

Prevalence of Factors That Can Increase the Risk of Hip Fracture and Its Complications after Surgery

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ABSTRACT

Background: hip fractures are defined as any fracture of the femur between the articular cartilage of the hip joint to 5 cm below the distal point of the lesser trochanter; they can occur at any age, they but are most common in the older persons. A worldwide incidence hip fractures are 1.6 million osteoporotic fractures of the hip in people aged 50 years and older in 2000, of which about 70% (1.14 million) were in women.

Objectives: this study aimed to evaluate various postoperative complications and their risk factors in hip fracture patients in King Fahad Hospital in Saudi Arabia.

Method: this prospective study enrolled patients with hip fractures who were subjected to hip fracture surgeries in the king Fahad Hospital in the period from 1/5/2010 to 31/1/2016. Detailed medical history, perioperative characteristics and post-operative characteristics were collected from the patient's files.

Results: the higher prevalence of hip fractures was founded among elderly patients with age range of 65 – 74 years. There was no significant correlations between age, gender, comorbidities (diabetes mellitus, anemia and walking of physical assistance), time of operation and post-operative complications (neurovascular, infection in joints, dislocation of the joint, loosening of the joint and post-operative disabilities) regarding readmission of hip fractures patients for the same reason within one year. While, there was a significant correlation between osteoporosis and readmission of hip fractures patients for the same reason within one year ($P=0.049$).

Conclusion: medical complications such as neurovascular and infection in joints are encountered more frequently than surgical complications such as dislocation of the joint, loosening of the joint and post-operative disabilities. So, postoperative care is necessary to prevent medical complications.

Keywords: hip fractures, surgical complications, readmission.

INTRODUCTION

Hip fractures are defined as any fracture of the femur between the articular cartilage of the hip joint to 5 cm below the distal point of the lesser trochanter; they can occur at any age, but they are most common in older persons^(1,2). Most patients presenting with hip fracture are women aged over 50 years and the mean age at first presentation was approximately 80 years^(3,4).

A worldwide incidence hip fractures were 1.6 million osteoporotic fractures of the hip in people aged 50 years and older in 2000, of which about 70% (1.14 million) were in women⁽⁵⁾. The absolute global annual incidence of hip fracture is expected to increase to 2.6 million by 2025 and to 4.5 million by 2050 alongside an expanding and increasingly elderly population^(6,7). Hip fractures are associated with increased mortality; 12% to 17% of patients with a hip fracture die within the first year and the long-term increased risk of death was two folds^(8,9). Of the patients who survive, only one-half walk independently again and 20% must move

to a long-term care facility. About functional independence, 50% of patients recover pre-fracture capability of activities of daily living and 25% recover full capability of their instrumental activities of daily living⁽¹⁰⁾.

Hip fractures are classified into three major types, depending on the specific location of the fracture: femoral neck, intertrochanteric and subtrochanteric fractures. The term pertrochanteric hip fracture may also be used in hip fracture literature and refers to a more inclusive set of extracapsular fractures, including intertrochanteric, subtrochanteric and mixed fracture patterns⁽¹¹⁾. Femoral neck fractures occur in the narrowed section of the upper femur between the rounded femoral head and bony projections called trochanters. Femoral neck fractures are grouped into nondisplaced and displaced fractures by the alignment of the fractured segments about the original anatomic position of the femur⁽¹¹⁾.

Intertrochanteric hip fractures occurred in the area between the greater and lesser trochanters. The trochanters are bony projections where major hip muscles attach. Intertrochanteric fractures may be further grouped into stable and unstable fractures, depending on the location, number and size of the fractured bony segments⁽¹¹⁾.

Subtrochanteric fractures occur at or below the level of the lesser trochanter in the upper portion of the femur. Isolated subtrochanteric fractures occur in the area between the upper border of the lesser trochanter to 5 cm below it, toward the knee. Subtrochanteric fractures may include only a short, linear section of the proximal femur or may be part of a larger fracture pattern that involves both the intertrochanteric and subtrochanteric sections of the femur. Orthopaedic surgeons differ on their definition of subtrochanteric fractures and may also consider fractures that extend further toward the knee to be subtrochanteric⁽¹¹⁾.

Most hip fractures are caused by factors that weaken bone, combined with the impact from a fall. Bone strength decreases as we age. Bones can become very weak and fragile a condition called osteoporosis. Osteoporosis often develops in women after menopause, and in men in older age. This bone-thinning disorder puts people at greater risk for broken bones, particular fractures of the hip, wrist, and spine⁽¹²⁾.

