Percutaneous coronary intervention in the elderly

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Abstract

Older patients represent the majority of those considered for coronary intervention but they are under-represented in most clinical trials in this area. Reviewing registry data and pooled data from clinical trials, this article discusses the effect of age on procedural mortality and morbidity. It also reviews the effect of age on interventional procedures in unstable patients, and on pharmacological intervention.

Despite the higher initial risks in older patients, the authors argue that several risk factors are responsible for predicting poor outcome following interventional procedures. Percutaneous coronary intervention can be very successful in the elderly and its risks must be balanced against the many important benefits older patients stand to gain from the procedure.

Key words: percutaneous coronary intervention, myocardial infarction, unstable angina, acute coronary syndromes, elderly.

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Introduction

The incidence of coronary heart disease increases with age. Thus the vast majority of patients considered for coronary intervention are either elderly or middle-aged. Percutaneous coronary intervention (PCI) is becoming routine in older patients. Despite this, the elderly population are under-represented in almost all trials of coronary intervention; 40% of all trials of treatment for myocardial infarction (MI), unstable angina or acute coronary syndromes published in the 1990s had an age restriction for recruitment.[1] Many factors may alter the safety and efficacy of treatments in this patient group, in particular the presence of co-morbid conditions. Thus the results of treatments validated in a younger age group cannot necessarily be extrapolated. For example, in the Should we emergently revascularise Occluded Coronaries for cardiogenic shock (SHOCK) trial,[2] patients with cardiogenic shock secondary to MI were randomised to either coronary intervention or medical management. The relative risk for mortality for the intervention group in patients under 75 years was 0.73, compared to 1.41 in those over 75 years (p=0.01).

So which elderly patients, among the many older individuals admitted with acute coronary syndromes or presenting with limiting angina, should we consider for PCI? In the absence of specific trials there is, at least, accumulating evidence from subgroup analysis of recent studies plus registry data of the risks and benefits of coronary intervention in the elderly. These data consistently show that elderly patients have higher procedural morbidity and mortality, but in patients who undergo successful intervention, the benefits seem to be at least as important as those seen in younger patients.

Age and procedural mortality

The risks of angioplasty increase with age. Six-month outcome data reported from the Rosetta Angioplasty Registry[3] showed that both cardiac and all-cause mortality was substantially higher in patients over 75 years compared to younger patients (5.7 *vs*. 0.4% and 10.2 *vs*. 0.9%). Patients were only enrolled in this registry following successful percutaneous transluminal coronary angioplasty (PTCA) and also if they were considered able to undergo exercise testing. These two conditions made this a highly selected group of fit, elderly patients. In a further registry of over 7,000 octogenarians who had undergone coronary intervention, Batchelor *et al*.[4] found a curvilinear relationship between age and mortality, with overall mortality being 3.8% in those over 80 years compared to 1.1% in those under this age (see figure 1). Chauhan *et al*.[5] report pooled data from six clinical trials of coronary artery stenting, finding a 5% relative increase in mortality for each decade of life using multivariate modelling.

Some patients are at greater risk than others. Several factors have been identified as predicting a poorer outcome (see table 1). Mortality in elective patients varies considerably depending on the presence of these risk factors, ranging from 0.79% in those with no risk factors to 7.2% in the presence of renal insufficiency or left ventricular impairment.[4] In the Rosetta Registry,[3] the strongest predictor of a poor outcome was prior coronary artery bypass grafting (CABG), which increased the risk of an adverse event six-fold. Importantly, elderly patients without prior CABG had adverse event rates similar to younger patients. Chauhan[5] found predictors of mortality to be prior MI,

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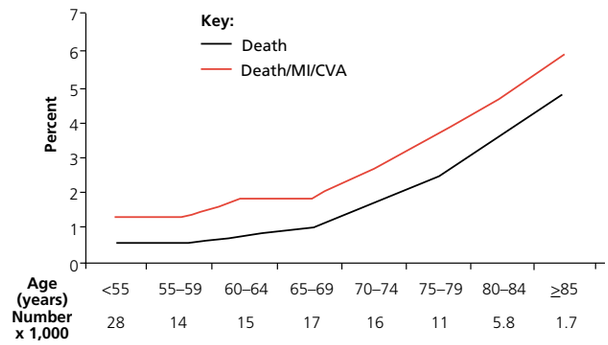
Figure 1. Outcome of percutaneous coronary intervention by age



Key: MI = myocardial infarction, CVA = cerebrovascular accident

Adapted from Batchelor *et al.*[4]

Table 1. Predictors of poor outcome in elderly patients considered for percutaneous coronary intervention

- Previous coronary artery bypass grafting
- Previous myocardial infarction
- Unstable symptoms
- Impaired left ventricular function
- Multivessel disease
- Complex lesions
- Cardiogenic shock
- Renal insufficiency
- Age >85 years
- Diabetes

Table 2. Procedural success of coronary intervention

Author	Age group (years)	Success rate (%)	Success rate in control group (%)
Batchelor[4]	>80	84.0	89.0
Chauhan[5]	>80	97.4	98.5
Nasser[9]	>75	98.8	96.6
Kahler[7]	>80	88.0	97.0

diabetes mellitus and three-vessel disease. De Gregorio[6] identified five factors associated with poor outcome: unstable symptoms, prior MI, reduced ejection fraction (< 50%), multi-vessel disease and complex lesions. Batchelor's registry data ranked cardiogenic shock, MI without shock, a left ventricular ejection fraction less than 35%, renal insufficiency, first intervention, age over 85 years and diabetes as predictors of mortality in descending order of importance. Thus the risks of angioplasty are related more to coexisting cardiac conditions and other co-morbidities, than to age itself.

