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Trochanteric femoral fractures treated by proximal femoral nail, a review of 110 cases

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Abstract
Intertrochanteric fractures are one of the most common fractures in osteoporotic individual. It is associated with high rates of morbidity and mortality. Management of Intertrochanteric fractures causes more burden to the any orthopaedics center across the country and its create a great surgical dilemma for orthopaedician. The treatment options have evolved over time from conservative management of such kind of fractures to use of cephalomedullary nails (PFN). This study was conducted to study outcome of Trochanteric femoral fractures treated by Proximal Femoral Nail. 110 patients were included in the study.

Keywords: Intertrochanteric fractures, PFN, comminuted fracture proximal femur, unstable fracture proximal femur

1. Introduction
Intertrochanteric fractures are one of the most common fractures encountered in an any Orthopaedic trauma centre across the country, with most of the patients aged ranges from 45 to 83 years. Though many treatment modalities have been proposed, none have proved as definitive method [1]. Plan of management depends on type of fracture, patient age, and time of consultation and finally skills of the surgeon. Various treatment modalities have been tried by various surgeons including conservative techniques, cephalomedullary nails and sliding hip screws. [2, 3]. There have been a lot of controversies exist between superiority of DHS and PFN for the treatment of comminuted intertrochanteric fractures, but none have been definitely proven as better [2]. Proximal Femoral Nail (PFN has been a relatively recent introduction for the treatment of unstable intertrochanteric fractures. It is very effective when the medial buttress is not maintained. The presence of a hip screw with an additional antirotation screw gives it additional stability over DHS. Shorter lever arm and reduced removal of bone are an added advantage [4]. We plan to study the results of Trochanteric femoral fractures treated by Proximal Femoral Nail in 110 patients, retrospectively, including their complications.

2. Patients and Methods
All the patients who were operated for intertrochanteric fractures with Proximal Femoral Nail in our centre between Jan 2012 to July 2016. All patients were dependents of serving Indian Army soldiers and ex-serviceman also were called up for follow up. They were divided into 3 groups 2 month follow up, 4 months follow up and 8 months follow up. Patients were examined clinically for infection, range of hip movement, gait and ability to weight bearing, deformities including rotational and coronal plane deformities. X-rays both hip were taken, both Antero Posterior and Lateral views and compared with immediate post-operative x-rays to look for signs of union, infection and other screw related complications. Patients were then encouraged for further follow up. A total of 110 patients (male and female) were operated out which 8 patients passed away due to natural reasons and 3 patients died of complication of infection. Tip Apex Distance [5] and Cleveland method [6] was used for the evaluation of placement of head screw whereas new mobility score was used for clinical evaluation of patient.

Trochanteric femoral fractures s were classified on the basis of AO/OTA classification system [7]. Fractures were classified according to the AO system, the most common fracture type was A2 (n=65), followed by A1 (n=37) and A3 (n=8). Screws tip apex distance was defined as the distance between the tip of the hip screw and the center of the femoral head in both AP and Lateral view. Cleveland method divided the femoral head in to 9 quadrants for correct determination of the placement of the hip screw on lateral X-ray.

All patients were preoperatively assessed to rule out any co morbidities conditions or any other medical condition which was contraindication for surgery. Patients were evaluated by anesthesiologist and graded according to ASA criteria. Reduction was achieved by closed manipulation and traction under anaesthesia. The fracture site was exposed only if reduction by closed means was not successful. The fixation used an intramedullary nail (10–11 mm in diameter), a lag screw (90–105 mm in length), and a hip pin (10–15 mm shorter than the lag screw). The lag screw was inserted near the subchondral femoral head. The intramedullary nail was interlocked distally with one or 2 screws. Prophylactic intravenous antibiotics (Tiecoplanin 400 mg) were administered. All patient were placed supine in standard fracture table with affected limb in slight adduction after closed fracture reduction with C-arm facility. Each patient were operated with standard surgical approach, drain was not placed in any patient. All patients post operative received 3 doses of IV Teicoplanin 400mg as daily single injection along with analgesics as per requirement. Patients were allowed to mobilise on postoperative day 2, and weight-bearing walking was initiated on day 3 or 4 as tolerated. For follow-up, patients were contacted on the phone, letters and emails and clinical examination status was calculated on the basis of new mobility score (NMS) [8], ranging from immobile to independently mobile.

