Mortality Rate Following Intertrochanteric Fracture Surgery in One Year: A Retrospective Study

Abstract

Introduction: Intertrochanteric femoral fractures are common and can be associated with significant complications and mortality. This study aimed to assess the mortality rate and related factors in patients undergoing surgical treatment for intertrochanteric fractures.

Materials & Methods: This retrospective descriptive-analytical study included patients with intertrochanteric hip fracture who underwent surgery between 2017 and 2018 in a teaching hospital .The demographic data were collected from patients' records, with specific attention to age, osteoporosis, previous fracture history, cognitive disorders, hypertension, delay in surgery, and the type of fixation implant. Mortality status was assessed through follow-up phone calls. Data were analyzed using STATA software and logistic regression analysis.

Results & Discussion: 227 case within one year were studied. The overall mortality rate was 16.3%. In the deceased ($p<0.05$). Logistic regression revealed that advanced age, osteoporosis, previous fracture history, cognitive disorders, history of falling, surgical delay, and type of surgery were independent predictors of mortality ($p<0.05$).

Conclusion: Postoperative mortality following intertrochanteric fracture surgery is influenced by a range of clinical and modifiable factors. Timely selection of an appropriate surgical method and identification of high-risk patients can play a significant role in improving treatment outcomes.

Keywords: Intertrochanteric fractures, Mortality, Risk factors.

Accepted: 39 days before printing

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Introduction

Intertrochanteric fractures of the femur are among the most common types of hip fractures in the elderly, particularly in patients with osteoporosis, and are associated with a considerable rate of mortality and functional disability[(1)]. These fractures involve the region between the greater trochanter (the attachment site for muscles such as the gluteus medius**,** gluteus minimus, and piriformis) and the lesser trochanter (the insertion site of the iliopsoas muscle, the primary flexor of the hip joint)[(2,3)].

The clinical significance of these fractures lies in their postoperative complications and their impact on patients' quality of life, particularly among older adults. Statistics indicate that the one-year mortality rate following surgery for intertrochanteric fractures ranges between 20% and 30%, which is higher compared to other types of hip fractures[(4,5)]. Given the increasing trend of population aging and the high prevalence of osteoporosis, early prediction and timely intervention in the management of these fractures play a crucial role in reducing mortality.

Previous studies have identified multiple independent predictors of mortality following surgery for intertrochanteric fractures, including advanced age, pre- and postoperative activity level, type of anesthesia, presence of comorbidities, and the time interval between the occurrence of fracture and surgical intervention[(6)]. However, many of these prior studies have been limited by small sample sizes, inappropriate study designs, or inadequate control of confounding variables.

Considering the high prevalence of these fractures, their substantial clinical and economic burden on healthcare systems, and the contradictory findings reported in earlier research, the present study was designed as a retrospective investigation to assess the one-year mortality rate in patients undergoing surgery for intertrochanteric femoral fractures and to explore the factors associated with it.

Materials & Methods

This study was a retrospective descriptive-analytical investigation conducted to assess the one-year mortality rate and its associated factors among patients with intertrochanteric femoral fractures who underwent surgical intervention during the period 2017–2018 (1396–1397 in the Iranian calendar). The study population included all patients admitted with a diagnosis of intertrochanteric fracture to Imam Khomeini and Bu-Ali Hospitals in Sari during this time frame. Based on archived medical records, the initial number of eligible patients was estimated to be approximately 340.

Patients were included if they met the following criteria:

1. Diagnosis of intertrochanteric femoral fracture based on plain radiography and confirmation by an orthopedic specialist;
2. Undergoing surgical intervention for fracture management;
3. Availability of complete demographic and clinical data in the medical record (including history of prior fracture, osteoporosis, falls, diabetes, Parkinson's disease, cognitive impairment, corticosteroid use, smoking, and alcohol consumption);
4. Possibility of follow-up regarding survival or death through telephone contact with the patient or their family.