Greater mortality in elderly patients undergoing coronary intervention is not limited to the procedure. In those studies that reported in-hospital and medium-term mortality separately, it is clear that elderly patients continued to have higher mortality, even after apparently successful intervention. Chauhan[5] found in-hospital mortality following stenting of 1.33% in those over 80 years, *vs.* 0.10% in younger patients. Figures at one year were 5.65% and 1.41% respectively. De Gregorio[6] found a procedural mortality of 2.2% in over 75 years and a 12-month mortality of 9.0%. Since the annual mortality of elderly coronary heart disease (CHD) patients is probably considerably greater than 10%, these figures are, at least to us, encouraging. A more meaningful comparison is with age-matched patients not undergoing intervention. In an age of increasingly defensive medical practice, accurate figures on death rates in patients treated conservatively are needed to place in context the true value of angioplasty in the elderly. Our belief is that many older patients stand to gain much from intervention.

Morbidity following intervention

Most older patients tolerate PCI reasonably well but more frequently suffer other complications than younger patients. Peri-procedural MI,[4-6] stroke[4] and emergency CABG[6] are all more common in the older patient. In addition, hospital stays are longer.[7] Femoral artery complications are more common and responses to antiplatelet drugs are less predictable. Another procedural point, well known to practitioners of transoesophageal echocardiography, is the substantial burden of aortic atheroma in older persons. It is our usual practice in these patients to advance catheters with a guidewire to the aortic root and also to withdraw catheters over the guidewire to minimise stripping the aorta of lumps of atheromatous emboli.

Morbidity and mortality associated with intervention must be considered in the context of the symptoms and events associated with the disease itself. In the registry data discussed above, elderly patients generally had more severe symptoms than their younger counterparts.[4,7] In the TIMI risk score,[8] age over 65 years was an independent predictor of an adverse event in patients with unstable symptoms, with an odds ratio of 1.75 compared to younger patients. We should not forget among all this data, however, that relief of angina, with improved function and quality of life, may be as important for patients as prolonged survival. Quality of life and functional assessment are rarely measured as outcomes, but physicians looking after older patients will appreciate that improvement in symptoms is what the individual cares about most.

Procedural success of intervention

In most series, elderly patients undergoing PCI are more likely to have multi-vessel disease, proximal left anterior descending (LAD) pathology or complex lesions.[4-6] Procedural success rates in this group are lower than in younger patients, although overall success rates are still good. This is shown in table 2.

Intervention in unstable patients

Sakai *et al.*[10] report a series of 261 patients over 75 years who

underwent primary angioplasty for acute MI. Successful reperfusion was similar to 802 younger patients (93% *vs*. 95% respectively), though in-hospital mortality was higher (8.4% *vs*. 3.7% respectively). This is similar to the 11% mortality seen in the setting of acute MI in the series described by Batchelor.[4] These results look most encouraging. Indeed, since the elderly are more prone to haemorrhagic stroke from thrombolysis after acute MI than younger patients, direct angioplasty has many attractions. Some centres, for example the Mayo Clinic, routinely use PCI over thrombolysis for all their elderly acute MI patients.

What about acute coronary syndromes? Subgroup analysis of the Fragmin and fast Revascularisation during Instability in Coronary artery disease (FRISC II) study,[11] (a study comparing an early invasive approach to a conservative strategy in patients with acute coronary syndromes), showed that patients over 65 years had a greater reduction in the primary end point of death or MI in the invasive strategy compared to those under 65 years (odds ratio 0.63 compared to 0.93), although end points were more frequent in the older patients. Little data is available for the very elderly. In the Treat Angina with Aggrastat and determine Cost of Therapy with an Invasive or Conservative Strategy-Thrombolysis In Myocardial Infarction (TACTICS-TIMI 18) study,[12] a similar study comparing an interventional approach to a conservative one in unstable patients, the primary end point of death, MI or repeat admission for unstable angina was also commoner in patients over 65 years, but the relative risk reduction was greater in older patients (21.2% *vs*. 16.3%). Thus the risks and potential gains of intervention in the elderly may be higher.

