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External fixation of intertrochanteric femur fractures in elderly patients: Functional outcome

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Abstract

Background: Intertrochanteric fractures are common extra capsular fractures of the proximal femur at the level of the greater and lesser trochanters, most commonly occurring in the elderly after falls. The treatment of this femoral fracture is a rapid, safe, and minimally invasive procedure for elderly patients with external fixation and high anesthetic risk. Objective: Evaluate the result of the external fixation devices in treatment of closed intertrochanteric femur fracture in elderly patients with high anesthetic risk.

Method: The study was conducted at the Department of Orthopaedic Surgery, Al-Kadhemia Teaching Hospital, between April 2014 and July 2017, and examined 30 cases of intertrochanteric fractures with high risk of anesthesia. The patients included 18 women and 12 men, 11 right-sided fractures and 19 left-sided fractures, and their ages ranged from 65 to 85 years. All fractures were fixed with an external fixator under general anesthesia (8 cases), neuraxial anesthesia (15 cases), epidural anesthesia (5 cases), and local anesthesia (2 cases).

Results: The average duration of the operation was 35 minutes (25-50 minutes), and no blood transfusion was required in any case. The remaining 28 patients did not die immediately after four months. Most patients had excellent and good results according to the Judet functional score. The most common complications were pin tract infection and deep vein thrombosis. The use of an external fixator significantly reduces blood loss, shortens the operation time, eliminates the need for surgical incisions other than the slotted incision for the insertion of the pins, reduces postoperative pain, and shortens hospital stay.

Conclusion: For elderly patients with high anesthetic risk, external fixation of intertrochanteric fractures is a rapid, safe, and minimally invasive procedure with few preoperative and postoperative complications.

Keywords: External, fixation, intertrochanteric, femur, fractures, elderly patients.

Introduction

Extracapsular fractures of the proximal femur, particularly at the level of the greater and lesser trochanter, are commonly seen following ground-level falls in the elderly population. These fractures typically occur due to an indirect twisting injury or a direct fall onto the greater trochanter. The fracture line extends between the greater and lesser trochanter, with the proximal fragment often displacing in Varus ^[1]. The classification of these fractures is crucial for understanding their patterns and guiding treatment. Kyle's classification, established in 1994, identifies four basic patterns that reflect increasing instability and the difficulty associated with reduction and fixation ^[2]. These types range from Type 1 to Type 4, with Types 1 and 2 accounting for nearly 60% of cases. The reverse oblique type, a subgroup of Type 4, poses similar challenges in fixation ^[3]. Patients with extracapsular proximal femur fractures typically present with an inability to stand, usually following a fall or similar injury. The demographic is predominantly elderly, with the condition manifesting as localized pain in the proximal thigh, exacerbated by attempts at hip flexion or rotation, whether passive or active ^[4]. Physical examination often reveals a shortened limb that is more externally rotated than seen in transcervical fractures due to the extracapsular nature of the injury. This condition significantly limits the patient's ability to lift their leg ^[5]. Understanding the complexity and classification of these fractures is essential for effective treatment. The increased instability and fixation difficulty associated with higher types in Kyle's classification highlight the need for specialized management strategies.

These fractures not only impact the physical health and mobility of elderly patients but also pose significant challenges in orthopedic treatment and rehabilitation, emphasizing the importance of timely and appropriate medical intervention [6, 7].

Objective

Evaluate the result of the external fixation devices in treatment of closed intertrochanteric femur fracture in elderly patients with high anesthetic risk.

