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ORIGINAL PAPER

Functional outcome, mortality and in-hospital complications of operative treatment in elderly patients with hip fractures in the developing world

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Abstract Hip fracture has been increasing in frequency for several decades, and 70–90% of patients who sustain a hip fracture survive for at least one year. Many of these survivors fail to regain their prefracture functional status. No work in this regard has been done in the developing world. Elderly patients with acute intertrochanteric fracture and fracture of the femoral neck were followed up prospectively for 12 months after surgery to record the mortality, morbidity, functional status and complications. Three hundred and forty-five patients (61% female) were assessed at six and 12 months after surgery, which included 62.9% intertrochanteric fractures and 37% femoral neck fractures. The mechanism of injury was from a fall in 67% of the cases. Nineteen patients died within six months after surgery while another eight died during the next six months. Obesity, male gender, multiple comorbidities and below normal ambulation status before fracture were identified as major determinants of bad functional outcome.

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Introduction

Because of the world's aging population, hip fractures represent an ever-growing problem, especially in the Western world. In United States alone, 350,000 cases of hip fractures are seen every year [13]. Incidence of hip fracture is very high in the elderly as compared to the younger population. With increasing age the incidence of hip fractures rises, reaching an exponential rise after a certain age [9]. Such a situation in the developing world will require much greater resources for improved effectiveness on this group of patients.

The incidence of hip fracture is expected to increase with an increase in the life expectancy of a population. Currently, life expectancy of males and females in Pakistan is 61 and 62 years, respectively. Compared to 50 years ago, there is an increase of about 20 years in the life expectance of both the sexes [20]. This increase in life expectancy in our part of the world can be attributed to increasing awareness of a healthy lifestyle and improved medical care; it is likely that the population of the older generation will increase, consequently increasing the hip fracture burden.

The increasing incidence has also produced predictions of an increase in requirement of resources in managing hip fractures, both in terms of finances and medical acumen. Knowledge of positive and negative predictors of outcome after hip fracture is needed to guide treatment, plan patient discharge, and decide on use of healthcare resources. Studies have focussed on factors predictive of return of ambulatory ability and mortality rates in patients with hip fracture in America and Europe. Studies assessing the factors affecting functional outcome after hip fractures are totally lacking in the developing world. The aim of this

study was to determine the risk factors which result in poor functional outcome after hip fracture and try to concentrate more on patients associated with these factors while considering the medical and physiotherapeutic measures which will overall improve the outcome for these patients.

Materials and methods

The data was collected at a single tertiary care private hospital during the period January 1, 2003 to December 31, 2006.

Inclusion criteria

Criteria for inclusion in the study were acute isolated fractures of the femur and intertrochanteric or femoral neck fractures treated by operative method (Dynamic hip screw, Austin Moore Hemiarthroplasty).

Exclusion criteria

Exclusion criteria for the study included the following:

- Age less than 50 years
- More than one week old fracture
- Prior history of fracture of the femur neck or inter-trochanteric fractures
- Pathological fractures
- Subtrochanteric fractures or fractures of femoral head
- Isolated fractures of the lesser or greater trochanter
- Fractures caused by complications or failure of the treatment of a previous hip fracture
- Fractures with significant loss of reduction

Three hundred and eighty-six elderly patients with acute hip fractures presented at Aga Khan University Hospital, Karachi between January 2004 through December 2006. Among them, 366 patients were enrolled for the study, with 21 patients lost during follow-up, giving final study population of 345. The patients lost to follow-up were not different in demographic or other characteristics. This is a small number compared to the final study population and should not affect the final results. All patients were thoroughly evaluated preoperatively for associated medical conditions. All patients underwent surgical intervention after optimisation of medical comorbidities.

Walking ability before and after the fracture was classified on the basis of standard definitions of community and household ambulation (Table 1). For purposes of analysis, all patients were categorised as community ambulant, house bound or nonfunctional ambulant. Basic activities of daily living were adapted from the report by Katz and Akpom [8], which includes feeding, dressing, toileting, and bathing. Each of the basic activities of daily living was rated on a scale of 1 to 4 points, with 1 point indicating complete dependence, 2 points indicating dependence on others in most of the activities, 3 points indicating independence except for some activities and 4 points indicating complete independence in that activity (Table 2).

Table 1 Preoperative and postoperative ambulation status of patients with hip fractures

Ambulation status definitions (preoperative and postoperative)
Independent community ambulation
Community ambulation with a cane
Community ambulating with a walker or crutch
Independent indoor ambulation
Independent indoor ambulation with cane or walker
Nonfunctional ambulation

Pain scores at six months postoperatively were recorded using the Charnley scale which classifies severity of pain into six categories [7]. Grade I (no pain), grade II (occasional and slight), grade III (when starting to walk, occasional analgesia), grade IV (with activities, frequent mild analgesia), grade V (constant but bearable, stronger analgesics) grade VI (constant, frequent strong analgesia) and unable to assess.

