing follow-up health status assessments can potentially produce selection bias from survey non-responders. Multiple imputation strategy was employed to account for missing scores. The results of sensitivity analysis using imputed data were similar to analytic cohort and were not presented in this paper. We also compared baseline characteristics between respondents and non-respondents of HRQoL assessment.

Statistical analyses were performed using SPSS version 17.0 for Windows (SPSS Inc., Chicago, Illinois). All calculated p values were two-sided and p value <0.05 were considered statistically significant.

3. Results

3.1. Patient population

A total of 624 consecutive patients admitted with ACS to our institution were enrolled and completed baseline HRQoL assessment. Of these, 287 patients (45.9%) underwent PCI (PCI group), 39 (6.3%) underwent coronary artery bypass surgery and 298 (47.8%) were treated conservatively (non-PCI Group) (Fig. 1). Thirty-three patients died before the 6-month interview. At 6-month follow-up, there were 233 (81.5%) respondents in the PCI group and 218 (81.9%) in the non-PCI group after exclusion of deaths.

3.2. Survey respondents versus non-respondents

There were no significant differences between non-respondents and respondents in terms of age, gender and most baseline characteristics except that non-respondents were more likely to have previous documented CAD (40.8% vs. 29.3%, $p=0.007$), heart failure (12.2% vs. 6.7%, $p=0.04$) and impaired renal function (17% vs. 5.1%, $p<0.001$). Patients who underwent PCI were more likely to be respondents (80.4% vs. 69.2%, $p=0.001$). There were no differences in baseline SF-36 score for HRQoL and adverse clinical events between respondents and non-respondents.

3.3. Baseline characteristics

Baseline characteristics of PCI and non-PCI groups were stratified by age groups (<60 yrs, 60–79 yrs, and ≥80 yrs old) as shown in Table 1. Patients who underwent PCI were younger, more likely to be male and had lower prevalence of co-morbidities such as heart failure and impaired renal function. Majority of patients presented with STEMI were treated with PCI. These differences between PCI and non-PCI groups were maintained within each age group. As expected, older patients were more likely to be females and had more co-morbidities, including hypertension, prior heart failure and history of myocardial infarction than younger patients. With regards to treatment strategy, older patients were less likely to undergo diagnostic angiography (84.8 vs.65.2 vs.24.8%, $p<0.001$) and PCI (73.6 vs. 55.7 vs. 21.6%, $p<0.001$) than younger patients.

3.4. Health related quality of life

Table 2 showed the unadjusted SF-36 scores at baseline and 6 months by age and treatment strategy. Older patients had lower HRQoL at baseline. Within each age group, unadjusted baseline HRQoL between PCI and non-PCI groups was comparable. At 6-month follow-up, HRQoL scores were significantly higher than baseline in all 8 domains, with improvements ranging from 4.5 points for mental