



The management and mortality of patients undergoing hip fracture surgery following recent acute myocardial infarction

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Having major elective surgery within 6 months of an Acute Myocardial Infarction carries an increased risk of re-infarction and death. However delaying surgery in patients with proximal femoral neck fractures would most likely lead to complications secondary to prolonged immobilisation and also provide difficulties with regards to nursing care. 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.

During the period January 2005 to September 2007, twenty-five patients were identified with an Acute Myocardial Infarction around the time of admission but prior to surgical treatment. There were 20 female and 5 male patients with an average age of 88 years (range : 78 to 98). All patients underwent surgery between 1 and 12 days post Acute Myocardial Infarction.

We report mortality rates of 28% and 40% at 1 and 6 months respectively, which is much higher than that of the overall proximal femoral neck fracture population.

This group of patients can provide a major dilemma to surgeons and anaesthetists alike with respect to the type and timing of surgery. We hope that this data, the largest published series to date, can provide accurate and timely prognostic information to not only clinicians, but also patients and relatives at such a difficult time.

Keywords : hip fractures ; myocardial infarction ; mortality rate.

INTRODUCTION

Fractures of the proximal femur form a major part of the trauma workload in all orthopaedic units. The accepted treatment of such patients involves medical optimisation prior to prompt operative treatment and subsequent early mobilisation.

Patients with co-existing acute medical problems and complex co-morbidities have often posed a management dilemma to surgeons and anaesthetists alike. A relatively common presentation is that of a patient with an Acute Myocardial Infarction either leading to, or occurring shortly after a hip fracture. The medical and operative management of this group of patients remains controversial with little advice available from the peer-reviewed literature.

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In particular it is often difficult to decide how long should elapse from the Acute Myocardial Infarction to surgical treatment and what impact any delay has on mortality.

In patients with a recent acute myocardial infarction, elective surgery is best avoided for at least 6 months (13). However, delayed surgery of patients with proximal femoral neck fractures leads to complications associated with prolonged immobilisation such as pressure sores and hospital acquired lower respiratory tract infections.

In our unit the timing of surgery is hugely subjective, being decided predominantly by the Consultant Anaesthetist performing the theatre session. Thus the timings of surgery can vary greatly and are often not evidence based. The only published data for patients undergoing hip fracture surgery following a recent Acute Myocardial Infarction is a series of 11 patients (6). This indicated mortality rates of 45.4% and 63.5% at 1 and 6 months respectively (6). The average delay from an Acute Myocardial Infarction to operation was 11.2 days (range 3-23 days) (6).

The aims of this study were to provide additional outcome information on patients with Acute Myocardial Infarction and proximal femoral fractures. We also hoped to identify any relationships between the delay in surgery, and subsequent mortality, thus providing advice as to how this complex group of patients should be managed.

PATIENTS AND METHODS

All patients with a proximal femoral neck fracture and a proven recent Acute Myocardial Infarction prior to surgery, during the period January 2005 to September 2007 were included. These patients either presented to hospital with both a femoral neck fracture and Acute Myocardial Infarction, or developed an Acute Myocardial Infarction in the early period following admission. Acute Myocardial Infarction was diagnosed on the basis of clinical presentation and either a raised Troponin I or ECG changes or a combination of both. The troponin I level was measured 12 hours after the attack of chest pain. Demographic details, co-morbidities, ASA grade, timing of surgery and the nature of surgery are shown in Table I. Death was the outcome measure.

All patients received aspirin 150 mg once daily as thromboprophylaxis, which is now widely appreciated to be an outdated method of pharmacological thromboprophylaxis. The Acute Myocardial Infarction was treated with sub-cutaneous therapeutic low molecular weight heparin (LMWH) or intravenous unfractionated heparin (based upon creatinine clearance), given for a period of 48 hours. A Beta-blocker was started for secondary prevention. Echocardiography was performed in all patients to assess cardiac function, and all patients were seen and assessed by a senior anaesthetist prior to surgery.

