

Analysis of Fractures of the Proximal Femur in the Jordanian Population

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Abstract

Background: Proximal femur fractures represent a challenging medical problem worldwide. In recent years numerous reports have documented a progressive increase in the incidence of hip fractures. In Jordan, this problem has not received sufficient attention, and to my knowledge, this is the first study to address the problem.

Objective: To analyze the predisposing factors involved in the occurrence of proximal femur fractures seen at a major medical center in Jordan.

Methods: A retrospective analysis was conducted of all patients admitted with hip fractures to King Hussein Hospital and the Royal Jordanian Rehabilitation Center at the King Hussein Medical Center over a 2 year period (1 January 1995 to 31 December 1996). We determined the associated chronic diseases and medications, mechanisms of injury, types of fractures and other circumstances in order to suggest preventive measures to decrease the incidence of this clinical problem.

Results: We identified 216 cases of fracture: 43% occurred in people over the age of 80 years, 95% were due to low energy injuries (falls), and 69.5% occurred in females. Two or more co-morbid medical conditions were present in 70% of the cases.

Conclusions: Since fractures of the hip in the study population in Jordan occurred predominantly as low energy injuries in the elderly, preventive measures should focus on fall avoidance.

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Hip fractures in the elderly remain a major medical challenge. They are even more difficult to manage in elderly patients with chronic medical conditions. The incidence of hip fractures is increasing from year to year and is estimated at more than 5/1,000 people above the age of 50 years, particularly women in

whom fractures are associated with trivial domestic stumbles. About half of this increase can be attributed to the aging process of the population, and another good percentage to osteoporosis and hormonal changes. Fractures of the proximal femur are usually classified as intracapsular (involving the neck of the femur within the capsule of the hip) or extracapsular (involving the remainder of the neck down to about 6 cm below the lesser trochanter). Extracapsular fractures are categorized as trochanteric or sub-trochanteric fractures.

Approximately 250,000 fractures of the proximal femur occur in the United States each year. The resulting annual healthcare costs of more than 8.7 billion dollars reflect the enormous economic impact of this problem. Unfortunately, despite advances in patient care, particularly new operative techniques and prosthetic device implantation, the outcome results in hip fractures often do not reach expectations.

In this retrospective analysis we examined all the associated circumstances that affect the occurrence of proximal femur fractures admitted to one of the major medical centers in Jordan. The associated chronic diseases and medications, mechanisms of injury, and types of fractures were identified and analyzed in order to suggest preventive measures.

Methods

The study involved a retrospective analysis of all patients admitted with hip fractures to both the King Hussein Hospital and the Royal Jordanian Rehabilitation Center at the King Hussein Medical Center between 1 January 1995 and 31 December 1996. King Hussein Medical Center is a complex military medical facility located in Amman, the capital of Jordan. The complex consists of three hospitals: a general hospital, a cardiac center and a rehabilitation center. It serves the medical needs of a large percentage of the Jordanian population, especially in tertiary and specialized medical branches. The demographic specifications of the population involved in this analysis differ considerably from those of western populations, especially with regard to lifestyle, socio-economic characteristics, and dietary habits.

Data were collected from each patient's chart using a format containing the following parameters: age, gender, associated diseases, mechanism of injury, type of fracture, pre-injury ambulatory status, pre-injury mental and neurological status, treatment modality, timing of surgery, complications, and

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survival and functional outcome. Age was categorized into four categories: under 60 years, 60–69 years, 70–79 years and above 80 years. Any chronic disease that required treatment or other medical care was documented, e.g., diabetes mellitus, ischemic heart disease, chronic obstructive pulmonary disease, chronic renal failure, osteoarthritis, osteoporosis, malignancy, etc.

The mechanism of injury was categorized as low energy injury such as falls, and high energy injury such as direct trauma and motor vehicle accidents. Anatomically, fractures were classified as intertrochanteric fractures, sub-trochanteric fractures and fractures of the neck of the femur, which were further sub-classified according to the Garden classification into four stages, I through IV. The patients were grouped according to the time interval from fracture to surgery as follows: within 2 days after fracture, 3–4 days, 5–6 days, and over 6 days after the fracture. Complications were divided into major medical, minor medical, and orthopedic complications. The collected data were analyzed using Fisher's exact test.