Table 1: Distribution of patients

Details	Number	Age	Mean age
Male patients	58	45-79	65
Female patients	42	50-83	66
Total	110		

Table 2: Distribution of Fracture as per AO classification

AO classification	Number of patients
A1	37
A2	65
A3	08
Total	110

3. Results

The mean age of surgery in male patients was 65 and in female patients was 66 years. Majority of the fractures were caused due to trivial fall at home, RTA and in game. The fracture was classified on the basis of AO/OTA classification. Fractures were classified according to the AO system, the most common fracture type was A2 (n=65), followed by A1 (n=37) and A3 (n=8). On Radiological Assessment post operatively the most common zone for hip screw placement on lateral x-ray was central- central (106 /110) whereas 4 were in central-inferior (04/110). The average TAD was 23.567 mm with SD 1.47. The Post-operative New Mobility Score was calculated on the basis of ability of patients to carry their daily activities. The average NMS came out to be 7.4, SD 0.66 with maximum being 9 and minimum 8.

Fig: Trochanteric fracture with implant in situ

Figure 1 The femoral head is divided into 9 sectors by drawing 2 parallel lines on the (a) anteroposterior radiograph to divide superior and inferior parts and 2 parallel lines on the (b) lateral radiograph to divide anterior and posterior parts. (c) All of the lag screws are inserted in the inferior part of the femoral head.

Table 3: Assessment of mobility before the fracture. Score is the total, 0-9

Mobility	No difficulty	With an Aid	With help from another person	Not at all
Able to get in the house	3	2	1	0
Able to get out of the house	3	2	1	0
Able to go shopping	3	2	1	0

Table 4: outcome of fracture and mobility score

New Mobility Score	No of patients
9	81
8	19
7	8
6	2

4. Discussion

With the development of intramedullary devices and nail systems, a new phase has started in the treatment of Intertrochanteric fractures. In general a rule which governs the surgical treatment is, achieving a stable fixation. A PFN consists of two screws, a larger head screw, which provides fixation and compression and a smaller antirotation screw, meant to provide rotational stability. The length of antirotation screw is important to prevent implant failure. When the anti-rotation screw is longer or of same length as the hip screw there are higher chances of screw cut out. The cut out rate with PFN is 0 .6 – 8% [9, 10], whereas in our study it was around 0.72%. The lag screw should be inserted as deep as the subchondral bone. On lateral X-ray, the ideal location would be Central – Central or just inferior to it [11]. In our study, 67% of the cases had lag screws in the central – central zone while rest of 23% had in the central inferior location. Screw cut out is most common when it is placed in the superior zone of the head which happens to be the weakest zone. Lateral slide of the Hip screw is common as the fracture consolidates over time though we didn't encounter a lateral slide in any of our cases in 6 months of follow-up. The patients were assessed on the basis of New Mobility Score, which happens to be more practical way of assessment for Indian population.

5. Conclusion

In our study and observations it appears that PFN gives biomechanically sound fixation and it is minimally invasive and less blood loss and which provides quick fracture fixation and permits early mobilization. It also prevents excessive varus collapse at fracture site and produces less stress riser effect below tip of nail. It also appears from our series that Indications of fixation are limited, excessive lateral cortical comminution may limits its use.

The Proximal femoral nail implant is fixed with 2 screws; the larger (lag) screw is designed to carry most of the load, and the smaller screw (the hip pin) is to provide rotational stability. If the hip pin is longer than the lag screw, vertical forces would increase on the hip pin and start to induce cutout, a knife effect or Z-effect. This might force the hip pin to migrate into the joint and the lag screw to slide laterally. The cut-out rate with a PFN is reportedly 0.6 to 8%. [12] Although complication rates remain low, cut-out of either screw is a serious complication, which can lead to revision surgery and related morbidity. When the hip pin was 10 mm shorter than the lag screw, the percentage of the total load carried by the hip pin ranged from 8 to 39% (mean, 21%) [13]; no cut-out of the femoral head and no unacceptable implant or fracture displacement were observed. [14]. In our study, the hip pin was 10 to 15 mm shorter than the lag screw, and this may have prevented overloading the hip pin and cut-out in all cases.

Therefore, free sliding of a PFN may provide better impaction for unstable A2 fractures. The presence of an additional anti-rotational screw, and the free sliding mechanism of the lag screw may increase rotational stability of cervico-cephalic fragments and decrease overload on the femoral head. Our results therefore suggest that a PFN is useful and quick implant for the treatment of most types of Trochanteric femoral fractures.

Note: Conflict of interest – None

6. References

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