Plain radiography is the initial diagnostic test for hip fracture⁽¹³⁾. A cross-table lateral view of the hip and an anteroposterior view of the pelvis are appropriate. The frog-leg view should be avoided; positioning the limb for this view results in severe pain and can cause displacement of a nondisplaced fracture or worsen a displaced fracture⁽¹⁴⁾. If radiography is negative and a hip fracture is still suspected, magnetic resonance imaging or a bone scan should be performed⁽¹⁵⁾. The imaging study should be evaluated for other possibilities, such as pelvic, stress or pathologic fractures. Computed tomography may be used, although it may not detect trabecular bone injuries in osteoporotic fractures or reveal bone marrow edema surrounding the fracture line⁽¹⁴⁾. Initially, care should focus on adequate analgesia and consultation with an orthopedic surgeon. Surgery is the most viable option for most patients. Nonsurgical interventions are reserved for patients with severe debilitation, unstable patients with major uncorrectable diseases, nonambulatory

patients, or patients at the end stages of a terminal illness⁽¹⁶⁾. However, some patients with impacted stable fractures may be considered for nonsurgical management⁽¹⁷⁾.

Postoperative complications of this procedure are still relevant and may affect around 20% of patients with hip fracture⁽¹⁸⁾.

Cognitive complications appear in approximately 10% of patients after hip fracture surgery, being more common in elderly (> 65 years) than younger patients⁽¹⁹⁾.

A report of the American College of Cardiology and the American Heart Association estimates at less than 5% the risk of cardiac complication in postoperative after major orthopedic surgeries, but the 1-year recorded mortality exceeds 20% in patients with hip fracture⁽²⁰⁾.

Postoperative pulmonary complications (PPCs) are quite common (4% of patients) and were defined as anomalies of the lung resulting in an identifiable disease with adverse impact on the clinical course of the patient⁽²¹⁾.

Common postoperative gastrointestinal complications after hip fracture surgery include dyspepsia, abdominal distention, reflexes ileum and constipation. The most common postoperative urinary tract complications after hip surgery are urinary retention, urinary infections and acute kidney injuries⁽²²⁾.

The prevalence of perioperative anemia in hip fractured patients ranges from 24% to 44%, being even higher if it considers only the postoperative one (51% to 87%)⁽²³⁾.

Malnutrition, which is in general prevalent among the elderly population, is even more frequent among patients hospitalized for hip fracture, with rates ranging from 20% to 70%⁽²²⁾.

A study conducted by **Flikweert et al.**⁽²⁴⁾ stated that 479 patients with a mean age of 78.4 years; 33% were men. The overall complication rate was 75%. Delirium was the complication seen most frequently (19%); the incidence of surgical complications was 9%. Most risk factors for complications were not preventable (high comorbidity rate, high age and dependent living situation). However, general anesthesia and delay in surgery may be risk factors that can potentially be prevented. Overall, the mortality risk was not higher in patients with a complication, but delirium and pneumonia were risk factors for mortality.

Carpintero et al. ⁽²⁵⁾ stated that even with optimal care, elderly trauma patients suffer a higher morbidity and mortality rate when compared to the general population and often demand for expensive hospital aftercare. Because of that surgical treatment of hip fracture in these patients has exceptional clinical challenges and needs strategies to optimize patient care. Preoperative early clinical assessment helps to identify patients at high-risk and to prevent unnecessary delays. Orthogeriatric units, with a medical co-management of these patients, offer the best chance for a successful outcome, reducing the length of stay, in patient problems and mortality, allowing the patient to recover his previous ambulatory state.

Another study evaluated by **Lin et al.** ⁽²⁶⁾ reported that among hemodialysis subjects, three months, one-year, two-years and five-years mortality rates were 17.3 %, 37.2 %, 51.5 % and 80.5 %, respectively; the one year and five years cumulative incidences of the first surgical complication were 14.2 % and 20.6 %, respectively and the three-month cumulative incidence of the first medical complication was 24.1 %. Hemodialysis subjects presented a 2.32 times higher hazard ratio of overall death, 1.15 times higher sub-hazard ratio (sub-HR) of surgical complications and 1.35 times higher sub-HR of the first medical complication than non-hemodialysis controls. **Kim et al.** ⁽²⁷⁾ stated that atelectasis was associated with postoperative pulmonary complications. Male gender and age \geq 80 years were associated with an increased incidence of postoperative delirium. ASA classification three was associated with death. A delay in surgery was not associated with any complications. Preexisting diseases and methods of anesthesia did not affect mortality and postoperative complications.