Operative treatments included Dynamic Hip Screw fixation or Trochanteric nail fixation for extracapsular fractures and either a cemented Thompson or uncemented Austin Moore hemiarthroplasty for intracapsular fractures. A consultant anaesthetist or senior specialist registrar performed the anaesthesia after a thorough pre-operative assessment and sufficient medical optimisation. All patients underwent standard physiological monitoring during surgery, and were transferred back to an orthopaedic ward when considered stable. No patients required intensive or high dependency post-operative care.

RESULTS

Between January 2005 and September 2007, 25 patients on or in the early period following admission with a fractured neck of femur were found to have a co-existing recent Acute Myocardial Infarction (Table I). There were 20 female and 5 male patients with an average age of 88 years (range : 78 to 98).

The Troponin I was significantly raised in all 25 patients with a mean of 3.16 ng/ml (range : 0.12 to 36.63). In addition all 25 suffered clinical symptoms of an Acute Myocardial Infarction (ie, chest pain). Eleven patients were diagnosed with an Acute Myocardial Infarction on admission to hospital, with the other 14 being diagnosed shortly after admission. Twenty-four patients were diagnosed with Non ST elevation myocardial infarctions (NSTEMI's) and 1 ST elevation MI (STEMI) based on ECG findings.

Nineteen patients had an ASA grade of 3, with the remaining 6 an ASA grade of 4.

Twenty three patients had a spinal anaesthetic and two a general anaesthetic.

Table I. — Demographic details of all patients sustaining proximal femoral neck fractures and acute myocardial infarctions.
Table includes details of the patients' other co-morbidities.

Pat No.	Age/ Sex	Admission to AMI (days)	AMI to operation (days)	Type of AMI	Operation to death (days, unless stated)	Trop I	Co-morbidities	Fracture type	Operation
1	94F	1	6	NSTEMI	5	36.63	HTN, DEM	IC	AM
2	93F	1	7	NSTEMI	6	0.26	-	EC	DHS
3	85F	4	7	NSTEMI	12	0.76	HTN, AF DEM	IC	AM
4	82M	2	9	NSTEMI	69	0.8	-	IC	AM
5	81F	0	5	NSTEMI	17	3.89	DEM, Ca Prostate Gastr	EC	DHS
6	89M	1	8	STEMI	38	1.4	NIDDM	IC	AM
7	96F	3	7	NSTEMI	28	0.53	AF	IC	AM
8	87M	0	4	NSTEMI	5 mths	3.23	HTN, PE	EC	DHS
9	92F	0	12	NSTEMI	5	0.26	-	IC	AM
10	91F	0	4	NSTEMI	22	1.8	HTN, AF, DEM	IC	AM
11	83M	1	9	NSTEMI	20 mths	5.06	IHD, AF PVD	IC	AM
12	78F	0	8	NSTEMI	24 mths	0.79	-	EC	TN
13	91F	1	5	NSTEMI	17 mths	1.48	COPD	IC	Thomps
14	97F	2	4	NSTEMI	-	0.56	HTN	IC	AM
15	93F	0	6	NSTEMI	32 mths	0.78	COPD, CVD	EC	DHS
16	79M	1	6	NSTEMI	16 mths	7.99	CVD	EC	DHS
17	91F	3	3	NSTEMI	-	4.4	HTN DVT	IC	Thomps
18	85F	0	1	NSTEMI	-	0.12	HTN IHD, NIDDM	IC	AM
19	83F	1	9	NSTEMI	-	0.12	-	EC	DHS
20	98F	1	12	NSTEMI	-	0.65	HTN, IHD, AF	EC	DHS
21	98F	0	6	NSTEMI	-	0.7	HTN, IHD, AF	IC	AM
22	91F	1	11	NSTEMI	19 mths	2.55	-	IC	AM
23	83F	1	5	NSTEMI	-	0.37	NIDDM	IC	AM
24	85F	0	5	NSTEMI	-	0.17	HTN, DEM	IC	AM
25	82F	0	5	NSTEMI	-	3.7	HTN, IHD, CABG	IC	Thomps

