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FUNCTIONAL OUTCOMES OF EXTERNAL FIXATION AMONG ELDERLY PATIENTS WITH INTERTROCHANTERIC FEMUR FRACTURES: A PROSPECTIVE STUDY CONDUCTED IN MOSUL CITY-IRAQ

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ABSTRACT

Background: Trochanteric fractures are a leading cause of morbidity and mortality in the elderly, particularly among those with osteoporosis. Individuals who suffer from age-related systemic diseases and trochanteric fractures are at an increased risk of complications and death. In certain circumstances, open reduction and internal fixation are not feasible due to the poor health status of the patients and the exceedingly high risks associated with surgery and anesthesia. External fixation and closed reduction can be regarded as a semiconservative course of treatment in these circumstances. **Objectives:** Is to evaluate the complication of external fixation techniques for treating closed intertrochanteric femur fractures in elderly patients at high anesthetic risk. **Methods:** The study is a prospective, interventional study. Forty patients with closed intertrochanteric femur fractures who received external fixator treatment at Al Salam Teaching Hospital in Mosul-Iraq between January 2020 and December 2024 are included in this study. The study questionnaire was divided into four parts. The first part provides demographic and trauma information of the study participants. The second part covers kyle's classification of the fractures. The third part covers anesthesia types the patient received and the last part covers the post-operative complications of the study's patients. **Results**: The study included 40 elderly patients, of 24 (60%) were females and 16 (40%) were males. With male to female ratio 1:1.5. the mean age ± standard deviation of the study participants is 79.93 ± 11.12 years. The majority of patients (47.5%) had type 1 (stable) fracture, followed by type 2 (30%) then type 3 (17.5%) and type 4 (5%). 24 (60%) patients reported fall on the ground, followed by 11 (27.5%) patients reported fall from height and lastly 5 (12.5%) patients reported road traffic accident. Spinal anesthesia was done for 19 (47.5%) patients, general anesthesia for 13 (32.5%) patients and epidural anesthesia for 8 (20%) patients. The average time needed for completing the operation is 46.38 ± 12 minutes. No patients need perioperative blood. Additionally; during the post-operative period, all patients exhibited limited knee flexion, but this improved with follow-up visits. Pin tract infection, which was prevalent among 21 (52.5%) patients. Moreover; 11 (27.5%) patients had bed sore which were treated successfully by local antibiotics and frequent dressing, 5 (12.5%) patients developed shortening and malunion of the affected limb which was resulted from varus angulation or bone impaction, 5 (12.5%) patients had deep venous. 1 (2.5 %) patient was died postoperatively during the first month due to unrelated medical conditions. **Conclusion:** Closed external fixation is recommended for older patients with high-risk intertrochanteric fractures due to its ease of use, low operation time, and few complication sequelae.

KEYWORDS: femur, Fracture, Older, Osteoporosis, Pin tract infection.

1- INTRODUCTION

Trochanteric fractures are a leading cause of morbidity and mortality in the elderly, particularly among those with osteoporosis.[1-2] Trochanteric fractures are expected to become a significant public health concern as people live longer lives and the population ages.[3-4] Individuals who suffer from age-related systemic diseases and trochanteric fractures are at an increased risk of complications and death.[5] About one-third of older victims who were previously independent

turn into total dependents.[6] Intertrochanteric femur fractures generally result in a 12- to 20% lower expected survival rate, with a 5- to 30% mortality rate in the first year after the fracture.[7] In addition to that; intertrochanteric fractures have a significant expensive impact on contemporary medical therapy.[8]

The ultimate treatment objectives are to achieve early and long-lasting fracture union, full limb function, and fast rehabilitation.[9] Surgical treatment strives for anatomic reduction of fractures, stable fixation, reduced mortality, and early mobilization.[10] Achieving and maintaining a stable fixation in elderly patients might be challenging due to their osteoporotic bones.[10-11] Intertrochanteric fractures are typically surgically treated with the dynamic hip screw, proximal femoral nail, bipolar hemiarthroplasty, and external fixator.[12] However, there is no universally accepted method for treating hip fractures in the elderly.[13]