Poh et al. ⁽²⁸⁾ demonstrated that for all patients, the mean length of hospitalization was 14.6 days. For the 242 patients who underwent surgical treatment after a mean of 3.6 days, 56.8% of them had at least one complication. Acute urinary retention (39.3%) and urinary tract infection (24.0%) were most common. Patients with ASA grade III or higher had 2.3 fold higher risk of developing complications than those with lower grade comorbidity, whereas patients with delayed operation (>48 hours after presentation) had 1.8 fold higher risk of developing complications than those without delayed operation. Four patients died in hospital: 2 from myocardial infarction and two from upper gastrointestinal

bleeding. **Guo et al.** ⁽²⁹⁾ stated that a total of 572 patients were eligible for inclusion in the study. Of these 21.0% were diagnosed with PD and 79.0% did not. Multivariate stepwise logistic regression analyses showed that older age, a history of stroke, lower albumin, higher blood glucose, higher total bilirubin, higher C-reactive protein, longer surgery duration and higher volume of red blood cell transfusions were independent risk factors for PD.

1-year readmission rates were 5–30% and 2-years reoperation rates may be as high as 20% after surgery for hip fractures in elderly adults. Unplanned readmissions for medical complications and unplanned reoperations for surgical complications not only increase the mortality, but also place an increased socioeconomic burden on healthcare systems and families ⁽³⁰⁾.

Another study conducted by **Lee et al.** ⁽³¹⁾ and concerned with one-year readmission risk and mortality after hip fracture surgery concluded that, In this population-based study of 5442 patients who underwent surgical treatment of hip fractures, we found the predictive factors for readmission included male gender, older age, a higher number of comorbidities, and a longer hospital stay in both early and late readmission groups. A higher risk of readmission is observed during the first 30 days of follow-up. We suggested that patients with predictive factors need careful follow-up, especially within 30 days following an operation for hip fracture.

PATIENTS AND METHODS

Study Design

This was a retrospective study and it was conducted in Department of Orthopedic Surgery of King Fahad Hospital in Riyadh, Saudi Arabia.

Patients

This study included all patients who were subjected to hip fracture surgeries at King Fahad Hospital between 1/5/2010 and 31/1/2016

Inclusion criteria

Patients who underwent the surgical operation of hip fractures.

Exclusion criteria

Patients with pathological fractures (other than from osteoporosis) were excluded.

Data collection methods, used instruments and measurements: Data were collected from patient's electronic files. We searched for complications occurred from admittance up to the last outpatient

visit 6 months after surgery. Registered baseline characteristics were demographic information, medical history, fracture classification and time of operation.

Statistical analysis

An excel sheet was used to record the data; then it was analyzed by using Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA)., Continuous variables were expressed as mean ± standard deviation and categorical variables were expressed as percentages. The t-test was used for continuous variables. Tables and possible graphs were used to show the results.

RESULTS

A total of 150 subjects who underwent an operation because of hip fracture met the criteria and were included in this study. Among these patients, 57 (38%) were females and 93 (62%) were males. 89 (59.3%) were readmitted for the same reason within one year.

The higher prevalence of hip fractures was founded among elderly patients with age range of 65 – 74 years. Also, there was no significant correlation between both of gender and sex and readmission of hip fractures patients for the same reason within one year (P=0.115 and 0.191) respectively (**Table 1**).

Table 1: prevalence and readmission of hip fractures patients for the same reason within one year regarding age and gender

Characteristics	No.	Readmission for the same reason within one year		P-value
		Yes	No	
		No=89 (59.3%)	No=61 (40.7%)	
Age in years				
< 55	7	6 (6.7%)	1 (1.6%)	0.115
55 – 64	44	27 (30.3%)	17 (27.9%)	
65 – 74	63	38 (42.7%)	25 (41.0%)	
> or = 75	36	18 (20.2%)	18 (29.5%)	
Sex				
Male	93	59 (66.3%)	34 (55.75%)	0.191
Female	57	30 (33.7%)	27 (44.3%)	

Of these subjects, 61(40.7%) patients had intracapsular fracture, 50 (33.3%) had intertrochanteric fracture and the remaining 39 (26%) had subtrochanteric fracture; 33 (37.1%), 33 (37.1%) and 23 (35.8%) were readmitted within 1 year for the same reason, respectively (**Table 2**). Intracapsular fracture showed the highest prevalence among our subjects.