The general health status was defined by the number of pre-existing important comorbid conditions. Patients were categorised as having no, one, or two comorbidities or as having three comorbidities or more. The classification system of the American Society of Anesthesiologists (ASA) was used to assess the role of the severity of health problems at the time of admission [15]. All patients were managed with a similar postoperative physiotherapy protocol, which consisted of early mobilisation on the first day postoperatively by an experienced physiotherapist using a walker as assisting device and walking with weight-bearing according to fracture type and method of treatment used. So all patients undergoing hemiarthroplasty and patients with stable fixation using DHS were allowed full weight bearing, but patients where stable fixation could not be achieved were allowed partial or non weight bearing ambulation. Patients who were not able to walk properly before discharge were provided with home physiotherapy.

Table 2 Functional status of patients with hip fractures as defined by Katz and Akpom [8]

Points	Functional status (feeding, dressing, toileting, and bathing)
1	Complete dependence
2	Dependence on others in most of the activities
3	Independent except for the some activities
4	Completely independent

After discharge, clinical and radiographic follow-up was performed at 14 days, six weeks, six months and 12 months after surgery. The outcomes examined were the length of hospital stay, mortality rate, and recovery of ambulatory ability at six and 12 months follow-up. The predictor variables were patient age, ambulatory status before the fracture and at two weeks after surgery, the presence of diagnosed dementia either before the fracture or during evaluation at the hospital, the presence of associated medical comorbidities, marital status, body mass index, living environment (rural, urban), mechanism of injury, activities of daily living dependency before the fracture and at two weeks after surgery, fracture type, and surgery type.

The data was analysed using Statistical Packages for the Social Sciences (SPSS version 14; SPSS, Chicago, Illinois) for descriptive statistical analysis. The influence exerted by each of the predictor variables was studied by univariate analyses. Predictors with p values less than 0.05 were selected as significant and used as variables in multivariate analyses.

Results

The mean age of our study population was 67.1 years with a range of 50–95 years; 39% were male and 61% female. Major comorbid conditions identified in our patients were hypertension and ischemic heart disease in 27.8% (96 patients), diabetes mellitus in 6% (21 patients), chronic renal failure in 4.9% (17 patients) and chronic obstructive airway disease in 4.6% (16 patients). Patients suffering from fracture of the femoral neck totalled 37.1%, while the rest (62.9%) presented with intertrochanteric fracture. The mechanism of injury was fall in the majority of patients (67%), while other mechanisms included road traffic accident (8%), fall from height (4%), and the rest due to miscellaneous causes.

In our study 223 patients (64.8%) were community ambulators before injury, while 69 (20%) were house-bound and 53 (15.3%) were bed-bound. Nineteen patients died within six months after fracture. Among these, three were community ambulant, five were house-bound and 11 were bed-bound patients. Eight patients died after six months of fracture and within 12 months. Among these, seven patients were bed-bound and one was house-bound. Seventy-six percent of patients were osteoporotic according to the Singh index [18]. All patients underwent surgical intervention after optimisation of medical comorbidities. The duration for optimisation was between one and five days with an average of two days. Most of this delay involved detailed cardiac and pulmonary assessment including stress echocardiography and pulmonary function tests. Less than 10% of the patients waited for more than two days before surgery. All of them had multiple comorbidities with an ASA grade of III or IV.

All cases of fracture of the femoral neck were Garden stage IV and an Austin Moore prosthesis (Corin; UK) was used. Of the 217 patients with inter-trochanteric fractures, 14.9% had Evans type Ia fracture, 33.8% had type Ib, 21.8% had type Ic, 23.7% had type Id and 5.8% had type II (reverse oblique) fractures. All cases with intertrochanteric fractures were treated with a dynamic hip screw (DHS; Synthes). Unstable fractures were treated with nonanatomical but stable reduction with medialisation of the calcar into the femoral canal. Only reverse oblique fractures were fixed with a dynamic condylar screw (DCS; Synthes). Nine patients had significant loss of reduction with cut-out of the lag screw, requiring another procedure. All of them had severe osteoporosis and unstable reduction of the fracture. They were treated by removal of the DHS and total hip replacement. We have excluded them from our study.

Seventy-six percent (169/223) of the community ambulatory patients were able to regain their pre-injury community ambulation six months after the surgery, while of the patients who were limited to indoor ambulation before injury, only 67% (46/69) were able to regain pre-injury ambulation status. Overall 75.6% (221/292) of the patients who were either community ambulant or house-bound were able to regain their pre-injury ambulation status (Table 3).

Postoperative complications occurring in these patients included myocardial infarction (nine patients), acute renal failure (five patients) and urinary tract infection (48 patients). Twenty one (11.7%) developed wound related complications that were managed by conservative measures except for two patients requiring operative intervention in the form of wound debridement. Predictors of good prognosis after hip fracture which were identified in this study are given in Table 4. In multivariate analyses, predictors of increased

Table 3 Functional status, one year mortality and recovery of elderly patients with hip fractures

Functional status before fracture	Number of patients who died within 12months of injury	Number of patients able to regain functional status after six months
Community ambulatory (n=223)	3 (1.3%)	169 (75.7%)
House bound (n=69)	6 (8.7%)	46 (66.6%)
Bed bound (n=53)	18 (33.9%)	0

Table 4 Predictors of good prognosis after operative treatment of hip fractures in the elderly

Factors associated with good prognosis after hip fracture	*P* value
Age <60 years	<0.01
One or no comorbid conditions	<0.01
Community ambulatory status before injury	<0.01
Good functional status score before injury	<0.01
Female gender	<0.01

mortality after hip fracture were patient age older than 70 years ($p<0.01$), male gender ($p<0.01$), presence of cardiovascular disease ($p<0.01$), presence of more than two comorbid conditions ($p<0.01$), and BMI >30 ($p<0.01$).