Exclusion criteria were as follows: patients who did not undergo surgery, had incomplete medical records, were not traceable for survival/death status, or suffered from severe unrelated chronic illnesses (e.g., metastatic cancer or advanced organ failure) that could bias mortality outcomes.

After applying these criteria, 227 patients out of the initial 340 were included in the final analysis. Sampling was performed using a census approach, and data were extracted from archived patient records. Demographic variables (age, sex) and clinical data (history of prior fracture, osteoporosis, falls, diabetes, Parkinson's disease, cognitive impairment, corticosteroid use, smoking, alcohol consumption, time interval between fracture occurrence and surgery, and type of surgical intervention) were collected. Additionally, treatment-related information (medical record number, contact number, admission date, discharge date, and other clinical characteristics) was documented.

To determine final outcomes, follow-up telephone calls were conducted with the patients themselves or their family members. In the case of survival, after obtaining verbal informed consent, supplementary data were gathered. In the case of death, the date and probable cause of death (if available) were recorded based on medical documentation or family report.

Data were entered into STATA statistical software. Continuous variables were described as mean ± standard deviation and analyzed using Student's t-test. Categorical variables were presented as frequency (percentage) and analyzed using the Chi-square test. Logistic regression modeling was employed to identify independent predictors of mortality.

This study adhered to ethical principles of research, including confidentiality of patient information and obtaining informed consent from participants (if alive) or their family members. The study protocol was also approved by the Ethics Committee of Mazandaran University of Medical Sciences.

Results

In this study, 227 eligible patients with intertrochanteric fracture were included in the final analysis. Demographic characteristics showed that 58.59% of the patients were male and 41.41% were female. The mean age of patients was 65.04 years (±21.26), reflecting a wide age range from 25 to 99 years.

The mean interval between fracture occurrence and surgical intervention was 4.57 days (±3.13). Furthermore, 6.17% of patients had a history of corticosteroid use, 5.29% had a history of falls, and 19.38% reported a prior fracture (Table 1). In addition, 55.1% of patients underwent a surgical procedure other than DHS fixation (Figure 1).

Table 1: Demographic and Clinical Characteristics of Patients with Intertrochanteric Fracture (n = 227)	
Sex* (No. of patients)	Male: 133 (58.59%) Female: 94 (41.41%)
Hospital of admission* (No. of patients)	Bu-Ali: 101 (44.49%) Imam Khomeini: 126 (55.51%)
Age (years)**	65.04 ± 21.26
History of prior fracture* (No. of patients)	44 (19.38%)
Osteoporosis* (No. of patients)	50 (22.03%)
History of falls* (No. of patients)	12 (5.29%)
History of hypertension* (No. of patients)	66 (29.07%)
History of diabetes* (No. of patients)	75 (33.04%)
History of Parkinson's disease* (No. of patients)	3 (1.32%)
History of other cognitive disorders* (No. of patients)	15 (6.61%)
Corticosteroid use* (No. of patients)	14 (6.17%)
Smoking* (No. of patients)	47 (20.70%)
Alcohol consumption* (No. of patients)	3 (1.32%)
Type of surgical device* (No. of patients)	DHS: 101 (44.49%) Non-DHS: 126 (55.51%)
Interval between admission and surgery (days)**	4.57 ± 3.13

* Data reported as number (percentage). ** Data reported as mean ± standard deviation. DHS = Dynamic Hip Screw.

