Outcomes in octogenarians undergoing percutaneous coronary intervention

ORIGINAL ARTICLE

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ABSTRACT

Background. Percutaneous coronary intervention (PCI) in older patients is associated with increased in-hospital and 1-year mortality. We evaluated the results of PCI in octogenarians (aged 80-89 years) in a regional hospital.

Methods. Records of 54 consecutive octogenarians who underwent PCI between July 2006 and July 2008 in our hospital were reviewed. They contributed to 4.8% of all PCI performed in our hospital. All patients were followed up for a mean of 609 days. Their clinical characteristics, procedural details, and their cumulative 1-month and medium-term outcomes were analysed.

Results. The indications of PCI were stable angina in 61% of the patients and acute coronary syndrome in the remaining 39%. Coronary angiography documented multi-vessel disease in 51.9% of patients with relatively complex lesions (type B or C) in 93% of those treated. The success rate for acute procedures was 94%, and stents were used in 94% of the cases. Cumulative mortality at hospital discharge and by 30 days was 0%. It increased to 5.6% (3 patients) at 6 months, and 9.3% (5 patients) at the end of follow-up. The long-term cumulative rates of recurrent myocardial infarction and stroke were 11.1% and 3.7%, respectively. No repeat revascularisation was performed within the follow-up period. The remaining patients reported improvement in anginal symptoms; 7.4% of whom remained symptomatic in terms of angina after PCI, and attained only partial revascularisation.

Conclusion. PCI can be performed safely in selected older patients, with good procedural success rates and acceptable short-term mortality. Moreover, most patients reported improvement in anginal status.

Key words: Aged, 80 and over; Coronary disease; Myocardial revascularization

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INTRODUCTION

Population ageing is a major public health issue in Hong Kong. Coronary artery disease is a leading cause of mortality and morbidity in octogenarians (80-89 years).[1] Percutaneous coronary intervention (PCI) is indicated when medical treatment fails to relieve symptoms. However, for octogenarians PCI is challenging as there is a higher risk of adverse outcomes secondary to procedural complications owing to a high prevalence of associated co-morbidities.[2-4] In-hospital mortality in octogenarians

after PCI was reported to be up to 4.1% in 2007.[5] The rates were 3.8% in the National Cardiovascular Network data (1994-1997)[6] and 3.8% in the American College of Cardiology/National Cardiovascular Data Registry (1998-2000),[7] indicating a 4-fold increase in risk. There are few data about PCI in local octogenarians. This study therefore evaluated the clinical characteristics and outcome of octogenarians undergoing PCI in a regional hospital.

METHODS

Records of 54 consecutive octogenarians (mean age, 82.2; standard deviation [SD], 2.0 years) who underwent PCI from July 2006 to July 2008 in our hospital were reviewed. Their clinical characteristics, angiographic data, procedural details, clinical outcomes at month 1, month 6, and last follow-up (mean, 609; SD, 280 days) were analysed. Cohort data and outcome were collected based on medical notes and PCI database. Electronic patient record data was also retrieved for analysis.

Before the catheterization procedure, informed consent was obtained. The interventional strategy and stent selection was at the discretion of the operators. Either the radial artery or femoral artery approach was used. Elective PCI was performed in stable patients in whom procedures could be deferred without increased risk of adverse clinical outcomes. Urgent PCI was performed during the same admission for patients who were at high risk of deterioration. All patients were pre-treated with aspirin 80 or 160 mg, and a loading dose of clopidogrel at 300 mg was given 6 hours before the procedure. All patients received intravenous unfractionated heparin of 70 to 100 units per kg during the coronary intervention. After the procedure, all patients received aspirin and clopidogrel according to standard guidelines.[8] Puncture site homeostasis after sheath removal was achieved by manual pressure and mechanical C-clamps in patients having the femoral approach, and Stepty–P in those having the radial approach.

Standard morphological criteria were used to identify lesion locations, lumen diameters, and lengths. The degree of coronary artery stenosis was assessed visually by the cardiologist in charge. Coronary angiograms were analysed to determine the extent of flow according to the thrombolysis in myocardial infarction (TIMI) classification (grade 0-3) before and after PCI.

Left ventricular ejection fraction was determined by echocardiography just prior to PCI. Chronic renal insufficiency was defined as a creatinine value of ≥200 μmol/l. Angiographic success was defined as angiographic residual stenosis of <20% by visual estimate with TIMI flow grade 3. In-hospital complications were recorded at the time of discharge. All cardiac events were recorded including death, myocardial infarction, target vessel revascularisation, and composite major adverse cardiac and cerebrovascular events (death, myocardial infarction, target vessel revascularisation, and stroke).