In certain circumstances, open reduction and internal fixation are not feasible due to the poor health status of the patients and the exceedingly high risks associated with surgery and anesthesia.[14] Traction [Hamilton-Russel traction] is an option for these patients as a conservative therapy but it has unusually significant risks of complications because of prolonged recumbence.[15] External fixation and closed reduction can be regarded as a semiconservative course of treatment in these circumstances, which was originally used to treat intertrochanteric fractures in 1943 by Anderson et al.[16]

Elderly people frequently sustain extracapsular fractures of the proximal femur after ground-level falls, especially at the level of the greater and lesser trochanters. Usually, a direct fall onto the greater trochanter or an indirect twisting injury causes these fractures. The proximal fragment frequently shifts in Varus, and the fracture line extends between the greater and lesser trochanters.[17] Understanding the patterns of these fractures and directing treatment depend greatly on their classification. Four main patterns are identified by Kyle's classification, which was created in 1994 and represents growing instability as well as the challenges of reduction and fixation. Higher types in Kyle's classification are linked to greater instability and fixation difficulty, which emphasizes the necessity of specialist timely management techniques.[18] Thus, the aim of the study is to evaluate the complication of external fixation techniques for treating closed intertrochanteric femur fractures in elderly patients at high anesthetic risk.

2-PATIENT AND METHODS

The study is a prospective interventional study. Forty patients with closed intertrochanteric femur fractures who received external fixator treatment at Al Salam Teaching Hospital in Mosul-Iraq between January 2020 and December 2024 are included in this study. The patient was first put on a standard operating table before being moved to an orthopedic table following the proper anesthetic.

To accomplish closed reduction, traction was applied to the affected limb, followed by abduction (about 30 degrees) and external rotation, then internal rotation (20 degrees). The foot was fastened in a traction boot and reduced using a Fluoroscopy C-arm. 18 patients had anatomical reduction, while 22 patients had acceptable reduction (valgus less than 10 degrees and less than 2 mm gap in anteroposterior view). A hand drill was used to insert two or three Schanz pins (4.5 or 5 mm in width and 200-250 mm in length) through a percutaneous longitudinal stab incision 5 cm below the greater trochanter along the axis of the femoral neck (130-degree angulation) across the fracture site. The inferior two Schanz pins were placed along the inferior portion of the neck and head, parallel in the anteroposterior view and central in the lateral view. The inferior two Schanz pins were placed along the inferior portion of the neck and head, parallel in the anteroposterior view and central in the lateral view. The superior Schanz pin was positioned slightly above the head and neck center. Pins were inserted 5 mm short of the subchondral bone. After stabilizing the trochanteric fracture, three 4.5 mm cortical Schanz screws of 150 mm were inserted at a straight angle to the femoral shaft, 10-20 cm from the fracture site. Reduction was assessed in both anteroposterior and lateral views.

Postoperatively, complete weight-bearing was not initially allowed. For the first 6 weeks, patients were allowed to walk with non-weight-bearing crutches and under close supervision of the physiotherapist. Partial weight-bearing was allowed after 6 weeks, followed by full weight-bearing once clinical and radiographic evidence of fracture union showed. Physiotherapy for hip and knee motion was recommended. Schanz pin sites were dressed with saline every day, and the patients' relatives received instructions for the ongoing care. Patients were discharged home on the second or third postoperative day and monitored every two weeks for hip discomfort, range of motion, pin track infection, fracture union (varus angulation), and limb shortening. The fixator was removed on an outpatient basis after 12-16 weeks using mild analgesics and sedation or local anesthesia.

The study questionnaire was divided into four parts. The first section provides demographic and trauma information of the study participants. The second part covers kyle's classification of the fractures. The third part covers anesthesia types the patient received and the last parts covers the post-operative complications of the study's patients.

Statistically analysis done by using the SPSS (scientific package for social sciences) version 30.0 software. Descriptive statistics, such as frequencies and

percentages, were used to present categorical variables in tables and figures.