Pharmacological intervention

There is little specific data on the use of glycoprotein IIb/IIIa antagonists in the elderly. The median age of patients in the Evaluation in PTCA to Improve Long-term Outcome with abciximab GP IIb/IIIa blockade (EPILOG) study,[13] which randomised patients to abciximab or placebo during PCI, was only 60 years. Subgroup analysis showed a trend to benefit of abciximab in those over 65 years, although the magnitude of benefit appeared lower, but confidence intervals were wide due to fewer numbers. Similar findings were reported in the Evaluation of Platelet IIb/IIIa Inhibitor for Stenting (EPISTENT)[14] and the Evaluation of c7E3 for the Prevention of Ischaemic Complications (EPIC)[15] studies. No benefit was seen with eptifibitide in patients over 65 years in the Platelet Glycoprotein IIb/IIIa in Unstable Angina: Receptor Suppression Using Integrilin Therapy (PURSUIT) trial.[16] Conversely, the benefit of tirofiban in the Platelet Receptor inhibition for Ischaemic Syndrome Management in Patients Limited by Unstable Signs and symptoms (PRISM-PLUS) study[17] was similar in the over 65 age group to that in younger patients. In unstable coronary syndromes, clopidogrel has significant benefit in those over 65 years, but again the magnitude of benefit was higher in younger patients.[18]

Decision making in the elderly population

Coronary intervention carries a greater risk in the elderly. Some of this additional risk is intrinsic to age itself but the presence or absence of serious co-morbidity seems to be more important in determining the degree of increased risk. Risk is also higher in patients with unstable symptoms but patients treated conservatively in this group also do badly.

There are important gaps in our knowledge. Much data come from registries and it is very likely that there is a selection bias in favour of fitter, older patients in some of these series. Few controlled trials have reported the number of patients screened before a decision has been taken to proceed to angiography and intervention. Therefore we do not know how selective a population has been reported in either clinical trials or registry data. Two of the most important trials of aggressive intervention in unstable patients have only presented their data on patients under or over 65 years.[11,12] We hope, but cannot presume, that the benefits seen in these trials will be similar among older patients.

In patients with stable angina, it seems reasonable to maximise medical therapy before considering intervention. If symptoms cannot be controlled, reversible ischaemia is demonstrated and co-morbidity does not confer prohibitive risk, intervention should be considered after careful discussion with patients on the risks and likely benefits. In patients with unstable symptoms, the risks of both intervention and conservative strategies are higher. Further randomised, controlled trials in elderly patients are desired before we can be sure of the optimum approach in this patient group. But in patients without serious co-morbidity, we believe it is important to consider PCI.

At the moment, careful consideration of the individual's biological age, functional level (i.e. how generally well are they now, and how good would they be after successful intervention?) and co-morbidity are what we base our decisions on. Chronological age, alone, is not a contra-indication to interventional therapies. With the growing number of older patients with CHD comes a growing need for an evidence-base and interventional cardiologists have a central role in providing this. It is our belief, that older patients with CHD merit equal access to specialist care, investigation and interventional strategies as much as their younger counterparts. Their initial risks may be higher but they have much to gain.

Key messages

- Several risk factors predict poor outcome following coronary intervention in older patients
- Percutaneous coronary intervention can be a very successful procedure in the elderly
- Medical therapy should be maximised before considering intervention in older patients with stable angina
- Further randomised, controlled trials are needed in this population

Editors' note

This is the fourth article in our clinical cardiology series. Previous articles include: the future of cardiology: heart disease in older patients (*Br J Cardiol* 2003;**10**:45-8); heart disease in older patients: myocardial infarction (*Br J Cardiol* 2003;**10**:123-7); thrombolytic therapy for acute ischaemic stroke (*Br J Cardiol* 2003;**10**:197-205).

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Book review

Oxford handbook of clinical and laboratory investigation

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Price: £19.95

The increasing repertoire and complexity of diagnostic investigations places a need for either an impossibly wide knowledge base or, more practically, a readily available and concise source of reference to the performance and interpretation of these investigations. It is in this latter role that the *Oxford handbook of clinical and laboratory investigation* more than adequately satisfies.

The book is an easily transportable, pocket-sized volume. It begins with a helpful introduction reminding the reader of some of the limitations of tests and highlighting some of the pre-analytical variables that can influence test results. Part one of the book is a patient-oriented section, focusing on a wide range of presenting signs and symptoms, and providing both lists of possible causes and tests that may help reach a diagnosis. For further information, there are regular cross-references either to specific investigations or to the companion *Oxford handbook of clinical medicine*. One small criticism is that there is something of a lack of consistency in the investigative lists. A consistent approach of, perhaps, first-line and second-line investigations would be preferable. That said, full and complete information is provided in a concise manner.

The remaining chapters of the book are specialty-specific, outlining an appropriate investigative approach within each specialist area. There is a variation in style, no doubt reflecting the various contributors. But, in general, the investigative techniques are well described, often supported by helpful flow diagrams and illustrations. Some chapters include helpful references for further reading. Perhaps one chapter that might be added is one for acute/emergency medicine, cross-referenced to the other specialist chapters as necessary, as these are undoubtedly the situations in which a rapid decision regarding appropriate investigations needs to be made.

The editors deserve credit for bringing together such a comprehensive oversight of currently available tests. Although this little handbook is likely to be of most benefit to the junior doctor on the 'shop floor', it could be a valuable source of knowledge to more senior doctors, medical students and anyone who has a role in ordering or carrying out investigative procedures.

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