20 (13.3%) were grade 1 hip fractures, 33 (22%) were grade 2, 58 (38.7%) were grade 3 and 39 (26%) were grade 4; 12 (13.5%), 21 (23.6%), 33 (37.1%) and 23 (25.8%) were readmitted within 1 year for the same reason, respectively (**Table 2**).

Grade 3 hip fracture showed the highest prevalence among our subjects.

Most cohorts were treated surgically 126 (84%), the remaining 24 (16%) were treated non-surgically; 78 (87.6%) and 11 (12.4%) were readmitted within one year for the same reason, respectively (table 2).

There was no significant correlation between types of fracture, fracture grade and treatment type regarding readmission of hip fractures patients for the same reason within one year (P=0.446, 0.940 and 0.142) respectively (**Table 2**).

Table 2: prevalence and readmission of hip fractures patients for the same reason within one year regarding types of fracture, fracture grade and treatment type

	Characteristics	No.	Readmission for the same reason within one year		P-value
			Yes	No	
			No=89 (59.3%)	No=61 (40.7%)	
Types of fracture	Intracapsular fracture	61	33 (37.1%)	28 (45.9%)	0.446
	Intertrochanteric fracture	50	33 (37.1%)	17 (27.9%)	
	Subtrochanteric fracture	39	23 (35.8%)	16 (26.2%)	
Fracture grade	1	20	12 (13.5%)	8 (13.1%)	0.940
	2	33	21 (23.6%)	12 (17.9%)	
	3	58	33 (37.1%)	25 (41.0%)	
	4	39	23 (25.8%)	16 (26.2%)	
Treatment type	Surgical	126	78 (87.6%)	48 (78.7%)	0.142
	Non-Surgical	24	11 (12.4%)	13 (21.3%)	

Most cohorts 137 (91.3%) were comorbid with other diseases including osteoporosis, diabetes mellitus, anemia and walking of physical assistance, the remaining 13 (8.7%) were medically free; 79 (88.8%) and 10 (11.2%) were readmitted within 1 year for the same reason, respectively (**Table 3**).

51(34%) patients had 2 or fewer comorbidities and 99 (66%) had 3 or more comorbidities; 34 (38.2%) and 17 (19.1%) were readmitted within 1 year for the same reason, respectively (**Table 3**). A patient who had 3 or more comorbidities had a

higher prevalence than who had 2 or fewer comorbidities. There was a significant correlation between osteoporosis and readmission of hip fractures patients for the same reason within one year (P=0.049). While, there was no significant correlation between number of comorbidities, diabetes mellitus, anemia and walking of physical assistance regarding readmission of hip fractures patients for the same reason within one year (P=0.189, 0.277, 0.762 and 0.281) respectively (**Table 3**).

Table 3: prevalence and readmission of hip fractures patients for the same reason within one year regarding comorbidities

Characteristics	No.	Readmission for the same reason within one year		P-value
		Yes	No	
		No=89 (59.3%)	No=61 (40.7%)	
No. of comorbidities				0.189
		<=2	51	
3 & above	99	17 (19.1%)	44 (72.1%)	
Osteoporosis				0.049
		No	82	
Yes	68	35 (39.3%)	33 (54.1%)	
Diabetes Mellitus				0.277
		No	115	
Yes	35	18 (20.2%)	17 (27.9%)	
Anemia				0.762
		No	138	
Yes	12	8 (9.0%)	4 (6.6%)	
Walking of physical assistance				0.281
		No	134	
Yes	16	12 (13.5%)	4 (6.6%)	
Medically free				0.242
		No	137	
Yes	13	10 (11.2%)	3 (4.9%)	

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Most cohorts 133 (88.7%) had an operation time less than 48, the remaining 17 (11.3%) had 48 minutes or more; 80 (89.9%) and 9 (10.1%) were readmitted within one year for the same reason, respectively (**Table 4**). There was no significant correlation between time of operation and readmission of hip fractures patients for the same reason within one year ($P=0.569$).

