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Evaluation of the outcome of proximal femoral nail in the treatment of unstable Intertrochanteric fracture in adult

Dr. Omar Ameen Saeed

Abstract

Background & Objectives: The incidence of intertrochanteric fractures among elderly patients is expected to be increased even further with the advancing age of the population, proximal femoral nail was introduced as a method of treatment for this fracture, which is currently the most effective surgical method. The goal is to find out the role of a proximal femoral nail in treating intertrochanteric fractures and assess the advantages and complications of this treatment method.

Methods: This prospective study was conducted on seventy patients with unstable intertrochanteric fractures treated with proximal femoral nails at Erbil teaching hospital. They were followed up for one year, from (May 2016 to May 2017). Patients were examined for the union of fracture and complications clinically and radiologically. The functional outcome was evaluated using the Harris Hip Score.

Results: Total number of 70 patients were included in this study, 44 (62.85%) were females, and 26 (37.15%) were males. The mean operative time was (90.885 min. ±11.38SD). Infection developed in (1.42%) of the patients. The most common complication was Varus malalignment which was found in (5.7%) of the cases. Harris Hip Score-based findings were excellent-good in (85.7%) of patients.

Conclusion: Proximal femoral nail is a relatively effective treatment possibility for most unstable intertrochanteric fractures with good biological stabilization, better short-term outcomes, and minimal complications.

Keywords: Adult, Proximal femoral nail, Unstable intertrochanteric fractures.

Introduction

The Association for Osteosynthesis /Association for the Study of Internal Fixation party (AO ASIF) developed the proximal femoral nail in 1998, proximal femoral nail has many generations Ex. (proximal trochanteric nails PTNs,

M.B.Ch.B, F.I.C.M.S.(ortho)
Department of Surgery, College of Medicine, Hawler Medical University.
Email: omar_jola@yahoo.com

proximal femoral nail with anti-rotation screw PFNA and Gama3 nail) we used PFNA type which has become a method of treatment of intertrochanteric fractures because it was improved by the addition of an anti-rotation hip screw proximal to the main leg screw. However, both benefits and technical failures of the proximal femoral nail have been reported. The effects of the proximal femoral nail in the treatment of intertrochanteric fracture have been reported.[1]

Due to increased longevity and increased incidence of road traffic accidents, the incidence of intertrochanteric fractures has increased with advancing age.[2,3]

The literature revealed from the early 1800s that intertrochanteric hip fractures were regularly healed but in Varus was malunited, leading to Varus deformity and hip abductor weakness.[4]

In 1990, 26 percent of all hip fractures occurred in Asians, Gulberg et al has predicted that the total number of hip fractures will reach 2.5 million by 2025 and 4.5 million by 2050 which means 37% and 45% successively.[5,6]

Nonsurgical treatment of intertrochanteric fractures, however, due to related medical problems, had severe, excessive morbidity and mortality.[4]

Intertrochanteric fractures are involving the upper end of the femur through and between the greater trochanter and the lesser trochanter accurse.[1] Both gluteus medius and minimus are inserted into the greater trochanter, while the iliopsoas is inserted into the lesser trochanter .[5,6]

Biomaterial and Biomechanics of Proximal femoral nail, in addition, an added 6.5 mm anti-rotational hip pin is mounted in the upper half of the femoral neck through the proximal part of the nail to prevent the rotation of the head-neck fragment. Distal locking with the locking hole round or oval is either static or dynamic to avoid entry into the nail's shaft, because of its intramedullary placement and excessive sliding inhibition, it has biomechanical advantages in treating unstable intertrochanteric fractures.[7, 8]

Mechanism of injury increased bone fragility in the intertrochanteric region of the femur is a result of the following factors; Diminished muscle strength and tone in the region because of the aging process, Benign and malignant tumors can also contribute to the compromised bony structure along with metastases.[9] Direct trauma or torsional force transferred to the intertrochanteric area through the thigh may result in a fracture when the forces in this region are greater than the bone's strength .[10]

Other causes like road traffic accidents (RT) or falls from height (FFH) are the 2nd common causes of unstable intertrochanteric fractures, especially in younger patients.