Results

A total of 216 fracture cases were identified for the study period. Case characteristics are summarized in Tables 1–4. Of the 216 patients 150 (69.5%) were females and 66 (30.5%) were males; the female to male ratio was 7:3. Forty-one patients (19%) were between 60 and 69 years of age (mean age 67.3 years), 79 patients (36.5%) were in the age group 70–79 (mean 75.8 years), and 93 patients (43%) were above the age of 80 (mean 86 years). Only three patients (1.5%) were under age 60 years (mean 37 years) [Table 1]. The overall average age was 85.2 years (range 22–97).

Altogether, 151 patients (70%) had two or more chronic diseases [Table 1], and 191 (88.5%) were on regular medications. Ten patients (5%) were non-ambulatory pre-injury, 29 (13%) had ambulatory limitations, and the remaining 177 patients (82%) were ambulatory pre-injury [Table 4]. An altered pre-injury mental and neurological status was found in 56 patients (26%), which manifested as senile dementia ($n=25$), hemiplegia ($n=13$), Parkinson's disease ($n=7$), peripheral neuropathy ($n=15$), and other disorders ($n=6$).

The majority of patients (94%) gave a history of falling, 3% denied any trauma, and 6 patients (3%) had other causes of trauma (twisting injury in 1 patient, motor vehicle accident in 3, and direct trauma in 2) [Table 2].

Fractures of the neck of the femur were identified in 155 patients (72%) (37.5% Garden I, 23% Garden II, 26% Garden III and 13.5% Garden IV). Forty-two patients (19%) had intertrochanteric and 19 (9%) had sub-trochanteric fractures [Table 2].

Sixteen patients (7.4%) died in the hospital, 9 of whom died before surgery [Table 3]. Deaths occurred in the first week after fracture (8 patients died within the first 24 hours, 5 died the day after, and 3 patients died on the third day after the fracture).

Of the study population 180 patients (83%) were treated surgically. Complications were reported in 15% (33 patients). Pneumonia occurred in 10 patients, non-union in 9, deep vein

Table 1. Demographic distribution and co-morbidities

	No.	%
Gender*		
Females	150	69.5
Males	66	30.5
Age (yr)		
< 60	3	1.5
60–69	41	19
70–79	79	36.5
> 80	93	43
Other diseases		
None	13	6
One	52	24
Two	113	52
Three or more	38	18

Table 2. Types of trauma and fracture

	No.	%
Trauma		
Fall	205	95.0
None	5	2.5
Other	6	2.5
Motor vehicle accident	3	
Direct	2	
Twisting	1	
Fracture		
Intertrochanteric	42	19
Sub-trochanteric	19	9
Neck of femur	155	72
Garden I	58	37.5
Garden II	36	23
Garden III	40	26
Garden IV	21	13.5

Table 3. Complications and mortality

Complications	15%	Deaths	7.4%
Total	33	Total	16
Pneumonia	10	Before surgery	9
Non-union	9	After surgery	7
Deep vein thrombosis	4	1st day after fracture	8
Wound infection	7	2nd day after fracture	5
Urinary tract infection	2	3rd day after fracture	3
Pulmonary embolism	1		

Table 4. Pre-injury and post-discharge ambulatory status

	Functional		Limited		Non-ambulatory		Total	
	No.	%	No.	%	No.	%	No.	%
Pre-injury	177	82	29	13	10	5	216	100
After discharge	71	43	18	11	75	46	164	100

* Female:male 7:3

thrombosis in 4, wound infection in 7, urinary tract infection in 2, and pulmonary embolism in one. Pneumonia was the most common cause of post-operative death (4 deaths), followed by pulmonary embolism and wound infection or sepsis (2 and 1 deaths respectively).

Of the 200 patients discharged from the hospital, 36 (18%) were lost to follow-up after the first visit and there were no data on their outcome or survival. After one year, 164 patients were known to be alive, of whom 71 patients (43%) were functionally ambulatory, 18 (11%) were ambulatory assisted, and the remaining 75 (46%) were non-ambulatory [Table 4].

Discussion

It is well known that hip fractures represent one of the most common disabling injuries in the geriatric population. These fractures are still one of the major consumers of national healthcare resources worldwide. The average age of patients with hip fractures ranges from 75 to 80 years [1,2]. There is an exponential increase in the incidence after age 60 in women, and these fractures are considered an important cause of morbidity and mortality in all age groups, particularly the elderly, and are more common in women than men [2-4]. In this study, it has been shown that the female to male ratio was 7:3, which is similar to others' findings [5]. This observation is most probably due to osteoporosis, which is considered a leading cause of fractures especially in post-menopausal women and the bedridden. Other studies showed that men with a hip fracture had a higher mortality rate than women with the same fracture [1,6].