Death included all-cause mortality. Acute ST elevation myocardial infarction was defined as presence of typical chest pain for at least 30 minutes but <12 hours in the presence of ST-segment elevation of ≥1 mm in at least 2 contingous leads, or new left bundle branch block together with ≥2 fold elevation of cardiac troponins. Target vessel revascularisation was a repeat revascularisation in the follow-up period due to restenosis either within the target lesion or the same coronary artery. The severity of bleeding complications was classified according to the TIMI bleeding classification.[9] Major bleeding was defined as either intracranial haemorrhage or clinically overt bleeding of ≥5 g/dl decrease in the haemoglobin concentration, whereas minor bleeding was a 3 to 5 g/dl decrease, and minimal bleeding as a <3 g/dl decrease.

Continuous variables were presented as mean±SD. Categorical variables were expressed as percentage. Survival estimates were computed using Kaplan-Meier methods.

RESULTS

Of the 54 patients, 63% were male and 2 underwent primary PCI (**Table 1**). With regard to indications for PCI, 61% had stable angina refractory to medical therapy and the remaining 39% had acute coronary syndrome. One patient presented with haemodynamically significant ventricular arrhythmia complicating the acute coronary syndrome.

Regarding left ventricular ejection fraction, 60% of patients had >55%, whereas only 5.6% had <35%.

Table 1
Baseline clinical characteristics

Characteristic	No. (%) of patients (n=54)
Male	34 (63)
Age (years)	82.2±2*
Clinical presentation	
Acute coronary syndrome	21 (39)
Stable angina	33 (61)
Sustained ventricular tachycardia/fibrillation	1 (1.9)
Hypertension	46 (85)
Diabetes mellitus	27 (50)
Smoker/ex-smoker	26 (48)
Hyperlipidaemia	27 (50)
Renal failure	1 (1.9)
Prior myocardial infarction	23 (42.6)
Prior coronary artery bypass grafting	0
Heart failure	5 (9.3)
Left ventricular ejection fraction	
>55%	32 (59.3)
35-55%	18 (33.3)
<35%	4 (7.4)

* Mean±SD are shown

9.3% of the patients had symptoms of heart failure; 52% were non-smokers, 85% had hypertension; 50% had diabetes mellitus and hyperlipidaemia; 1.6% had chronic renal insufficiency; 43% and 14.8% had a history of myocardial infarction and stroke, respectively. No patient had had coronary artery bypass grafting. Most patients were ambulatory and independent in terms of activities of daily living.

94% of the procedures were elective; 52% of the patients had 2 or 3 vessel disease; 76% had only 1 vessel treated (with lesions of type B/C in 93% of cases); 2 patients had left main artery disease. The mean number of stents deployed per patient was 1.5 (SD, 0.32); 30% were drug-eluting stents and the remainder were the bare metal type. The intra-aortic balloon pump was used in 5.6% of the cases. The overall procedural success rate was 94% (**Table 2**).

There was no mortality in hospital or within 1 month (**Table 3**). The cumulative mortality rate increased to 5.6% (n=3) at 6 months and 9.3% (n=5) at the end of follow-up. The causes of death included myocardial infarction (n=3), stroke (n=1) and unknown (n=1). A Kaplan-Meier curve of 1-year survival is shown in **Figure 1**. The total major adverse cardiac and cerebrovascular event rate at 1 month was 1.9%, and increased to 16% at 6 months, and 22% at the end of follow-up (**Figure 2**). At the end of follow-up, the cumulative rates of recurrent myocardial infarction and stroke were 9.3% and 3.7%, respectively. No repeat revascularisation was performed within 1 year. After PCI, 89% of the patients reported improvement in anginal symptoms, and 7.4% remained symptomatic in terms of angina (Canadian Cardiovascular Society class III). Bleeding risk is a major concern in older patients, especially when they are treated with dual antiplatelet agents during the post-intervention period. Five patients had bleeding complication (4 minor and 1 major); all the bleeding was gastrointestinal. In addition, 3 patients had complications related to puncture site homeostasis (2 developed femoral wound haematomas and 1 a femoral artery pseudoaneurysm).