The intertrochanteric fractures, A1 are commonly described as stable fractures. A2 and A3 are usually unstable.[11]

Deep vein thrombosis (DVT) and joint stiffness are common complications, particularly in untreated elderly patients, because of long immobilization.[10,11]

Deformity and malunion: if the fracture is healed with excessive shortening, rotation, the extremity of extreme Varus angulation resulting in reduced mobility and eventual disability, Weakness, and usually, wit couple of exceptions, all trochanteric fractures are treated with surgery .[12]

The aims of the study were to report and evaluate the efficacy of proximal femoral nails in selected cases of intertrochanteric femoral fracture (85.7%).to assess time to weight-bearing, time to union, and post-operative complications.

Patient and methods

A prospective case series study was conducted at Erbil teaching hospital, from 1st ' of May 2016 to the 15th of May 2017 on total of 70 patients; 44 (62.85 %) of patients were female and 26 (37.15 %) were male, with a female-to-male ratio of 1.69. This study included patients of 40-65 years of age with a mean age (60+- 4.79 SD).

All patients were presented with closed unstable intertrochanteric fracture femur (type A2, A3 according to A/0 classification). Patients with open fractures, polytrauma patients, and pathological fractures are excluded from the study.

All patients were closely examined, and detailed information was included to figure out the cause of the fracture and other diseases. Verbal and written consent was obtained from each patient before participation in the study. The pelvis radiograph was taken with both hips, Skin traction has been applied to all cases. All patients were sent for a full investigation and 500 – 1000 cc of blood was prepared for all the patients pre-operatively. Antibiotics (I gram ceftriaxone) was given to the patient one hour before the surgery. Anatomical alignment of the fracture or a valgus type of reduction was considered an acceptable reduction, which provides immediate stability and Poor reduction was that with no medial cortical contact and Varus malalignment of more than ten degrees compared to the opposite side.

The important parameters were assessed; Demographic characters, Operative time, Time for radiological union, Time for partial and full weight-bearing, and Complications Post-operative. Harris hip score;[13] was used to evaluate the impact of hip fractures on the quality of life of patients, this method was applied considering the return of the patient or not to all the activities that used to perform before the accident: < 70 = Poor, 70 — 79 = Fair, 80 — 89 = Good, 90 — 99 = Excellent.

Operative technique in proximal femoral nail under anesthesia closed reduction done for the fracture site by traction and internal rotation kept by the orthopedic table and confirmed by the C-arm in AP and lateral views, the limb was scrubbed then painted and draped under sterile condition.

Figure (1): patient position with C-arm in between the legs.

Marking of the greater trochanter and the iliac crest was done with a sterile marker pen. A longitudinal incision was done by about 3-5 cm over the greater trochanter with an incisional length of about 3-4 cm. The entry point was found by the C-arm at the tip of the greater trochanter. Using an awl, the entry point was formed, and a guidewire was inserted down to the shaft.

Figure (2): Entry point by the awl.

In most cases, Guidewire is inserted and confirmed by reaming on AP and lateral views. Nail diameter was calculated by calculating the diameter on AP X-ray under fluoroscopic guidance, after which a proper size nail was inserted. After the proximal screws are inserted into the femoral neck, the traction at the fracture site was reduced and the distal screw was inserted. Then the wound was closed.

Figure (3): proximal and distal screws insertion.