Methods

In this study there are thirty patients with closed intertrochanteric fracture of the femur were treated by external fixator between April 2014 and July 2017 in Al Kadhemia teaching hospital. The patient was initially placed on a standard operating table, and after appropriate anesthesia, transferred to an orthopedic table. Closed reduction was achieved by traction on the affected limb, abduction (about 30 degrees), and external rotation, followed by internal rotation (about 20 degrees). The foot was then secured in a traction boot, and reduction was checked using a Fluoroscopy C-arm, resulting in anatomical reduction in 13 patients and acceptable reduction in 17 patients (valgus less than ten degrees and less than 2mm gap in anteroposterior view). Through a percutaneous longitudinal stab incision 5 cm below the tip of the greater trochanter, two or three Schanz pins (4.5 or 5 mm in width and 200-250 mm in length) were introduced across the fracture site along the axis of the femoral neck (130-degree angulation) using a hand drill. The inferior two Schanz pins were parallel in the anteroposterior view and central in the lateral view, positioned along the inferior part of the neck and head. The superior Schanz pin was placed just above the center of the neck and head. The pins were advanced 5 mm short of the subchondral bone. Once the trochanteric fracture was stabilized, three 4.5 mm cortical Schanz screws of 150 mm were introduced at a right angle to the femoral shaft, 10-20 cm from the fracture site. Reduction was checked in anteroposterior and lateral views. Postoperatively, full weight-bearing was not permitted initially. Patients were allowed non-weight-bearing crutch walking with physiotherapist assistance and close observation for the first 6 weeks. Partial weight-bearing was permitted for the next 4 weeks, with full weight-bearing allowed after clinical and radiological signs of fracture union appeared. Physiotherapy for hip and knee motion was advised. Daily dressing changes for Schanz pin sites with saline were performed, and instructions for continued care were provided to the patients' families. Patients were typically discharged home on the 2nd or 3rd postoperative day and reviewed biweekly to monitor hip pain, range of motion, pin track infection, fracture union, malunion (varus angulation), and limb shortening. The fixator was removed at an average of 12-16 weeks on an outpatient basis under simple analgesia and sedation or with local anesthesia.

Results

The age of the patients was between 65 to 85 years and their weight between 50-85 kg, (Table 1).

Twelve of them were males and 18 were females, 11 patients had right sided fracture and 19 had left sided intertrochanteric fracture. (Table 2).

Most of the patients had simple fall or simple trauma (low energy) as a mechanism of injury, (Table 3).

Table 1: Age and sex of patients

Age of patients	male	female
65-70	4	6
70-75	5	8
75-80	0	2
80-85	3	2
Total	12	18

Table 2: Type of fractures

Type of kyle classification	male	female	Number of patients
Type 1 (stable)	7	10	17
Type 2 (unstable)	3	8	11
Type 3 (unstable)	2	0	2
Type 4 (unstable)	0	0	0

Table 3: Type of injury

Type of injury	Number of patients
Fall from high	9
Fall on the ground	17
Road traffic accident	4
Total	30

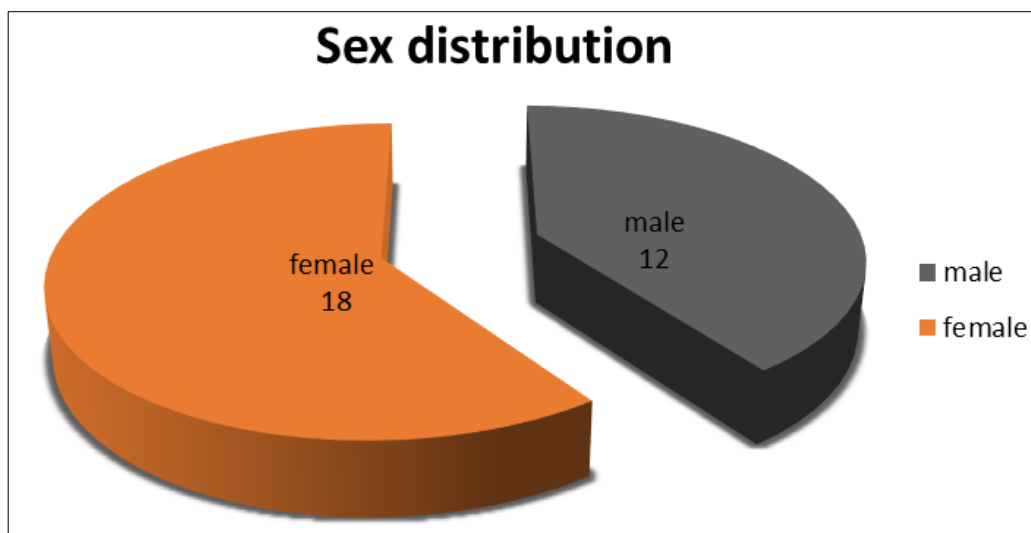
The patients in this study had high surgical and anesthetic risk factors for an open reduction internal fixation procedure or for extended anesthesia (operation time) because they had more than one comorbidity disorders like hypertension, diabetes mellitus, cerebrovascular accident, osteoarthritis or ischemic heart disease. Spinal anesthesia done for (15) patients, (8) patients general anesthesia, (5) patients epidural anesthesia and (2) patients local anesthesia together with narcotic analgesia support, (Table 4).