DISCUSSION

Older patients are usually treated conservatively and referred late for revascularisation. In post-PCI octogenarians, in-hospital and long-term mortality rates are reported to be higher, as are bleeding and

Table 2
Angiographic characteristics and procedural details

Parameter	No. (%) of patients (n=54)
Urgency	
Elective	51 (94.4)
Urgent	3 (5.6)
No. of vessels involved	
Single	26 (48.1)
Double	11 (20.4)
Triple	17 (31.5)
Vessel involved	
Left main artery	2 (3.7)
Left anterior descending artery	43 (79.6)
Left circumflex artery	25 (46.3)
Right coronary artery	31 (57.4)
No. of vessels treated	
1	41 (75.9)
≥2	13 (24.1)
No. of lesion type B or C	93
No. of stents deployed	94
Total no. of stents used	81
% of drug-eluting stents	29.6
Stent diameter (mm)	2.95±0.48*
Stent length (mm)	19.5±5.81*
Procedural success rate (%)	94

* Mean±SD are shown

Table 3
Cumulative outcomes

Outcome	No. (%) of patients (n=54)		
	1-month follow-up	6-month follow-up	End of follow-up (mean, 609 days)
Death	0	3 (5.6)	5 (9.3)
Myocardial infarction	1 (1.9)	4 (7.4)	5 (9.3)
Stent thrombosis	0	0	0
Target vessel revascularisation	0	0	0
Stroke	0	2 (3.7)	2 (3.7)
Major adverse cardiac and cerebrovascular events	1 (1.9)	9 (16)	12 (22)

vascular complications.[2-5,10,11] Nonetheless, older patients should not be excluded from revascularisation procedures solely because of their age. Despite higher risk profiles, selected older patients benefit from revascularisation. Among stable patients after revascularisation, the randomised TIME trial demonstrated improved symptom control and quality of life,[12] compared to those receiving optimal medical treatment. In patients aged ≥80 years with non-STEMI or acute coronary syndrome, early PCI achieves better outcomes than medical treatment alone.[13]

In the present study, low in-hospital mortality and free from major adverse cardiac and cerebrovascular events in the short term was achieved. Other independent predictors of in-hospital mortality included emergent presentation and presence of cardiogenic shock. We reported good angiographic success rates and in-hospital mortality. However, nearly all the PCI were elective rather than urgent procedures, and there was a low prevalence of cardiogenic shock, heart failure and chronic renal failure. Moreover, most patients were