Abbreviations; NSTEMI : non ST-elevation myocardial infarct ; STEMI : ST-elevation myocardial infarct ; HTN : hypertension ; DEM : dementia ; AF : atrial fibrillation ; Ca Prostate : Carcinoma of the prostate ; Gastr : gastrectomy ; NIDDM : non-insulin dependent diabetes mellitus ; PE : pulmonary embolus ; IHD : ischaemic heart disease ; PVD : peripheral vascular disease ; COPD : chronic obstructive pulmonary disease ; CVD : cerebrovascular disease ; DVT : deep vein thrombosis ; CABG : coronary artery bypass graft ; IC : intracapsular fractures ; EC : extracapsular fractures ; AM : Austen Moore ; DHS : Dynamic hip screw ; TN : Trochanteric intra-medullary nail ; Thomps : Thompson's hemiarthroplasty ; mths : months.

Five patients had been diagnosed with dementia. Six patients had no significant past medical history. The remaining 19 patients had a varying mix of co-morbidities including hypertension, ischaemic heart disease, atrial fibrillation, and diabetes mellitus (Table I).

A senior medical physician saw 22 of the patients with an Acute Myocardial Infarction within 48 hours and gave advice on the remaining 3 by telephone.

An Austin Moore (uncemented) hemiarthroplasty was performed in 14 patients, a Thompson

(cemented) hemiarthroplasty in 3, a Dynamic Hip Screw (DHS) in 7, and a Trochanteric Intra-Medullary nail in 1 (Table I).

Seven patients had died by one month post operation (mortality rate of 28%), with 10 having died by 6 months (mortality rate of 40%). Of the seven patients that had died within a month of operation, the average delay from acute myocardial Infarction to operation was 6.14 days (range : 4 to 12 days). Of the 18 patients alive at one month post operation, the average delay from acute myocardial infarction to operation was 6.67 days (range : 1 to 12).

Of the 11 patients that were found to have an acute myocardial infarction on admission to hospital, 4 had died within 1 month of surgery. Of the 14 that sustained Acute Myocardial Infarction's post-admission, 3 had died within that same time period.

DISCUSSION

Patients presenting with femoral neck fractures commonly have multiple co-morbidities.

These frequently cause a dilemma for both the surgeon and anaesthetist with respect to the type and timing of surgery. A co-existing Acute Myocardial Infarction can further complicate matters. The overall mortality rate presented in this study of 28% and 40% at 1 and 6 months respectively portrays the poor outcome for these patients. Two poignant questions remain ; is surgery indicated in such patients ? And if surgery is indicated, how long ought it be delayed ?

When considering these questions it must be remembered that the overall mortality in the medical patient suffering an Acute Myocardial Infarction is also high. Published mortality rates in subjects over 75 years of age is 19-26% at 1 month (15), and 35% at 1 year (5). The overall mortality for femoral neck fractures in the general population has been quoted as 1.71% (during the first week), 8.99% (30 days), and 30.74% (first year) (10). In our study, allowing for the fact that the co-morbidities of our patients were not dissimilar to other studies on femoral neck fractures, a recent acute myocardial infarction increased the mortality to 28% and 40% at 1 and 6 months respectively.

Having major elective surgery within 6 months of Acute Myocardial Infarction carries an increased risk of re-infarction and death. In a survey (16) of 12,712 men over 50 having operations the incidence of infarction in those without a previous event was 0.66% compared with 6.6% in those who had had a previous infarct. The mortalities in the two groups were 26.5% and 70% respectively. The recurrence rate was 50% when the interval between the infarct and surgery was less than six months, falling to 1% after three years. In a large survey at the Mayo Clinic (14) covering 32,877 patients who underwent surgery during 1966-8 there were 422 with previous myocardial infarcts and, of these, 6.6% suffered a further infarct during the first post-operative week. Those operated on within three months of infarction had a 37% reinfarction rate. This fell to 16% after three months and 4.5% after six months. Those who had suffered a previous infarct bore a 50-fold greater chance of infarction than those with no such history.