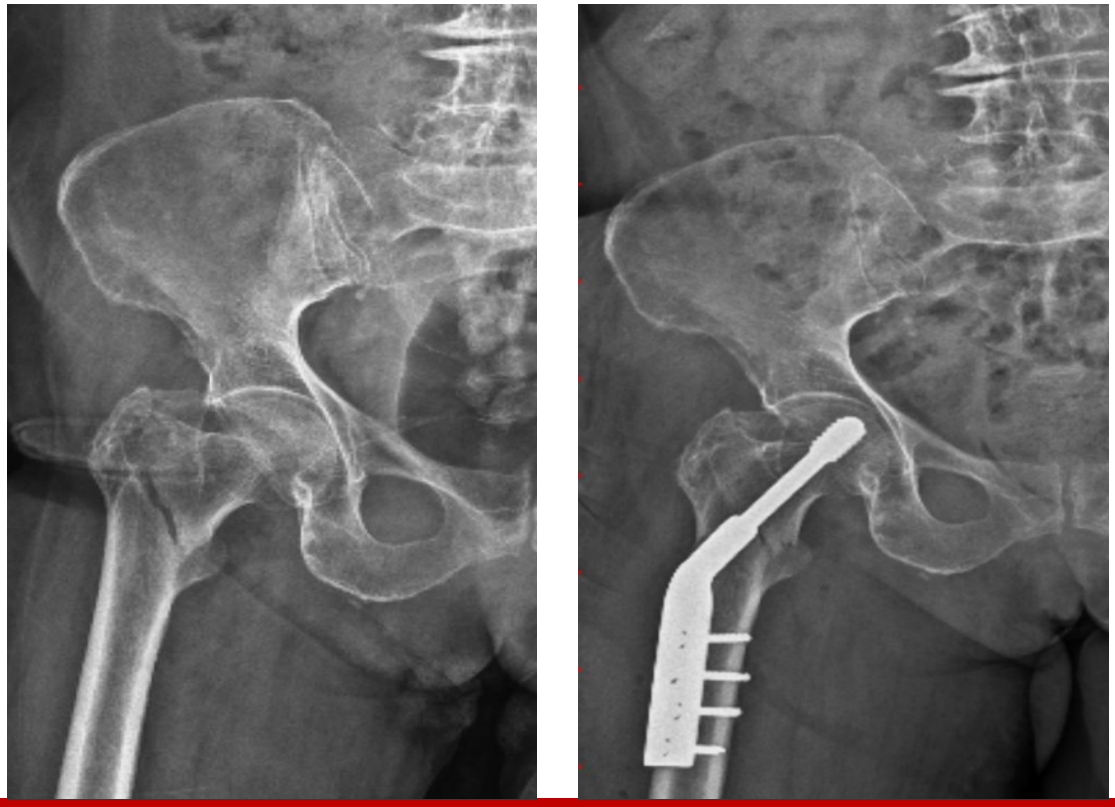

Figure 1: Preoperative and postoperative radiographs of DHS fixation

Comparison of Potential Mortality-Related Factors

The comparison of potential factors associated with mortality between the two groups is presented in Table 2. The overall mortality rate in this study was 16.3% (37 patients). The mean age of the deceased group was significantly higher compared to the surviving group (75.38 years vs. 63.03 years; $p < 0.001$). A history of hypertension and osteoporosis was also significantly more frequent in the deceased group compared with survivors (45.95% vs. 25.79%

and 51.35% vs. 16.32%; p = 0.014 and p = 0.001, respectively).

Furthermore, a history of cognitive disorders was more prevalent among deceased patients compared to survivors (18.92% vs. 4.21%; p < 0.001), and a history of prior fracture was also significantly higher in the deceased group (43.2% vs. 14.74%; p = 0.042). No significant differences were observed between the two groups with respect to smoking (p = 0.238), alcohol consumption (p = 0.442), and diabetes (p = 0.780). Finally, Dynamic Hip Screw (DHS) fixation was significantly more common in the surviving group than in the deceased group (47.37% vs. 29.73%; p < 0.001), indicating that survivors were more frequently treated with DHS, whereas non-DHS surgical procedures were more common in the deceased group.

The overall mean interval between admission and surgery was 4.57 ± 3.13 days; however, this interval was significantly longer in the deceased group (7.41 ± 4.17 days) compared with the surviving group (4.02 ± 2.56 days; p < 0.001). The results of the logistic regression analysis for predicting mortality after intertrochanteric fracture surgery are presented in Table 3. Age was significantly associated with mortality, with each additional year increasing the odds of death by approximately 4% (OR = 1.04, p = 0.006). Sex (female vs. male) was not significantly associated with mortality (OR = 1.56, p = 0.334). A history of previous fracture significantly increased the risk of mortality by about 3.8 times (OR = 3.77, p = 0.007), and osteoporosis was associated with more than a fivefold increase in mortality risk (OR = 5.60, p = 0.001).

