

## Treatment Intertrochanteric Fracture of Femur in Elderly by External Fixation: Prospective Case-Series Study; Ibn-Sina Training Hospital, Baghdad

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### Abstract

<b>Background</b>	Internal fixation is gold standard in treatment of intertrochanteric fractures, but in patients with anesthesia or surgical hazards the external fixation should be explored as a safe approach to reduce operative time and complications risk.
<b>Objective</b>	To assess the outcome of external fixation of an intertrochanteric fracture in elderly patients with co-morbidities.
<b>Methods</b>	Twenty-eight elderly patients with non-pathological fractures, closed, who were 65 years old or older, unsuited for surgery for a long period, and had chronic uncontrolled medical problems such as hypertension, diabetes mellitus, or heart disease were included in the study. Criteria for exclusion include reverse obliquity fractures, dementia, pathological fractures and prior hip fractures. Those patients treated with percutaneous external fixation under image intensifier from 2015 to 2020 in Ibn Sina Training Hospital in Baghdad.
<b>Results</b>	At 1-year follow-up, 80% returned to pre-fracture ambulatory status. Average time to fixator removal was 12 weeks. There were no cases of pin loosening, breakage, or penetration of femoral head. All patients were evaluated clinically and radiologically for 24 months except 3 patients, 2 died 6 months' post-operative due to causes unrelated to the surgery, and 1 lost follow up 3 months after surgery. Excellent and good results were found in 8 patients. The time of radiological union and fixator removal about 12 weeks. Pin tract infection occurred in most of the patients. Varus malalignment occurred in 20% of patients. Shortening ranged from 0 to 3 cm.
<b>Conclusion</b>	External fixation of intertrochanteric fractures in elderly high-risk patients is a dependable, successful, and safe therapeutic option.
<b>Keywords</b>	Intertrochanteric fracture, external fixator, elderly patient
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**List of abbreviations:** None

### Introduction

In the elderly, intertrochanteric fractures are most commonly caused by low-energy trauma (such as mild falls). At least 30% of beds in orthopedic institutes are occupied by patients with this type of fracture (1-3). These

fractures are more common in elderly, especially those over 65 years, because bone mass loss (osteoporosis) is much larger (4-5).

The most important goals of treatment for intertrochanteric fractures are to mobilize the patient in a short period of time and guarantee proper union (6). Surgical procedures are the only way to attain these goals. Internal fixation

is the gold standard treatment for osteoporosis. Implant failures and mal-unions are common in patients treated with internal fixation<sup>(5,6)</sup>.

Many internal fixation devices have been employed, including angulated plates, gamma nails and sliding hip-plates.

Intertrochanteric fractures are particularly common in individuals with poor general health who are unable to endure general anesthesia or who are unable to undertake invasive procedures due to chronic conditions. It is not possible to treat such individuals with long-term immobilization due to the risk of decubitus ulcers, pneumonia, urinary tract infections, deep vein thrombosis, and cardiac problems<sup>(5-9)</sup>.

For the first time in 1943, Anderson et al. used external fixation to treat fractures of the intertrochanteric area<sup>(10)</sup>. External fixators were developed, and new materials such as hydroxyapatite-coated pins were introduced, prompting surgeons to reconsider external fixators as an alternate option for treating intertrochanteric fractures in older high-risk patients<sup>(11)</sup>.

This study aimed to assess the effectiveness of external fixation in treatment high risk elderly patients with intertrochanteric fracture.

## **Methods**

From March 2015 to March 2020, 28 elderly patients with intertrochanteric fractures were operated on with external fixation and followed up.

There were 15 males and 13 females, with 15 having right side fractures and 13 having left side fractures, 18 had stable fractures and 10 unstable fractures (classified according to intact posteromedial cortex or not). Patients with non-pathological fractures, closed, who were 65 years old or older, unsuited for surgery for a long period, and had chronic uncontrolled medical problems such as hypertension, diabetes mellitus, or heart disease were included in the study.

