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Surgical management of proximal femur fractures by proximal femoral nail

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Abstract:

Background and Objectives: Proximal third fractures of femur like intertrochanteric and subtrochanteric fractures, are a leading cause of hospital admissions in elderly people. The number of such admissions is on a raise because of increasing life span and sedentary habits. Conservative methods of treatment results in malunion with shortening and limitation of hip movement as well as complications of prolonged immobilization like bed sores, deep vein thrombosis and respiratory infections. This study is done to analyze the surgical management of proximal third fractures of femur using Proximal Femoral Nail. **Materials and Methods:** This is a prospective study of 40 cases of fresh trochanteric and subtrochanteric fractures admitted to Mamata general Hospital, Khammam, A.P., From Aug 2010 to Sep 2012. Cases were taken according to inclusion and exclusion criteria i.e., patients with Proximal third fracture femur above the age of 18yrs. Medically unsuitable and patients not willing for surgery were excluded from the study. **Results**: In our series of 40 cases there were 24 male and 16 female, maximum age of 85 yrs and minimum age of 20 yrs, most of the patients were between 60 to 80 yrs. Mean age of 53.9yrs. 45% of cases were admitted due to slip and fall and with slight predominance of right side. Out of 40 cases, 10 were trochanteric and 30 were subtrochanteric. In Trochanteric class 60% were Boyd and Griffin type 2, in subtrochanteric class 40% were Sinsheimer type 3a and 30% were 2b. Mean duration of hospital stay is 19.62 days and mean time of full weight bearing is 10.6 wks. Out of 40 cases 5 cases expired before first follow up time of 6 wks and 5 cases were lost for follow up. Out of 30 remaining cases 6 were Trochanteric and 24 were subtrochanteric. Good to excellent results are seen in 100% cases of trochanteric fractures and 91.5% cases in subtrochanteric fractures.
Conclusion: From this sample study, we consider that PFN is an excellent implant for the treatment of Peritrochanteric fractures. The terms of successful outcome include a good understanding of fracture biomechanics, proper patient selection, good preoperative planning, accurate instrumentation, good image intensifier and exactly performed osteosynthesis.

Key words: Intertrochanteric; PFN; Peritrochanteric; Subtrochanteric; Trochanteric

Introduction

Fractures of the proximal third femur and hip are relatively common injuries in adults. The trochanteric fractures can be managed by conservative methods. If suitable precautions are not taken the fracture undergoes malunion, leading to varus and external rotation deformity at the fracture site and shortening and limitation of hip movements. subtrochanteric fractures are femoral fractures where the fractures occur below the lesser trochanter to 5 cm distally in the shaft of femur [1]. These fractures occur typically at the junction between trabecular bone and cortical bone where the mechanical stress across the junction is highest in the femur, which is responsible for their frequent comminution [1]. These fractures occur typically in two age groups. In young and healthy individuals, the injury results from high-energy trauma, whereas in the elderly population, most of the fractures are osteoporotic, resulting from a fall. With the increase in the aging population, there is also considerable growth in the number of pathological fractures and fractures around hip prostheses (periprosthetic fractures) [1-3].

Subtrochanteric region is usually exposed to high stresses during activities of daily living. Axial loading forces through the hip joint create a large moment arm, with significant lateral tensile stresses and medial compressive loads. In addition to the bending forces, muscle forces at the hip also create torsional effects that lead to significant rotational shear forces. During normal activities of daily living, up to 6 times the body weight is transmitted across the subtrochanteric region of the femur [4]. As a result of these high forces, the bone in this region is a thick cortical bone with less vascularity and results in increased potential for healing disturbances. Hence subtrochanteric fracture is difficult to manage and associated with many complications [3,5].

Conservative management of these subtrochanteric fractures thus poses difficulties in obtaining and maintaining a reduction, making operative management the preferred treatment. The goal of operative treatment is restoration of normal length and angulation to restore adequate tension to the abductors [6].

