Mortality following hip fracture surgery in patients with recent myocardial infarction

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ABSTRACT

INTRODUCTION In an elective setting, surgery is best avoided for at least 6 months following myocardial infarction. However, in the presence of a femoral neck fracture, this would most probably lead to significant complications in relation to prolonged immobilisation. There is no published mortality data for patients undergoing surgery for hip fracture following a recent myocardial infarction. The aim of this retrospective study was to assess the mortality of hip fracture patients with a recent myocardial infarction that have undergone surgery at our institution.

PATIENTS AND METHODS Between January 2003 and October 2005, 2270 patients were admitted to our unit with a proximal femoral fracture. Of these, 11 patients were found to have a recent myocardial infarction.

RESULTS Of these 11 patients, 8 were female. The average age was 78.2 years (range, 59–90 years). Average delay from the time of infarction to operation was 11.2 days (range, 3–23 days). Mortality at 1 and 6 months was 45.4% and 63.5%, respectively.

DISCUSSION This is much higher than the overall reported mortality following proximal femur fracture. This information may be useful when planning future peri-operative care and discussing overall prognosis with patients and their relatives.

KEYWORDS

Hip fractures – Myocardial infarction – Mortality rate

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Operative treatment and early mobilisation is the accepted treatment for the vast majority of proximal femoral fractures in order to minimise the complications of immobilisation and allow earlier rehabilitation. Patients with proximal femoral fractures and acute medical problems can pose a dilemma in management. In particular, if and when surgery is appropriate. In patients with a recent myocardial infarction, elective surgery is best avoided for at least 6 months.¹ However, delayed surgery in patients with femoral neck fracture leads to significant complications associated with prolonged immobilisation such as pressure sores and bronchopneumonia.

Additionally, it must be remembered that the mortality rate in non-surgical patients is significant. The 30-day mortality following myocardial infarction has been reported as 19–26% in subjects over 75 years of age.^{2,3} There is no published mortality data for patients undergoing hip fracture following a recent myocardial infarction. The aim of this retrospective study was to assess the mortality of hip fracture patients that have undergone surgery at our institution following a proven acute myocardial infarction.

Patients and Methods

Patients with a hip fracture and a proven acute myocardial infarct prior to surgery were included in this study. These patients either presented to hospital with both neck of femur fracture and myocardial infarction simultaneously (Group 1, 4 patients), developed a myocardial infarction while waiting for their hip operation (Group 2, 4 patients) or were admitted with a myocardial infarction (Group 3, 3 patients) and sustained their fracture following a fall within the hospital. Myocardial infarction was diagnosed when the patient had chest pain and either a raised troponin I, typical ECG changes or both.

The troponin I level was measured (TOSOH-chemiluminescence method) 12 h after the attack of chest pain. The risk of myocardial infarction is low if the troponin I is less than 0.10 µg/l, moderate if the level is 0.10–0.6 µg/l and high when the troponin I level is greater than 0.6 µg/l. The typical ECG changes (ST elevation or T-wave inversion) were also considered diagnostic of myocardial infarction. The diagnosis of non-ST elevated myocardial infarction (non-

Table 1 Demographic characteristics, medical co-morbidities and operative details of proximal femur fracture patients with a recent myocardial infarction

Patient number	1	2	3	4	5	6	7	8	9	10	11
Age (years)	77	59	83	90	83	84	79	77	77	75	77
Sex	F	F	M	F	F	F	F	M	F	M	F
ASA grade	4	4	3	4	4	3	4	3	3	3	3
MI to operation (days)	3	7	22	9	20	8	7	23	3	10	12
Operation to death	1 month	1 month	6 months	–	–	4.5 months	4 days	1 month	–	7 days	–
Troponin I (µg/l)	14.63	0.34	1.89	0.23	3.13	4.37	0.12	4.70	0.16	2.57	0.82
Co-morbidities	IHD, HT, NIDDM	COPD, IHD, HT	CCF, CRF, PVD	IHD	HT, CVA, IHD, AS, PVD	HT, OA	IHD	IDDM, HT, CVA, DVT, gastrectomy, pancreatotomy	HT, TB-lobectomy	Carcinoma colon, LVF, colovesical fistula, NIDDM, anaemia	Asthma, COPD
Fracture type	Intra-capsular	Extra-capsular	Intra-capsular	Intra-capsular	Extra-capsular	Extra-capsular	Intra-capsular	Extra-capsular	Intra-capsular	Intra-capsular	Intra-capsular
Operation	Thompson's	DHS	Thompson's	Thompson's	DHS	DHS	Thompson's	DHS	Furlong	Thompson's	Thompson's
Surgeon	Consultant	SpR	Consultant	SpR	SpR	Consultant	?	Consultant	Consultant	Consultant	SpR
Anaesthetic	Spinal	Spinal	Spinal	GA, block	Block	GA, block	?	Spinal	Spinal	GA, block	GA

IHD, ischaemic heart disease; HT, hypertension; NIDDM, non-insulin dependent diabetes mellitus; COPD, chronic obstructive pulmonary disease; CCF, congestive cardiac failure; CRF, chronic renal failure; PVD, peripheral vascular disease; CVA, cerebrovascular accident; AS, aortic stenosis; OA, osteoarthritis; IDDM, insulin-dependent diabetes mellitus; TB, tuberculosis; DVT, deep venous thrombosis; LVF, left ventricular failure.