3-RESULTS

The study included 40 elderly patients, of them; 24 (60%) were females and 16 (40%) were males. With male to female ratio 1:1.5. The mean age ± standard deviation of the study participants is 79.93 ± 11.12 years. It's evident that the majority of patients enrolled in the study are belonged to the age category of 65-70 years. As shown in table 3.1.

Table 3.1: Distribution of the study patients according to their ages.

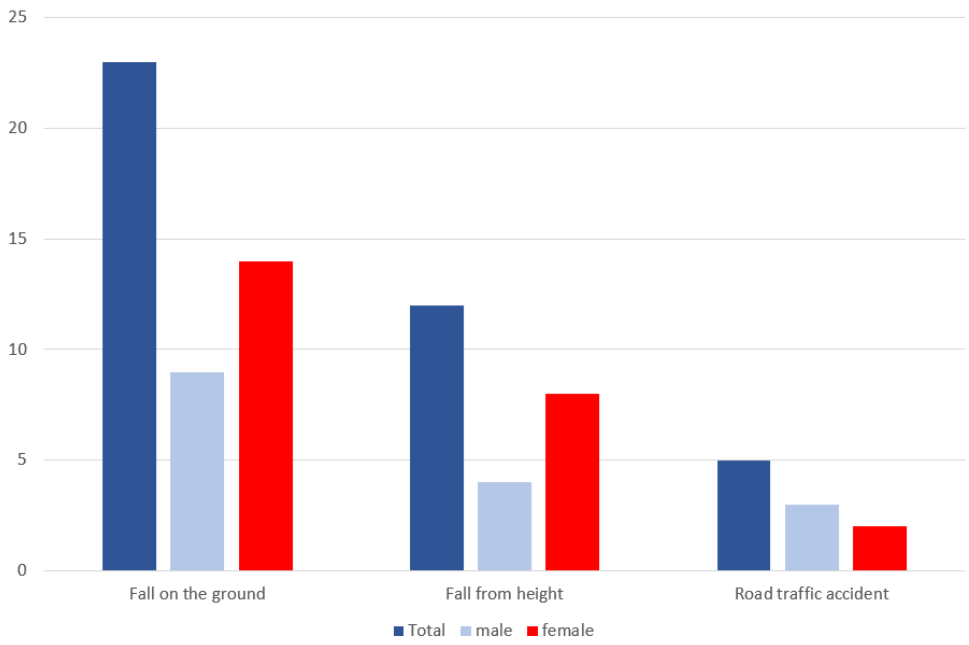
Ages	Males= 16, number (%)	Females= 24, number (%)
65-70	6 (37.5%)	7 (29.19%)
70-75	4 (25%)	6 (25%)
75-80	3 (18.75%)	5 (20.83%)
80-85	2 (12.5%)	4 (16.67%)
More than 85	1 (6.25%)	2 (8.33%)

Table 3.2 shows distribution of the study patients according to types of intertrochanteric fracture according to kyle's classification. The majority of patients (47.5%) had type 1 (stable) fracture, followed by type 2 (30%) then type 3 (17.5%) and type 4 (5%).

Table 3.2: Distribution of the study patients according to their types of fractures.

Ages	Males= 16, number (%)	Females= 24, number (%)	Total number of patients (%)
Type 1 (stable)	8 (50%)	11 (45.83%)	19 (47.5%)
Type 2 (Unstable)	4 (25%)	8 (33.33)	12 (30%)
Type 3 (Unstable)	3 (18.75%)	4 (16.67%)	7 (17.5%)
Type 4 (Unstable)	1 (6.25%)	1 (4.17%)	2 (5%)

Figure 3.1 explores distribution of the study participants according to their types of trauma, 24 (60%) patients reported fall on the ground, followed by 11 (27.5%) patients reported fall from height and lastly 5 (12.5%) patients reported road traffic accident.



The patients in this study had multiple comorbidities such as hypertension, diabetes, cerebrovascular accident, osteoarthritis, and ischemic heart disease, making them high surgical and anesthetic risk factors for open reduction internal fixation procedures or extended operation time. As a result, spinal anesthesia was done for 19 (47.5%) patients, general anesthesia for 13 (32.5%) patients and epidural anesthesia for 8 (20%) patients.