Cognitive disorders were also significantly associated with a 4.5-fold higher risk of mortality (OR = 4.53, p = 0.019). Although corticosteroid use (OR = 1.57, p = 0.578) and a history of falls (OR = 1.75, p = 0.521) were associated with an increased risk of death, these associations were not statistically significant. Finally, undergoing a non-DHS surgical procedure was significantly associated with a more than fivefold increase in the odds of mortality compared with DHS fixation (OR = 5.36, p = 0.002).

Table 2: Potential Mortality-Related Factors in Two Groups

Variable	Survived (n = 190)	Deceased (n = 37)	P-value
Age (years)	63.03 ± 21.87	75.38 ± 14.00	<0.001
Male Female	118 (62.11%) 72 (37.89%)	15 (40.54%) 22 (59.46%)	0.015
Hypertension	49 (25.79%) Yes 141 (74.21%) No	17 (45.95%) Yes 20 (54.05%) No	0.014
Diabetes	62 (32.63%) Yes 128 (67.37%) No	13 (35.14%) Yes 24 (64.86%) No	0.780
Osteoporosis	31 (16.32%) Yes 159 (83.68%) No	19 (51.35%) Yes 18 (48.65%) No	<0.001
Cognitive disorders	8 (4.21%) Yes 182 (95.79%) No	7 (18.92%) Yes 30 (81.08%) No	0.001
History of fracture	28 (14.74%) Yes 162 (85.26%) No	16 (43.24%) Yes 21 (56.76%) No	<0.001
Corticosteroid use	9 (4.74%) Yes 181 (95.26%) No	5 (13.51%) Yes 32 (86.49%) No	0.042
Smoking	42 (22.11%) Yes 148 (77.89%) No	5 (13.51%) Yes 32 (86.49%) No	0.238
Alcohol consumption	3 (1.58%) Yes 187 (98.42%) No	0 (0.00%) Yes 37 (100%) No	0.442
History of falls	7 (3.68%) Yes 183 (96.32%) No	5 (13.51%) Yes 32 (86.49%) No	0.015
Type of surgery	90 (47.37%) DHS 100 (52.63%) Non-DHS	11 (29.73%) DHS 26 (70.27%) Non-DHS	0.048
Interval between admission and surgery (days)	4.02 ± 2.56	7.41 ± 4.17	<0.001

DHS = Dynamic Hip Screw.

Table 3: Logistic Regression for Predicting Mortality Following Intertrochanteric Fracture Surgery				
Variable	Beta Coefficient	P-value	Odds Ratio (OR)	95% Confidence Interval (Lower – Upper)
Age (per year increase)	0.040	0.006	1.041	1.011 – 1.071
Sex (female vs. male)	0.447	0.334	1.563	0.631 – 3.869
History of fracture	1.329	0.007	3.779	1.436 – 9.944
Osteoporosis	1.724	0.001	5.606	1.994 – 15.761
History of falls	0.562	0.521	1.754	0.315 – 9.759
Corticosteroid use	0.451	0.578	1.570	0.321 – 7.681
Hypertension	0.276	0.551	1.317	0.532 – 3.259
Cognitive disorders	1.511	0.019	4.529	1.279 – 16.047
Type of surgery (Non-DHS vs. DHS)	1.680	0.002	5.367	1.882 – 15.308
Constant	0.000	0.001	-6.936	—

DHS = Dynamic Hip Screw.

Discussion

The present study was conducted to examine the mortality rate and associated factors in patients with intertrochanteric fractures. In this short-term follow-up, the mortality rate was 16.3%. The findings indicated that advanced age, a history of prior fractures, osteoporosis, the presence of cognitive disorders, type of surgery, and delayed surgical intervention were significantly associated with patient mortality. The impact of each of these factors is analyzed below based on the current study and similar investigations.