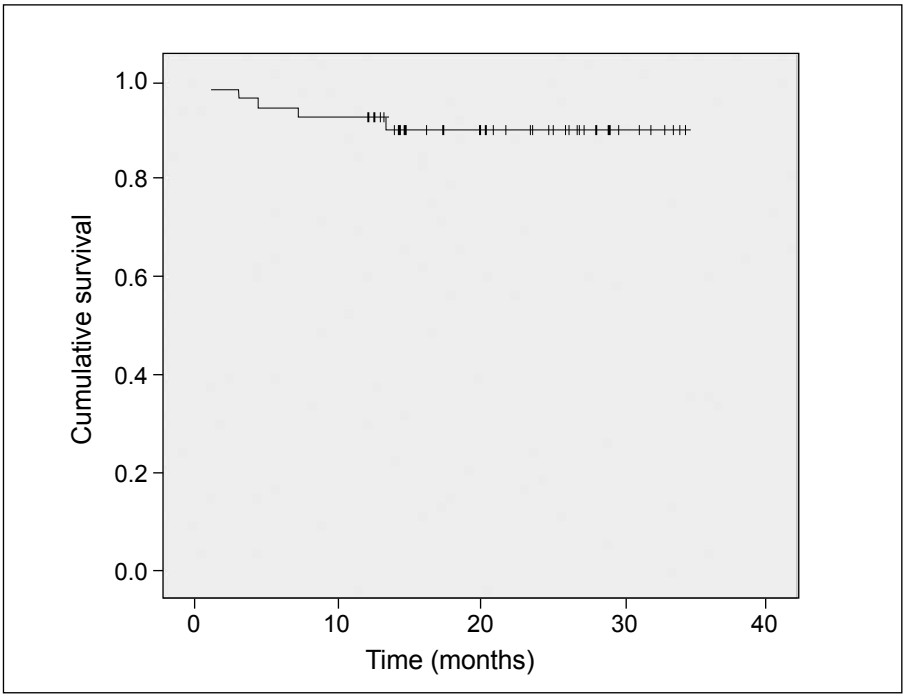

Figure 1. Kaplan-Meier curves on the cumulative survival

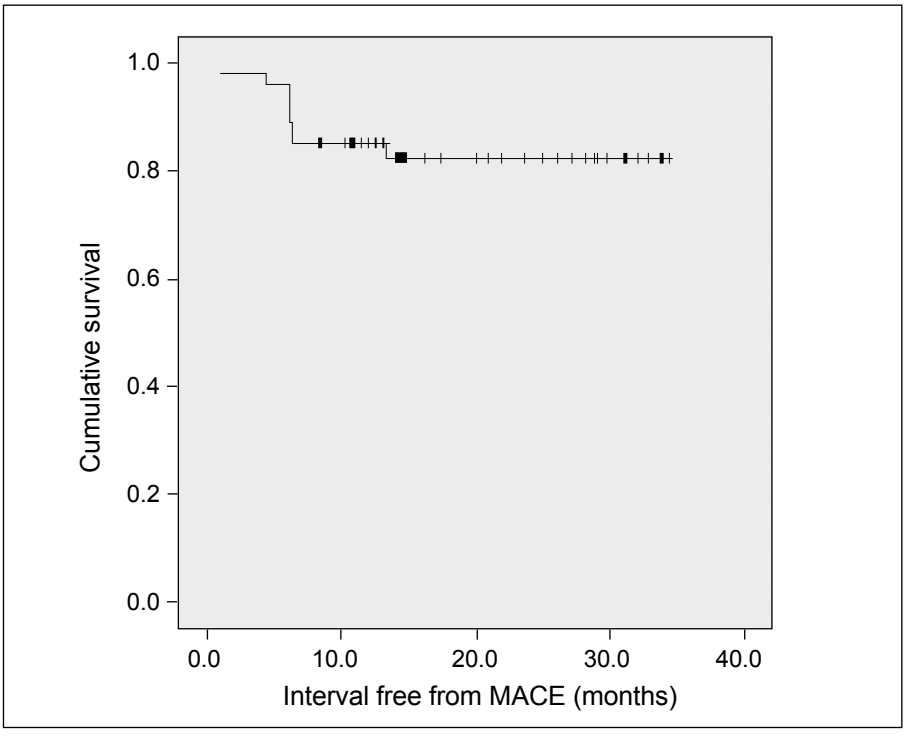

Figure 2. Kaplan-Meier curves on interval free from major adverse cardiac and cerebrovascular events (MACE)

ambulatory and independent. On the contrary, a previous study reported a higher incidence of prior myocardial infarction, lower left ventricular ejection fraction, and more frequent heart failure in octogenarians undergoing PCI.[7] Nevertheless, our study suggested that in selected octogenarians, PCI was safe and had an acceptable procedural success rate and short-term results. In a group of patients aged ≥90 years with stable angina who were treated electively, the mortality was 0%.[14] Thus, careful attention to background medical history and clinical presentation should dictate the

prognosis and management among this group of patients.

In our study, the procedural success rate was 94%. This was comparable to other PCI trials and registries concerning octogenarians. Prior to the stent era, the procedural success rate of PCI in older patients were disappointing. Contemporary PCI methods with routine use of more deliverable stents, atherectomy devices, and antithrombotic agents have dramatically changed the scope and results of PCI. Indeed, in the stent era, procedural success and restenosis rates are comparable to those for non-octogenarians.

Apart from those presenting with acute coronary syndrome, a group of older patients with refractory angina despite optimal medical treatment were selected to undergo PCI, as the procedure was deemed useful in those with refractory angina despite optimal medical therapy.[15] Overall, most of our patients reported improvement in angina status after intervention. Percutaneous intervention in octogenarians often confers symptom relief, rather than complete revascularisation.

In our study, a significant portion of patients did not achieve complete revascularisation. Indeed, this is a common clinical practice to limit the complexity of interventions in this patient subset. In contrast to young patients, a simplified approach with incomplete or 'culprit-lesion' only PCI may be a better option in older patients with multi-vessel disease, in order to minimise periprocedural complications and enable a meaningful clinical recovery with good quality of life. Indeed, in older patients the results of partial revascularisation may not be inferior to complete revascularisation.[16]

In our hospital, only 4.8% of all the PCI were performed in octogenarians, compared to 8.8% to 11% in the western societies.[7] This can be explained by cultural difference; the Chinese believe that older patients with co-morbidities may not benefit from invasive procedures.

In older patients, arteries are prone to age-related changes, including more extensive atherosclerosis, medial calcification, tortuosity, and impairment of endothelial function. These features, together with co-morbidities such as chronic renal insufficiency, higher rates of bleeding complications from PCI are expected. Our bleeding complication rate of 9.3% was comparable to that of another study.[17]

One limitation of our study was that it was a retrospective analysis, and our PCI database was not originally designed to capture data for this study. Moreover, the sample size was small. As we collected data from patient records retrospectively, anginal symptoms during follow-up might have been underestimated. Nevertheless, we attempted to reflect the 'real world' of an interventional cardiology practice in Hong Kong, with the understanding that the studied population was highly selective.

CONCLUSIONS

PCI can be performed safely in selected older patients, with good procedural success rates and acceptable short-term mortality and complication rates. Moreover, most patients reported improvement in angina status after the procedure.

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