Since the mortality of hip fracture surgery following a recent myocardial infarction is high, consideration must be given as to whether operative treatment is indeed beneficial. Currently 98% of all patients with a fractured neck of the femur are treated operatively and the overall outcome after surgery is better than with conservative treatment (8). The non-operative treatment of intracapsular fractures leads to higher rates of secondary surgery and avascular necrosis (9). In addition non-operative treatment leads to longer hospital stay and increased loss of dependence at 6 months, not to mention complications related to prolonged immobilisation.

The only previous series of hip fracture patients with a recent history of infarction reported mortality rates of 45.4% and 63.5% (6) at 1 and 6 months respectively. Our mortality rates are somewhat lower (28% at 1 month and 40% at 6 months) and this may possibly be due to several reasons : 83.3% of our patients with intracapsular fractures were treated with uncemented hemiarthroplasty compared to only 14% in the previous study (6). Cement is known to cause a transient, but significant, reduction in cardiac output of 33% and a reduction in stroke volume of 44% and may increase repeat

infarction in the immediate peri-operative period (3). Though it would be difficult to make any statistical conclusions from this observation, owing to the relatively small cohort of patients investigated in both studies, we postulate that the use of uncemented hemiarthroplasty for this difficult group of patients had a positive effect on mortality.

Another possible explanation could be related to the use in our unit of LMWH or un-fractionated heparin for a period of 48 hours post Acute Myocardial Infarction in order to reduce risks of re-infarction. In the previous study, aspirin (150 mg) alone was employed post Acute Myocardial Infarction (6). The short-term treatment of unstable coronary artery disease with the LMWH, is strongly recommended within the literature (7). It is also known that, in aspirin-treated patients with acute coronary syndrome without ST elevation, short-term un-fractionated heparin or low molecular weight heparin (LMWH) halves the risk of myocardial infarction or death (4). There is no convincing difference in efficacy or safety between LMWH and un-fractionated heparin.

It is widely accepted that timely operative treatment within 48 hours of a hip fracture, reduces morbidity and mortality (12). However we have been unable to find any advice within the literature regarding the consequence of surgical delay in hip fracture patients with a recent history of acute myocardial infarction. Due to the relatively small numbers within this study, it would be difficult to extrapolate any conclusions regarding the consequence of surgical delay on mortality from this data. However, this is certainly an area where prospective randomised controlled studies in the future could indeed be extremely enlightening.

Therefore, despite the increased mortality in this group of high-risk patients, it would appear that surgery is still indicated in the majority, due to the previously mentioned complications of non-operative management. With that in mind, peri-operative medical optimisation of this group of high-risk patients is paramount to reducing morbidity. For example, patient outcomes are better when peri-operative management is undertaken by experienced anaesthetic personnel (2). An Audit Commission report has shown wide variations in

practice in the anaesthetic management of hip fracture patients (1). In some hospitals, all patients with a fractured hip are anaesthetised by an experienced anaesthetist (registrar or above), whereas in others almost half are anaesthetised by an unsupervised senior house officer (1). Secondly, there is an argument for invasive intravascular monitoring to be carried out in such patients undergoing hip fracture surgery, as they are frequently fluid-depleted prior to surgery whilst at the same time unable to cope with large volumes of parenteral fluid. For those undergoing a general anaesthetic it has been found that the usage of an oesophageal Doppler monitor to optimise the intravascular status of patients was associated with a more rapid recovery postoperatively and reduced length of hospital stay (11). And finally should these patients undergo more intensive monitoring post-operatively on a High Dependency Unit (HDU) or a Post Operative Care Unit (POCU)? Initially this may appear costly in terms of manpower and resources, but the longer term improvements and subsequent increased independence of patients may mean that overall this approach is cost effective as well as best medical practice.

In conclusion, we report mortality rates of 28% and 40% at 1 and 6 months respectively, which is much higher than that of the overall femoral neck fracture population. This group of patients can provide a major dilemma to surgeons and anaesthetists with respect to the type and timing of surgery. We hope that this data, the largest published series to date, can provide accurate and timely prognostic information to not only clinicians, but also patients and relatives at such a difficult time.

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