Criteria for exclusion included reverse obliquity fractures, dementia, pathological fractures and prior hip fractures.

The patients ranged in age from 66 to 81 years old. Traffic accidents caused 8 fractures, while falls caused 20. Following hospitalization, the patients were operated on an average of 3 days (1 to 6 days).

## **Surgical Procedure**

An hour before surgery, intravenous wide spectrum antibiotics were given. Under C arm supervision, the patient was putting in supine position on orthopedic traction table. Anesthesia is administered by spinal or epidural anesthesia or local nerve block.

On the fractured side, reduction was performed by placing the limb into 20°-30° abduction and 10°-15° internal rotation, acceptable reduction depending on restoring the Shenton line by AP view.

The first pin with the proper neck-shaft angle and ante version angle under fluoroscopy was put into the femoral neck through a tiny incision at the base of the greater trochanter, across the fracture site. A couple of pins were installed. The pin heads were spaced 10 mm apart from the joint line. allows the proximal pins to be inserted at a 135° angle to the fixator's stem. Three 5-mm pins were placed into the femur's shaft in the middle third. The frame was tightened and the final position was confirmed (Figure 1).

Antibiotics and analgesics were administered for three days, and anticoagulants were prescribed during the non-weight bearing period. Radiographs in AP and lateral views were taken. The average length of stay in the hospital after surgery was 4 days (range 3-5 days). On the first postoperative day, active hip and knee exercises were begun. On the second or third day, the patients were mobilized with partial weight-bearing using a walker. Patients were required to visit the out-patient clinic every two weeks during the first month, then every month after that for clinical and radiological evaluations until the frame was removed when the patient can fully weight bearing without pain at fracture site.



**Figure 1. A and B position of patient in the theatre with c arm. C and D pre and postoperative x-ray**

### Results

The time of follow-up was 24 months. Only twenty-five of the 28 operated patients (13 females and 12 males) were clinically and radiographically evaluated; two patients died due to causes unrelated to surgery within the first six months and one patient lost to follow-up.

Data about side and mode of fracture were collected and summarized in table 1. Thirteen patients of participants have right side fracture. In 28% of patients the cause was road traffic accidents. Regarding morbidity, the highest percentage has diabetes mellitus 36%.

**Table 1. Basic characteristics for participants shown as frequency and percentages**

Variable		Frequency	Percentage
Gender	Male	12	48
	Female	13	52
Age distribution (yr)	66-70	12	48
	70-73	6	24
	73-81	7	28
Side of fracture	Right	13	52
	Left	12	48
Mode of fracture	Road traffic accidents	7	28
	Fall on ground	5	20
	Fall from height	8	32
	Others	5	20
Co-morbidities	Diabetes mellitus	9	36
	Ischemic Heart Disease	6	24
	Hypertension	3	12
	Renal Failure	4	16
	Others	3	12