Table 4: prevalence and readmission of hip fractures patients for the same reason within one year regarding the time of operation

Characteristics	No.	Readmission for the same reason within one year		P-value
		Yes	No	
		No=89 (59.3%)	No=61 (40.7%)	
Time of operation <48 min	133	80 (89.9%)	53 (86.9%)	0.569
48 & above	17	9 (10.1%)	8 (13.1%)	

The two most frequently encountered medical complications were neurovascular complications (N=87, 58%) and infection in joints (N=92, 61.3%); 52 (58.4%) and 52 (58.4%) were readmitted within one year for the same reason, respectively (**Table 5**). There was no significant correlation between

postoperative complications including neurovascular, infection in joints, dislocation of the joint, loosening of the joint and post-operative disabilities and readmission of hip fractures patients for the same reason within one year ($P=0.189, 0.277, 0.762$ and 0.455) respectively (**Table 5**).

Table 5: prevalence and readmission of hip fractures patients for the same reason within one year regarding post-operative complications

Characteristics	No.	Readmission for the same reason within one year		P-value
		Yes	No	
		No=89 (59.3%)	No=61 (40.7%)	
Post-operative complications				
Neurovascular				0.898
No	63	37 (41.6%)	26 (42.6%)	
Yes	87	52 (58.4%)	35 (57.4%)	
Infection in joints				0.377
No	58	37 (41.6%)	21 (34.4%)	
Yes	92	52 (58.4%)	40 (65.6%)	
Dislocation of the joint				0.310
No	126	77 (86.5%)	49 (80.3%)	
Yes	24	12 (13.5%)	12 (19.7%)	
Loosening of the joint				0.739
No	141	83 (93.3%)	58 (95.1%)	
Yes	9	6 (6.7%)	3 (4.9%)	
Post-operative disabilities				0.455
No	93	53 (59.6%)	40 (65.6%)	
Yes	57	36 (40.4%)	21 (34.4%)	

DISCUSSION

This study aimed to describe the complications and readmission after hip fracture surgery. The most important outcome of this study was the high percentage of patients suffering post-operative complications including neurovascular and infection in joints.

Complication rates after hip fracture surgery reported in the literature differ widely between 12.5 and 57%⁽³²⁾.

Roche et al.⁽¹⁸⁾ stated that 59% had at least one co-morbid condition compared to our results which found that 51(34%) patients had 2 or fewer co-morbidities and 99 (66%) had 3 or more co-morbidities. The mean age in their study was 82 years. While, most of our study population's age ranged from 65 to 74 years and 80% of their patients were women compared to 38 % in our study. They also reported a higher mortality in men than in women.

By comparing our results with **Wehren et al.**⁽³³⁾ results we found that their study reported a higher prevalence of women 78%, which was also a higher proportion than in our study. The mean age in their study of 81 years was also considerably higher than in our study.

Flikweert et al.⁽²⁴⁾ reported that the three most frequently encountered medical complications were delirium (N = 98, 20%), pneumonia (N = 47, 10%) and congestive heart failure (N = 25, 5%). **Poh et al.**⁽²⁸⁾ also reported that 56.8% of their population had at least one complication. Acute urinary retention (39.3%) and urinary tract infection (24.0%) were most common. While, our study found that the two most frequently encountered medical complications were neurovascular complications (N=87, 58%) and infection in joints (N=92, 61.3%).

Lee et al.⁽³¹⁾ stated that in this population-based study of 5442 patients who underwent surgical treatment of hip fractures, we found the predictive factors for readmission included male gender, older age, a higher number of comorbidities and a longer hospital stay in both early and late readmission groups. A higher risk of readmission was observed during the first 30 days of follow-up. We suggested that patients with predictive factors need careful follow-up, especially within 30 days following an operation for hip fracture. While, our study reported that, there was no significant correlations between age, gender, comorbidities (diabetes mellitus, anemia and walking of physical assistance), time of

operation and post-operative complications (neurovascular, Infection in joints, dislocation of the joint, loosening of the joint and post-operative disabilities) regarding readmission of hip fractures patients for the same reason within one year. While, there was a significant correlation between osteoporosis and readmission of hip fractures patients for the same reason within one year (P=0.049).

CONCLUSION

In our study, the prevalence of hip fracture was higher in males than in the females. Medical complications such as neurovascular and infection in joints are encountered more frequently than surgical complications such as dislocation of the joint, loosening of the joint and post-operative disabilities. So, postoperative care is necessary to prevent medical complications. The most common reasons for readmission was the comorbidities and post-operative complications.

ETHICAL CONSIDERATIONS

Ethical approval for this study was obtained from ethics review committee in King Fahad Hospital. The confidentiality of the anonymously collected data would be maintained all the time. All data would be stored in a secure and safe place which was only accessible by the researcher.

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