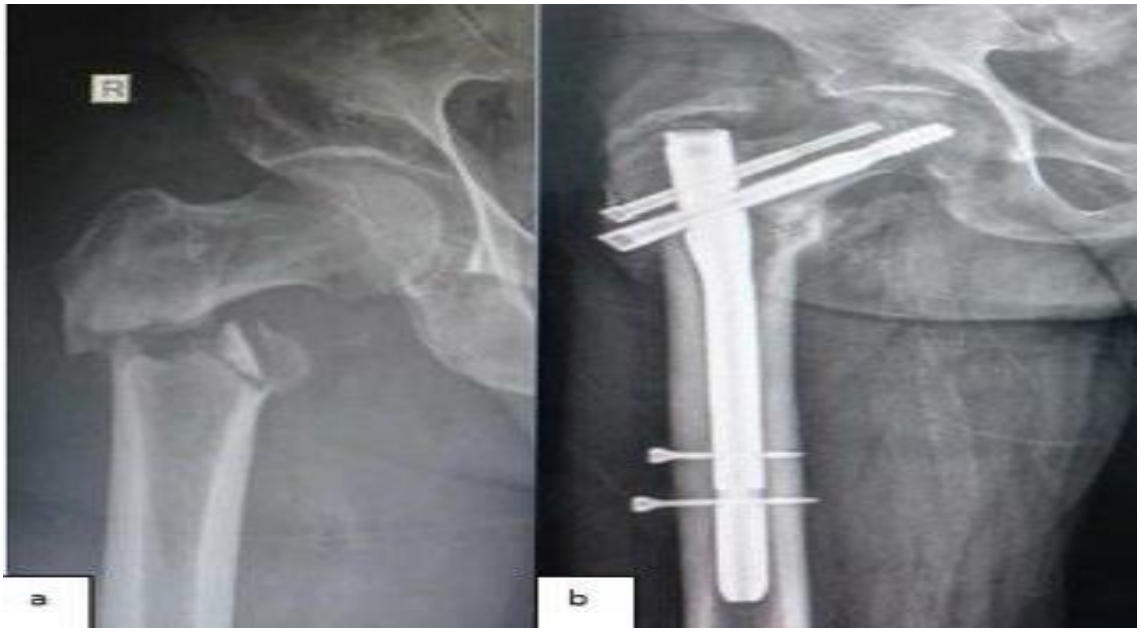

Figure (4): (a) is showing X-ray of 60 years old female with intertrochanteric fracture before operation**,** (b) is showing X-ray 6 weeks after operation

Injectable Antibiotics (ceftriaxone) which was started preoperatively and postoperatively for 5 days. Subcutaneous low molecular-weight heparin was given to all patients for 14 days. In the current study, all patients are treated using physical therapy such as early mobilization Patients were encouraged to sit with 90 degrees of hip flexion, ankle, and calf exercises from day one, and mobilized weight-bearing starting from the second postoperative day.

The study was approved by the ethics committee of Hawler medical university, college of medicine.

Data were analyzed using statistical package for social science (SPSS) version 19 computer software. Descriptive statistics were used to evaluate the results of the study

Results

Of the study sample of 70 patients: 44 (62.85%) patients were females and 26 (37.15%) were male

, with the female to the male ratio being 1.69. The patients' age was 40-65 years with a mean age of 60 + 4.79.

The current study revealed that 46 (65.7%) of the patients had right-sided fractures while only 24 (34.3%) of the patients had left-sided fractures. Regarding the mechanism of injury, the results showed that 60 (85.7%) of the patients, were subject to falls, while 10 (14.3%) of patients were subjected to road traffic accidents Table (1).

Table (1). Socio-demographic chart of the study samples.

Variable	No.	%
Gender		
Female	44	(62.85)
Male	26	(37.15)
Fracture side		
Right	46	(65.7)
Left	24	(34.3)
Mechanism of injury		
Fall	60	(85.7)
RTA	10	(14.3)
Total	70	100

In the current study, 56 (80%) of patients were allowed partial weight-bearing within 2nd postoperative day with walking aid. In patients having proximal comminution, lateral wall deficiency, and severe osteoporosis, Partial weight-bearing was delayed because there was a risk of post-operative collapse at the fracture site in these patients.

The study showed that 60 patients (85.7 %) were allowed full weight-bearing without support within 12 weeks after surgery and 10 patients (14.3 %) were allowed full weight-bearing after 12 weeks.

In this study, the fracture line was visible on x-rays in only fourteen (20%) of patients, while 56 of patients (80%) showed radiological union at six months follow-up Table (2).

Table (2). Time to the radiological union at six months.

Fracture line	No.	%
Visible	14	(20.0)
Not visible	56	(80.0)
Total	35	(100.0)

Table (3). Limb length discrepancy at six months follow-up.