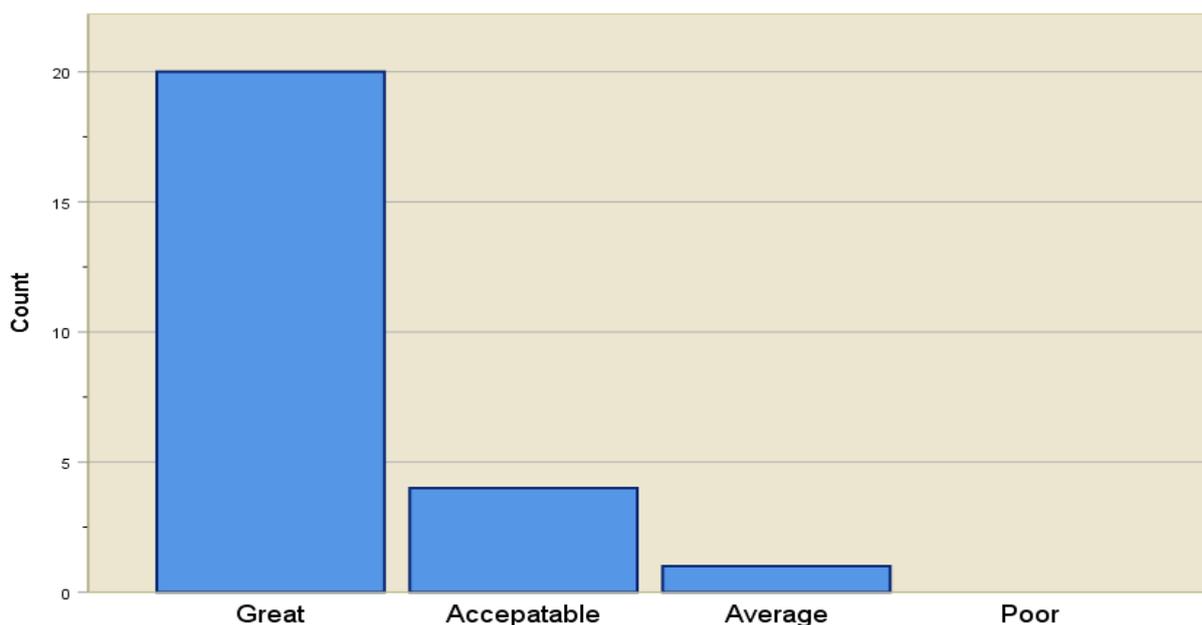
Other data as time interval between injury and union are summarized in table 2. surgery, hospital stay, surgery time and time to

**Table 2. Basic characteristics shown as mean with minimum and maximum value**

Variable	Mean	Minimum	Maximum
Age (yr)	71.7	66	81
Injury to surgery time (day)	2.72	1	6
Hospital stay (day)	2.6	1	5
Surgery time (minute)	51.8	40	70
Time to union (week)	14.4	10	31

At one year, 18 of 25 followed patients (72%) had regained their normal functional status and were able to walk with the use of a cane. At the final follow-up, five of the 25 patients (20%) who were not utilizing mobility aids preoperatively required a cane or walker.

Judet's grading system was used to grade the functional results <sup>(12)</sup>. There were 20 (80%) great results, 4 (16%) acceptable results, 1 (4%) average result and no poor outcomes as shown in (figure 2).



**Figure 2. Judet's grading for patient after 24 months of surgery**

Five patients (20%) experienced quadriceps muscle wasting, which was reversed after an intensive physiotherapy treatment. Because

trochanteric fractures originate through the vascular cancellous bone, non-union is uncommon.

Coxa vara deformity and length disparities between extremities were noted on AP pelvic x-rays. Nine patients had varus malalignment less than 10 degrees, 5 patients had more than 10 degrees, and 11 patients had no varus angulation. Impaction and varus deformity

caused shortening in 5 cases ranging from 0 to 3 cm.

The time to begin full weight bearing varied from 6 to 16 weeks, with an average of 12 weeks. In outpatient clinics, the time it took to union and remove the fixator about 10 to 16 weeks (Figure 3).



**Figure 3. A patient before and after the frame was removed three months after surgery**

All patients had pin tract infection to varying degrees, which were treated with antibiotics and daily dressings and were totally cured, with the exception of 5 patients who had moderate pin tract infection, for whom early removal was required to control infection.

There were no instances of pin loosening or femoral head penetration.

The fixator was well accepted, and no patient had any problems sitting or lying down with it (Figure 4).



**Figure 4. After surgery, A. series of x-rays. B. a patient who is standing and walking with external fixation**

### Discussion

One of the most common fractures among the elderly are trochanteric hip fractures, and they are a primary cause of fracture-related death and disability<sup>(13)</sup>. These fractures have a high mortality rate (up to 50%) when treated conservatively.

Except in severely sick or non-ambulatory patients, surgical management is required up to 60%)<sup>(14,15)</sup>.

Geriatric individuals with accompanying medical conditions are high-risk patients for surgery, and every effort should be made to shorten operating time, reduce hospital stay, and allow early mobilization of these patients.