STEMI) was made when there was no ST elevation and a significantly raised troponin level.

Demographic details, co-morbidities, ASA grade, timing of surgery, the nature of surgery and anaesthesia are shown in Table 1. Death was the main outcome measure.

Patients with a myocardial infarction received aspirin 150 mg for 6 weeks (or Dalteparin 2500 IU s.c. daily if aspirin was contra-indicated) from the time of admission as per our hospital protocol. All patients were seen and assessed by a physician (consultant or registrar) and started or continued on a β -blocker (bisoprolol or metoprolol). Echocardiography was performed in all patients pre-operatively to assess cardiac function. All subjects with a diagnosis of myocardial infarction were seen and assessed pre-operatively by a senior anaesthetist.

The increased peri-operative risks were discussed with the patient or with their relatives in cases of significant dementia. All patients were advised to choose surgery for their fracture unless their life expectancy was only a few weeks. Patients underwent either a cemented Thompson's hemiarthroplasty, Furlong bipolar hemiarthroplasty or a dynamic hip screw procedure. A consultant anaesthetist or senior specialist registrar performed the anaesthesia after a thorough pre-operative assessment and optimisation of the patient's medical condition. Patients were anaesthetised with general anaesthesia, spinal anaesthesia or a femoral 3-in-1 nerve block and sedation, as required. Standard anaesthetic physiological monitoring was used in all cases (non-invasive blood pressure, ECG, pulse oximetry, end-tidal carbon dioxide and anaesthetic gases/vapour). In one patient, continuous intra-arterial pressure monitoring was used. Patients received three doses of i.v. Cefuroxime (1.5 g at time of induction, 750 mg at 8th and 16th hourly postoperatively) as antibiotic prophylaxis. Patients were initially treated postoperatively in a post-anaesthetic care unit (PACU) before being transferred to an orthopaedic ward when considered stable. None were admitted to the critical care unit.

Results

Between January 2003 and October 2005, 11 of 2270 patients admitted with fracture neck of femur met our diagnostic criteria for myocardial infarction (see Table 1). The average age was 78.2 years (range, 59–90 years) and 8 were female. All were ambulant prior to surgery with a stick or frame. The troponin I level was significantly increased ($> 0.10 \mu\text{g/l}$) in all patients except one who showed typical ECG changes for the diagnosis of myocardial infarction (the troponin level had been checked too early and not repeated). Non-STEMI was diagnosed in six patients. The ASA grade was recorded as 4 in five patients and 3 in six patients. Patients had either a general anaesthetic, spinal

anaesthesia, general anaesthetic with a femoral 3-in-1 nerve block or just the nerve block and sedation as shown in Table 1. Blood pressure was well maintained in all patients except one who had 3-in-1 femoral block and developed a single episode of hypotension which was corrected immediately. Normal saline (3–4 l) was used to maintain blood pressure during each operation and three patients also received boluses of ephedrine. Only one patient had an arterial line sited for continuous monitoring of blood pressure. The anaesthetic records could not be found for one patient. A hemiarthroplasty was performed in seven patients and a DHS in four (see Table 1). The average delay from the time of infarction to operation was 11.2 days (range, 3–23 days). Five patients died within a month and two patients died within 6 months of operation. The mortality at 1 and 6 months was 45.4% and 63.5%, respectively. Only five patients went home after their operation and one patient died in a rehabilitation hospital. Those patients (Group 2) who sustained their myocardial infarction while waiting for their hip operation survived more than 6 months. All those patients (Group 3) admitted with myocardial infarction who sustained their neck of femur fracture in the hospital and those patients (Group 1) that presented with myocardial infarction and neck of femur fracture died within 6 months of their operation.