Table 4: Types of anesthesia

Type of anesthesia	Number of patients
Spinal	15
General	8
Epidural	5
Local anesthesia	2

This study shows that female affected more than males as in graph 1.

The average age in this series was 75 years (65-85 years). The average time of operation was 35 minutes (25-50), no one needs blood transfusion. No mortality in immediate post-operative period but two died after 10 days of operation because of co morbid disease and they excluded from the follow up. The rest 28 of cases were evaluated for rate of union by clinical and radiological signs, pin track infections, Varus misalignment, shortening of the limb, hardware failure and hip and knee range of motion, and developing general complication as deep veins thrombosis and bed sores. In post-operative period, all patients had limited flexion of the knee, recovery was seen during follow up. Seven patients developed deep veins thrombosis and treated by low molecular weight heparin and Warfarin for 6 months. Two of them need hospital admission. Twelve patients had bed sores, all cases are treated successfully with local antibiotics and daily dressing. Fourteen patients developed pin tract infection; two patients of them developed severe soft tissue infections and needs parenteral antibiotics. Nine patients had an average limb shortening of 15 mm (10-30 mm) resulted from impaction and Varus angulations, (Table 5).



Graph 1: Sex distribution

Table 5: Types of complications

Types of complications	Numbers of patients	%
Pin tract infections	14	50
Bed sores	12	43
Shortening and Malunion	9	31.5
Deep venous thrombosis	7	24.5
Hardware failure	0	0

Discussion

Intertrochanteric fractures of the femur are common and significant fractures in the elderly, primarily due to their impact on mobility and overall health. The primary goal of treatment for these fractures is to achieve bone union in a good position with minimal blood loss, discomfort, mortality, hospitalization time, and cost. In elderly patients with high-risk comorbidities like hypertension, ischemic heart disease, diabetes mellitus, and chronic obstructive pulmonary disease, the conventional open reduction and internal fixation can pose significant anesthetic and surgical risks^[8]. The primary treatment objective is patient survival, minimizing complications related to age and immobilization. Union of these fractures is facilitated by vascular cancellous bone, with the goal being to maintain or reconstitute the neck shaft angle and secure it to allow ambulation^[9]. External fixation presents a semi-conservative alternative for elderly patients in poor general condition who cannot tolerate prolonged surgery. This method preserves the fracture hematoma, crucial for bone union^[10]. Kostas Kazakos *et al.*^[11] treated 56 elderly high-risk patients with intertrochanteric fractures using the Citieffe/Ch-N external fixator, noting short operative times (37 minutes), no need for preoperative blood transfusion, short hospital stays, and rapid mobilization. Union was achieved in all patients within six months, with a mortality rate of 16.1% at six months and 20.4% at twelve months. Subasi *et al.*^[12] evaluated 33 patients (average age 65.9 years) treated with external fixation, achieving complete fracture healing in all patients. The mortality rate was 39% within six months' post-surgery, with some instances of varus malalignment and pin-tract infections. The external fixation allowed early mobilization and was easily removed, making it suitable for high-risk elderly patients. Dr. Naveed Bashir Wani *et al.*^[13] managed 48 high-risk patients (average age 79.5 years) with closed reduction and external

fixation under local anesthesia, supported by analgesics, achieving good outcomes. Vossinakis *et al.*^[14] compared pertrochanteric external fixator (PF) with sliding hip screw (SHS) in a randomized study of 100 patients, finding no significant differences in mortality, fracture healing, or functional outcomes. The external fixator method was deemed an effective and safe alternative. Suhail Afzal *et al.*^[15] treated 12 patients with intertrochanteric fractures using external fixation, achieving good fixation and early ambulation with minimal blood loss. One case of pin-tract infection and pin loosening was reported, with an average union time of 16 weeks. Possible complications of external fixation include pin-tract infection, limb shortening, and varus malunion, but these occur at low rates. The study demonstrated that external fixation provides semi-rigid stability advantageous for unstable intertrochanteric fractures, with minimal surgical trauma, satisfactory stability, and early weight-bearing. External fixators can be applied under local anesthesia, suitable for patients with poor general health. After fracture union, the fixators are removed in an outpatient setting under analgesia and sedation^[16].

Conclusion

For elderly patients with high-risk intertrochanteric fractures, it is best to limit the use of closed external fixation because it is simple and quick to use (short operation time) and has few complications.

Conflict of Interest

Not available

Financial Support

Not available

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