We prospectively follow up on our experience utilizing external fixation to treat elderly patients with trochanteric fractures. We discovered that majority of our patients' functional outcomes at one year were good to excellent, with 80 percent returning to pre-fracture functional levels, as shown in prior trials<sup>(16-20)</sup>.

The modified Hamilton Russell traction is the most effective conservative therapy approach. It necessitates the patient's hospitalization for

at least 2 to 3 months, and problems are possible. This is not feasible in most developing countries since it requires a high hospital bed occupancy rate. External fixation may thus be an appropriate therapeutic option for patients who are at a high risk of surgical complications. Although open reduction and internal fixation of trochanteric fractures is the standard method, there is a high risk of anesthesia or postoperative problems in patients at risk, such as those with ischemic heart disease, chronic pulmonary disease, diabetes mellitus, or severe anemia. The use of a sliding hip screw for intertrochanteric fracture stabilization has been linked to a 4% to 12% loss of fixation rate<sup>(21,22)</sup>.

External fixation also has the advantage of being able to be applied under local anesthesia for patients with poor general health<sup>(23)</sup>. There were no intraoperative problems, as described in prior investigations<sup>(24,25)</sup>.

In line with prior research, the average intraoperative time for applying the fixator was short (50 minutes) when compared to alternative internal fixation surgical procedures<sup>(23,26)</sup>.

Blood transfusions were not required because blood loss during surgery was minimal compared to other surgical procedures (23,26). External fixation gear is also less expensive than other internal fixation devices and is readily available in all hospitals.

Due to osteoporosis, gradual weight bearing was postponed for 6-12 weeks after surgery to avoid fracture displacement, implant failure, collapse, Varus malalignment, and femoral head penetration. This differs from what was reported by Refaat et al. (27). In stable fractures, partial weight bearing was started as soon as the patient was able, while in unstable fractures, it was started after 6 weeks.

Union took an average of 12 weeks, ranging from 10 to 16 weeks. This is consistent with the findings of numerous writers, such as Subasi et al. (19) and Catagni et al. (26) who reported union at 10-18 and 10-12 weeks, respectively.

When compared to gold standard internal fixation techniques that may require general anesthesia, the ability to immediately place an external fixator using local anesthetic and remove it in an outpatient clinic offers it a worthy alternative in elderly, high-risk patients with trochanteric fractures (16).

A common consequence has been documented to be pin-track infection (18). When hydroxyapatite coated pins are used instead of normal pins, the incidence of pin-track infection is reduced (16).

Regular saline washes, antiseptic dressings, oral antibiotics, and finally the removal of pins and frame following full fracture union were used to treat 18 patients (72%). Pin-track infection occurred in 15 of their 50 patients (30%) treated with the Orthofix external fixator using normal pins, according to Vossinakis and Badras (16) Pin-track problems were found in 45 percent and 60 percent of people in previous studies (11).

The majority of the high-risk, elderly patients in our study had poor bone quality. Varus angulation of an average of 10 degrees was observed in 8 of the 25 instances (32%), which is similar to prior findings (20). External fixation improves fracture stability in stable trochanteric fractures by increasing callus formation, and it improves load sharing in

unstable trochanteric fractures by promoting tension band effect (21).

In conclusion, minimal surgical trauma, low cost, short operative time, minimal anesthetic complications, preservation of fracture hematoma, negligible blood loss, and possibility of application under local anesthesia, frame adjustment, short hospital stay, and removal are all advantages of using external fixator in intertrochanteric fracture in elderly high-risk patients.

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### Author contribution

Dr. Alsudany: Manager of Ibsina Orthopedic Training Center, surgeon, study designer and writing manuscript. Dr. Alhamashi: Surgeon and data collector. Dr. Al-Abbody: Surgeon and data collector. Dr. Ismael: Acquiring and analyzing data.

### Conflict of interest

There are none for the authors to declare.

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