Discrepancy	No.	%
Normal	52	(74.3)
<1cm	14	(20.0)
> 1cm	4	(5.7)
Total	70	(100.0)

The study revealed that 38 patients (54.28%) had excellent results and 22 patients (31.42%) had satisfactory results. All of them performed their routine normal activity well, 6 patients (8.6%) obtained fair results, and 4 patients (5.7%) had poor results Table (4).

Table (4). Results based on Harris Hip score.

Results	No.	%
Excellent	38	(54.28)
Good	22	(31.42)
Fair	6	(8.6)
Poor	4	(5.7)
Total	70	(100.0)

The current study revealed that there was only one case that developed postoperative superficial surgical site infection. This infection was treated with daily dressing & intravenous Antibiotics for 14 days, Implant failure in form of back out of anti-rotation screw was reported in one patient which was attributed to deficient lateral wall, proximal comminution & lack of medial wall continuity, this patient was treated by screw removal and the patient was doing well. The study showed that 4 patients (5.71) have Varus collapse of fracture on the follow-up, Table (5).

Table (5). Post-operative complications.

Local complication	No.	%
Screw back out	1	(1.42)
Malunion	1	(1.42)
Infection	1	(1.42)
Abductor weakness	3	(4.28)
Varus Malalignment	4	(5.71)
Total	10	(14.25)

Discussion

Proximal femoral fractures are a concern for orthopedic surgeons, particularly in elderly people with osteoporosis. The dynamic hip screw became the preferred implant for the treatment of stable intertrochanteric fractures, while a problem stays the ideal implant for treating unstable fractures. According to this study, a proximal femoral nail with an anti-rotational screw is an ideal osteosynthesis tool as it can be quickly mounted, supplies angular and rotational stability, and allows early weight-bearing on the affected side.

The current study showed that 85.7% of fractures were due to simple falls while 14.3% were due to RTA, this goes with the study which was conducted by Shamir, et al.[9]who showed in a study on 63 patients that

90.5% of fractures were low energy trauma and 9.5% were due to high energy trauma.

The present study revealed that 37.15% of patients were males and 62.85% were females, with a female-male ratio1.69:1, this goes with the study conducted by Shamir, which showed 24(38%) males and 39(62%) females with a ratio of 1.6:1.[14-15]

The current study shows the mean age of patients was 60-+4.79SD, this differs from the study, which was done by Kristek, which showed a mean age of patients 73.4, this difference may be attributed to a difference in the socio-demographic characteristics of the study samples.[16]

The current study finds the meantime of operation was (90.885 min. 111.38SD), which is longer than the study conducted by Sreeraj, et al.[17] Which revealed the mean operative time as 80 minutes; this difference may be due to that they were more familiar with using the Proximal femoral nail for intertrochanteric fractures treatment.

The current study revealed that one patient developed a superficial infection which stands for 1.42% of the patients, which is less than the study presented by Sreeraj, et al.[17] who studied 70 patients with 2 (3%) of the cases developed an infection, one case with superficial infection and the second case with deep infection.

Post-operative assessment done by using the Harris Hip Score Grading, the study showed that approximately 36 (54.28%) patients had excellent results and 22 (31.4%) patients with superior results, all of them performing their routine normal activity well, (8.57%) of patients were having fair results and (5.71%) went with poor results. These results were comparable with Sreeraj, et al .[17] which showed 36(51.42%) patients with excellent results, 22(31.42%) patients with superior results, seven (10%) patients with fair results, and five (7.14%) with poor results.

The most common difficulty met during surgery was the localization of the correct entry portal over the greater trochanter, especially in the comminuted cases, therefore an excellent quality orthopedic table and intraoperative imaging are necessary to enable adequate limb adduction so that, the awl can be guided in the proper direction.

This study is not without limitations. (there is no control group in this study). The results would have been much validated if this study was done on a larger sample size; the relatively short duration of follow-up is another limitation of this study.

Conclusions

The proximal femoral nail is a minimally invasive device that is a good option for treating unstable intertrochanteric fracture femur as it has greater resistance to cut out and Varus collapse, less surgical trauma, without excessive soft tissue dissection or evacuation of fracture hematoma, early active mobilization and weight-bearing, relatively short operative time , minimum complications and noticeably short hospital.

Conflict of interest

There was no conflict of interest.

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