The type of trauma that causes most hip fractures is a fall from the standing position [5,6]. The majority of patients (95%) in this study had a history of a fall, but it was difficult to estimate whether the fall preceded or followed the fracture. Most authors contend that the trauma of the fall produces the fracture in the majority of patients [7,8], which is in accordance with our findings, but they also raise the issue whether the fracture precedes the fall or the fall causes the fracture. Others believe that falls occur during walking or when rising from sitting to standing or the reverse. This can be explained by the fact that reduced postural control or reduced muscle function in lower extremities impairs control when changing body position, since normal forces acting on the proximal femur have vectors perpendicular to the femoral neck and along the axis of the femoral neck

In the last 50 years the fracture incidence has increased for both cervical and trochanteric fractures. The total incidence for cervical fractures ranges between 2 and 3 per 1,000 [8]. In our study more than 70% of patients had fractures of the neck of the femur, of which Garden I represented 37.5% and about 30% presented with trochanteric fractures.

Many factors influence the morbidity and mortality of hip fractures, including age, gender, systemic diseases and mental illnesses. In his study of 406 hip fractures, Kenzora et al. [10] found a direct proportional relationship between the mortality rate and advancing age in patients with trochanteric fracture, but they also noted no increase in the mortality rate in elderly

patients who had a fracture of neck of femur. Hazards in the domestic environment, such as poor lighting, scattered obstacles and throw rugs can play a significant role, causing the elderly with already impaired vision and weak muscles to fall. Sloan and Holloway [9] found that 24% of patients had increased pain in the groin before the lower limb gave way.

It has been found that poorly controlled systemic diseases such as heart failure, diabetes mellitus, ischemic heart disease, chronic obstructive pulmonary disease, chronic renal failure and others increase the mortality rate of fracture of the hip. Mental illnesses have been considered a co-morbidity that compromises the prognosis of hip fractures [1,6]. However, it is still debatable whether the increased susceptibility to hip fractures is due to these systemic diseases or simply to the aging process with which these diseases are associated. In this study, it emerged that 70% of the cases had two or more co-morbidities and 88.5% of the patients were on regular medications. The peri-operative management of medical conditions in geriatric patients with hip fractures has been shown to have a crucial effect on survival. It is essential that all co-morbidities — namely cardiopulmonary problems and fluid and electrolytes imbalances — be properly evaluated and treated without delay before surgery. Although some authors [11] recommend postponing surgery in those with three or more co-morbidities, the usual pattern of treatment in our group was to operate as soon as possible from the perspective of the patient's condition and fitness, surgeon's readiness, and operating list. The outcomes of treatment in terms of survival, ability to walk again and functional independence were satisfying in this group of elderly patient's. About 43% of those who were discharged from the hospital (about one-third of the total) were functionally independent after one year.

In this analysis, the overall complication rate was 15% for all types of hip fractures. Postoperative complications were observed to be associated with a higher mortality rate. Major medical complications were limited to pneumonia, pulmonary embolism and deep vein thrombosis; and among the minor medical complications urinary tract infection was the most dominant. Orthopedic complications comprised wound infection and non-union. Many authors [10,12] have reported that in-hospital deaths had a higher rate of postoperative complications than occurred in patients who survived. It has been noted that advanced age, male gender, poorly controlled systemic diseases, mental instability, improper surgical timing and postoperative complications increase the mortality rate of hip fracture [1].

Hip fractures are common in patients over 60 years old, especially women, and they are most frequently caused by a fall. These injuries present a medical challenge difficult to manage despite the impressive advancements in this field of medical knowledge. One of the major factors affecting the outcome and mortality rate is advanced systemic illnesses, especially cardiopulmonary diseases and fluid and electrolyte imbalance.

In conclusion, fractures of the hip in the study population in Jordan occurred predominantly as low energy injuries in elderly

patients. The high prevalence of these fractures in the geriatric population is related to various factors including osteoporosis, malnutrition, chronic systemic illnesses, impaired vision, poor balance, muscular weakness and being bedridden. We believe that the prevention of falls is a key to control the increase in these injuries. Removing obstacles that can cause tripping, such as throw rugs, and improving lighting are important measures. Correction of the conditions that cause muscular weakness and imbalance is an additional means to decrease the prevalence of hip fractures.

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