There was no statistically significant difference in the level of pre-injury ambulation achieved at six months between patients with femoral neck fractures and those with intertrochanteric fractures. Functional outcome, morbidity and mortality rates were not found statistically different among intertrochanteric and femoral neck fractures, although there were minor differences between the two.

Discussion

A hip fracture is generally felt to be a significant adverse event with a poor outcome. Hip fractures are not only associated with considerable morbidity and mortality but the incidence also seems to be increasing with increasing age [11].

Hip fractures represent an increasing health problem not only in the Western world but also in the developing world mainly because the of the world's aging population. The challenge for us lies in efficient use of the limited resources available to provide high quality care based on clinical evidence. A great deal of work has already been done in the West on the functional outcome of hip fractures [4–6].

The aim of our study was to accurately document the outcome for a consecutive series of elderly patients with hip fractures. This enables the expected outcome for patients treated by current methods to be more accurately described. In Korea, a study found that 61% of fractures occurred as a result of fall [17]. In our study, most of the fractures occurred after a fall. Our community should be educated to avoid this injury by providing walking or standing aids. Prevention of osteoporosis and early treatment may also help to prevent these fractures.

Incidence of complications after treatment is relatively low. Infection occurs in less than 5% of patients. Most hip fracture patients fail to regain their prefracture level of activities of daily living, and up to 20% of hip fracture patients need to be institutionalised because of the fracture [10]. Factors consistently associated with recovery of walking ability are male gender, younger age, absence of pre-existing dementia, and use of an assisting device before the injury [10]. In one study, 40% of the patients were unable to walk independently after hip fractures and 60% required assistance with basic activities of daily living, but the study fails to mention what proportion of the patients were able to perform this task before the fracture [3].

Elderly patients are particularly prone to mortality in the first year after a hip fracture with mortality rate ranging from 14% to 36% [12]. Epidemiological studies have consistently shown that a hip fracture is associated with a significantly increased risk of mortality for six to 12 months after the injury. After the first year, the mortality rate is similar to that among age- and sex-matched persons without hip fractures. An increased risk of death after hip fracture is associated with advanced age, male gender, poorly controlled systemic disease, psychiatric illness, institutionalisation, operative management before stabilisation of coexisting medical conditions, and postoperative complications [19]. When mortality was analysed in our study, 60% of patients were either overweight (body mass index BMI 26–30) or obese (BMI>30). In Thailand, it was found that male gender, old age, chronic diseases, poor ambulation before fracture and nonoperative management were associated with increased mortality [2]. In our study, increased incidence of mortality was seen in patients with nonfunctional ambulation, male gender, cardiovascular disease, and two or more comorbid conditions.

To achieve functional independence and return home after a hip fracture, patients must recover the ability to perform basic activities of daily living (feeding oneself, bathing, dressing, and using the toilet) and instrumental activities of daily living (food shopping, preparing meals, managing finances, doing laundry and housework, and using public transport). A substantial portion of elderly patients with hip fractures do not regain their ability to perform either basic or instrumental activities of daily living. Factors that predict recovery of ability to perform activities of daily living include younger age, absence of pre-existing dementia and involvement in a social network [1, 16]. We found that among patients who were independent in basic activities of living (feeding, bathing, dressing and toileting) before fracture, only 50% were able to function independently in performing basic activities of living at six months after surgery, with 35% requiring some help, and 15% completely dependent.

Many crucial factors affecting outcome are completely independent of fracture repair and instead depend on prefracture conditions. A multidisciplinary approach to care, provided by teams of health care personnel working closely together, may be an effective way to improve short- and long-term outcome. A case-management approach to care after discharge may decrease overall need for home health services. Olsson et

al. prospectively studied the implication of an integrated care pathway (ICP) in patients with hip fractures and it was noted that the ICP reduced the number of hospital days by half and significantly reduced the time to first ambulation [14].

Conclusion

In managing fractures in elderly patients, physicians must understand the nature of injury, potential impact on the patient's level of function, and the secondary impact on the patient's family. The primary goal of management is to return the patient to his or her level of function before fracture. For most patients, this goal is best achieved by operative management followed by early mobilisation. Patients who are older than 60 years, male, nonfunctional or house-bound before fracture and obese are more likely to have a worse outcome. It is possible that new and better treatments for osteoporosis and increased awareness of healthy lifestyles will result in a decreased incidence of hip fractures in the future. Until that time we must address the epidemic of hip fractures with all our available expertise, try to prevent it by increasing awareness among people, and provide proper counselling of patients at risk.

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