Discussion

Hip fracture patients commonly have co-morbidities on admission that may influence their management and prognosis. The goal for treatment must be to attend to their operative care rapidly if the patient is to have the best chance of a return to a reasonable quality of life. A recent myocardial infarction, therefore, poses a management dilemma. Currently, 98% of patients with a fractured neck of femur are treated operatively and the overall outcome after surgery is better than with conservative treatment.⁴

However, major surgery within 6 months of a myocardial infarction carries a risk of around 55% of re-infarction.¹ This compares with a risk of around 1% at 3 years. It must be remembered that there is a significant mortality following myocardial infarction in the non-surgical population. In a series of over one-third of a million patients aged 30–89 years, there was an overall in-hospital mortality rate of 13.6%.⁵ This rate increases with age and has been reported to be 19–26% at 30 days in subjects over 75 years of age^{2,5} and 35% at 1 year in subjects over 70 years.⁶ The overall mortality for hip fractures in the general population is around 9.6–13.3% at 1 month, 18% at 3 months and 33% at 1 year.^{7–14}

Patients undergoing surgery for neck of femur fracture with cardiovascular disease have twice the mortality of those who do not.¹⁰ In our series, though of only 11 patients,

a recent myocardial infarction increased the mortality to 63.5% at 6 months.

Since the mortality from hip fracture surgery following myocardial infarction is so high, one must consider whether non-operative treatment would be more appropriate. However, it is likely that this group would have a significant mortality rate with this approach too. Traction may be an option for extracapsular hip fractures, although it is not often used nowadays as it is associated with the complications of immobility. A randomised, controlled trial comparing DHS fixation and traction for extracapsular fractures showed no difference in morbidity and mortality.¹⁵ However, those treated in traction had a longer hospital stay and an increased loss of dependence at 6 months. Non-operative treatment of intracapsular fractures invariably leads to non-union.¹⁶ The patient will require strong analgesia, often for several weeks. Skilled nursing is needed to avoid pressure sores and the other complications of immobility. Mobilisation, once the pain has settled, is also difficult due to shortening. Conservative treatment should be reserved for those with only a few weeks to live.¹⁶ To our knowledge, there is no published data on the non-operative treatment of hip fracture in patients with acute myocardial infarction.

Another option within the operative group is to use an uncemented hemiarthroplasty for intracapsular fractures since the use of cement can cause a transient, but significant, reduction in cardiac output of 33% and a reduction in stroke volume of 44%.¹² and may increase repeat infarction in the immediate peri-operative period. However, there is no difference in mortality at 3 months and cementing the prosthesis gives a lower revision rate, less thigh pain and better mobility.^{17,18}

Though troponin I may be raised in other conditions apart from myocardial infarction (*e.g.* pericarditis, pulmonary embolism, heart failure, sepsis and renal failure), it is the most specific indicator of myocardial infarction with associated chest pain. The standard criteria of chest pain with either raised troponin I and/or typical ECG changes were followed in our study. As this is a retrospective study, there may have been other patients with silent infarction who could have been missed. However, by their nature, these cases can be difficult to detect.

Perhaps the outcome could have been improved if these patients had received more invasive peri-operative monitoring (*e.g.* continuous central venous and intra-arterial pressure) and/or trans-oesophageal Doppler monitoring and had been nursed in a high dependency unit or intensive care unit. Pre-operative optimisation of the patient's status, aggressive invasive monitoring of the haemodynamic status and prompt treatment of any haemodynamic aberration may be associated with decreased peri-operative morbidity and mortality in patients with previous myocardial infarction.¹⁹ A randomised,

controlled trial comparing conventional fluid challenge with invasive or non-invasive monitoring of fluid challenge resulted in rapid postoperative recovery^{20,21} and a significantly reduced hospital stay.²⁰ There are, of course, financial and logistical issues with this approach and considerable competition for scarce hospital resources. Our hospital now has a PACU that can take patients for the first 24 h following surgery and has, therefore, reduced the burden on critical care beds. Additionally, oesophageal Doppler monitoring has been funded and was introduced for fractured neck of femur cases in February 2006. It is hoped that these measures will help to improve the outcome for this vulnerable patient group.

The survival beyond 6 months of all patients who developed myocardial infarction while waiting for their hip operation (Group 2) compared to the universally poor outcome in the other two groups was unexpected. Though the overall number of patients is small, the apparently better outcome in this group may reflect early detection and treatment of their acute myocardial infarction.

Conclusions

Despite thorough pre-operative work-up and a consultant anaesthetist supervising the anaesthetic, the mortality following surgery for proximal femur fractures in patients with acute myocardial infarction in our series is 45.4% at 1 month and 63.5% at 6 months. This is much higher than the expected mortality of 18% at 6 months in the general population following proximal femur fracture and 10% mortality at 3 months in our institution. However, this was a retrospective study and the overall number of subjects was small.

Whilst this study does not answer the question of whether or not to operate on proximal femoral fractures in patients with a recent myocardial infarction, it does provide approximate mortality figures that may be useful when discussing the outcome of surgery in this high-risk situation.

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