The mean age of deceased patients in this study was significantly higher than that of survivors. The same results was reported by Kim et al., who documented a two-year mortality rate of 40.6% in patients over 90 years of age[7]. This underscores the pivotal role of age in prognosis following hip fracture. Numerous studies have identified older age as an independent risk factor for mortality, due to reduced physiological reserve, multiple chronic comorbidities, and diminished tissue repair capacity[8,9].

History of prior fractures were significantly more represented in the deceased group, and regression analysis revealed that this factor increased the risk of mortality by 72%. Similarly, Barceló et al. reported that multiple comorbidities, including previous fractures, constitute significant mortality risk factors in elderly patients[10]. Recurrent fractures may indicate advanced osteoporosis, poor balance, and overall functional decline, all of which contribute to worse outcomes[11,12].

The role of osteoporosis in elevating mortality risk was particularly notable in this study, increasing the risk by 75%. Okkaoglu et al. similarly identified osteoporosis as one of the most important predictors of mortality in intertrochanteric fractures[13]. Additionally, the presence of cognitive disorders, such as dementia, was associated with a 68% increase in mortality risk. This aligns with findings from Ha YC et al. and AbuAlrob et al., who reported higher post-hip fracture surgical mortality among patients with cognitive impairment[14,15]. The elevated mortality may result from reduced patient compliance in rehabilitation, increased risk of immobility-related pneumonia, and malnutrition[16–18].

In the present study, the use of non-DHS surgical methods was significantly associated with increased mortality, and regression analysis indicated a nearly seven-fold higher risk of death. This finding is consistent with Olof et al., who evaluated 19,935 patients over 60 years old with intertrochanteric fractures, showing that intramedullary nailing compared to hip screw fixation was associated with a significantly higher postoperative mortality in 30 days[19].

However, López-Hualda et al., who compared DHS and trochanteric fixation nail advanced (TFNA) in 152 patients, reported that although mortality was higher in the DHS group, this difference was not solely attributable to implant type; rather, longer surgical delays in this group likely played a key role in increased mortality[20].

These findings emphasize the importance of timely surgery as a determinant of survival in patients with intertrochanteric fractures. Variations among studies may be attributable to differences in patient characteristics, fracture severity, surgical method selection, and postoperative management. Therefore, the choice of surgical technique should be

appropriated to fracture type and clinical condition of patent. Future studies should focus on key factors such as surgical timing, fracture severity, and patient condition to evaluate the effects of different surgical approaches on mortality and subsequent complications.

The present study also demonstrated that surgical delay was significantly associated with increased mortality. The mean interval in the deceased group exceeded seven days, compared with approximately four days in the surviving group. Similarly, Chang et al. reported that surgery delayed beyond two days increased mortality risk[21], potentially due to preoperative complications such as pressure ulcers, respiratory infections, and venous thromboembolism[22,23].

Finally, in the present study, hypertension was significantly associated with mortality, whereas diabetes, alcohol consumption, smoking, and corticosteroid use were not. Babagoli et al. similarly reported that hypertension significantly increased both in-hospital and long-term mortality, whereas diabetes was only associated with long-term mortality without a significant effect on in-hospital mortality[24].

The limitations of the present study are single-center, retrospective and short-term study. Additionally, certain clinical data, such as the severity of comorbidities and nutritional indices, were not available. Furthermore, the choice of surgical method (DHS versus non-DHS) may have been influenced by different factors like; fracture severity, surgeon expertise, or hospital resources, which could not be controlled due to the retrospective study design.

Conclusion

The findings of this study indicate that advanced age, osteoporosis, a history of fractures, cognitive disorders, surgical delay, and the type of surgical procedure are independent risk factors for mortality following intertrochanteric fracture surgery. Accordingly, the development of risk-based treatment protocols for elderly patients—particularly taking into account their cognitive and bone health status—may help reduce mortality and improve treatment outcomes. Additionally, ensuring timely surgical intervention and selecting the appropriate surgical technique play a key role in enhancing clinical outcomes.

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