Table 3.3 illustrates postoperative complications faced the study patients. The average time needed for

completing the operation is 46.38 ± 12 minutes. No patients need perioperative blood. Additionally; during the post-operative period, all patients exhibited limited knee flexion, but this improved with follow-up visits. It's evident that the most frequent postoperative complication faced the study patients is pin tract infection, which was prevalent among 21 (52.5%) patients, 6 of them developed severe soft tissue infection and treated by intravenous antibiotics. Moreover; 11 (27.5%) patients had bed sore which were treated successfully by local antibiotics and frequent dressing, 5 (12.5%) patients developed shortening and malunion of the affected limb which was resulted from varus angulation or bone impaction, 5 (12.5%) patients had deep venous thrombosis and they are treated by low molecular weight heparin and oral rivaroxban 15 mg twice daily for 2 weeks then 20 mg once daily for 3-6 months. At the end of fourth months postoperatively, those patients are recovered. On the other hand; 1 (2.5 %) patient was unfortunately died postoperatively during the first month due to unrelated medical conditions.

Table 3.3: Postoperative complications of the study patients.

Type of complications	Number	Percent
Pin tract infection	21	52.5 %
Bed sore	11	27.5 %
Shortening and malunion	5	12.5 %
Deep venous thrombosis	5	12.5 %
Death	1	2.5 %

4- DISCUSSION

Elderly patients with high-risk comorbidities such as diabetes mellitus, ischemic heart disease, hypertension, and chronic obstructive pulmonary disease may be at serious risk for anesthesia and surgery from the traditional open reduction and internal fixation.[19] The major therapeutic priority is to ensure patient survival while avoiding age-related comorbidities and immobility.[20] Vascular chancellors bone aids in the union of fractures, preserving the neck shaft angle and allowing for ambulation.[21] External fixation is a semi-conservative option for older patients with poor general health who cannot withstand prolonged surgery. This approach maintains the fracture hematoma, which is essential for bone union.[16]

This study showed that female gender was predominant affected by intertrochanteric fracture than male, with the mean age of the study patients just closed to 80 years. These findings reflect differences in the nature and rate of bone loss, and frequency of falling events between males and females. Comparable finding was obtained from Kalliopi Alpantaki et al.[22]

From the other hand; most of the study patients had stable kyle's classification of the fracture. Additionally; most of the patients getting their fracture due to simple trauma, in other word fall on the ground, which can be explained by the fact that most of the elderly patients had osteoporotic bones. The results are going in parallel to Saif Bashar Abbas et al study findings.[23]

Regarding the given anesthesia; the study showed that spinal and epidural anesthesia were used more frequently than general anesthesia for elderly. As spinal and epidural anesthesia was associated with a lower risk of intraoperative hypotension and lower doses of ephedrine is used in older patients undergoing hip fracture surgery, which is runs with Hua Lin BM et al study conclusion.[24]

Concerning postoperative complications; about the operation last in average about 46 minutes and no patients need blood. Comparably; Hassan.M.Attia et al. found the average operative time is 47.5 minutes and no one need for blood transfusion.[25] The main postoperative complications found in the study was pin tract infection, which is occurred in more than half of the patients especially among diabetic patients. In the same way; Yu Liang et al found that pin tract infection occurred among 10 out of ten older patients enrolled in his study.[26] From the other hand; bed sore was occurred among about quadrant of the study patients which is goes with Gholam Hossein Kazemian et al study findings.[27] While shortening or malunion of femur and deep venous thrombosis occurred among 5 (12.5%) patients respectively. Higher percent was found by Saif Bashar Abbas et al[23] however, different patients' medical comorbidities and operations circumstances can lead to these differences. Only one patient died during the first postoperative month due to unrelated medical condition. Mahmood A Aljumaily et al had near result.[28]

The study's findings are limited by a convenience small sample of elderly patients from only one center, which may not be representative of all similar-aged patients.

5- Conclusion and Recommendation

Closed external fixation is recommended for older patients with high-risk intertrochanteric fractures due to its ease of use, low operation time, and few complication sequelae.

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Conflict of Intertest

About this study, the authors disclose no conflicts of interest.

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