Proximal femoral nail, which is also a collapsible device with added rotational stability, is the more latest device for the management of trochanteric fractures [7]. This implant is a centromedullary device, biomechanically more sound, can be performed with small incision and minimal blood loss [8]. The present study is to determine the effectiveness of proximal femoral nail in treatment of subtrochanteric fractures.

Material and Methods

The present study consists of 40 adult patients of proximal third factures of femur, who are treated with Proximal Femoral nail in Mamata general hospital, khammam. This study was carried out to study the epidemiology of proximal third femoral fractures, to testify the anatomical and functional outcomes of treatment with proximal femoral nail.

Patients with Intertrochanteric and Subtrochanteric fractures in adults were included in the study while pathological fractures, Fractures in children, old neglected fractures and peri prosthetic fractures were excluded from the study. Patients were followed every monthly up to 6 months and every 3rd month until 2 years. Functional result was assessed using Harris hip score [9]. Fig 1& 2 depict method of insertion of a proximal femoral nail.

Results and Discussion:

24 men and 16 women were included with mean age of 53.9 (32-83years) years. There were 10 trochanteric and 30 subtrochanteric fractures included in the study. Trochanteric fractures were classified based on Boyd and Griffith clsification [10] and Subtrochanteric fractures on Sensheimer classification [11].

In our study, we encountered certain complications intraoperatively. Most of these complications occurred in the first few cases. In five of our patients we had to do open reduction. In another patient, there was an iatrogenic fracture of lateral cortex of proximal fragment, in the same case we were unable to put derotation screw [12,13], these complications occurred due to wrong entry point. In four cases we failed to achieve anatomical reduction and we failed to put derotation screw in three cases. In three patients we failed to lock distally. In three more patients the jig has got mismatched and we have done distal locking with free hand technique. We had four cases of fixation of fracture in varus angulation.

There was one case with superficial wound infection post operatively, that subsided with appropriate antibiotics. One patient had decreased knee ROM who had ipsilateral supracondylar fracture femur and fracture shaft tibia treated with DCS and IMIL nailing respectively and patient

improved to some extent after rigorous physiotherapy. One case had Z-phenomenon [14] of backing out of proximal screws that was managed with screw removal after 3 months. We encountered two cases of delayed union and four cases of mal union. One case had shortening of 2 cm who was treated with sole raise. We had no cases of nonunion or implant failure or cutting out of screws. In our study the average duration of hospital stay was 19.62 days. The mean time for full weight bearing was 10.6 weeks.

Conclusion

From the present study we conclude that PFN has the advantage of collapse at fracture site and is biomechanically sound as it is done by closed technique, fracture opened only when closed reduction could not be achieved and it is an intramedullary device. Another advantage of this device is it prevents excess collapse at fracture site thus maintaining neck length. Osteosynthesis with the proximal femoral nail offers the advantages of high rotational stability of the head-neck fragment. The device is fixed distally in both dynamic and static mode so in case of delayed union it can be dynamized. The entry point determination is the most crucial step in this procedure which is the tip of trochanter. The two neck screws should be placed in the centre of neck and head, the proximal one acts as derotation screw and the distal one as collapsing screw. The nail has a 6^{o} mediolateral angulation which prevents medial collapse and a 135^{o} neck shaft angle which maintains the normal neck shaft angle. Post-operatively early mobilization can be begun as the fixation is rigid and because of the implant design. If the above technical details are achieved, the function of the hip joint is regained to near normal and the rehabilitation of the patient is smooth. Most of the complications are surgeon and instruments related which can be cut down by proper patient selection and good preoperative planning.

From this sample study, we consider that PFN is an excellent implant for the treatment of proximal third fractures of femur. The terms of successful outcome include a good understanding of fracture biomechanics, proper patient selection, good preoperative planning, accurate instrumentation, good image intensifier and exactly performed osteosynthesis.

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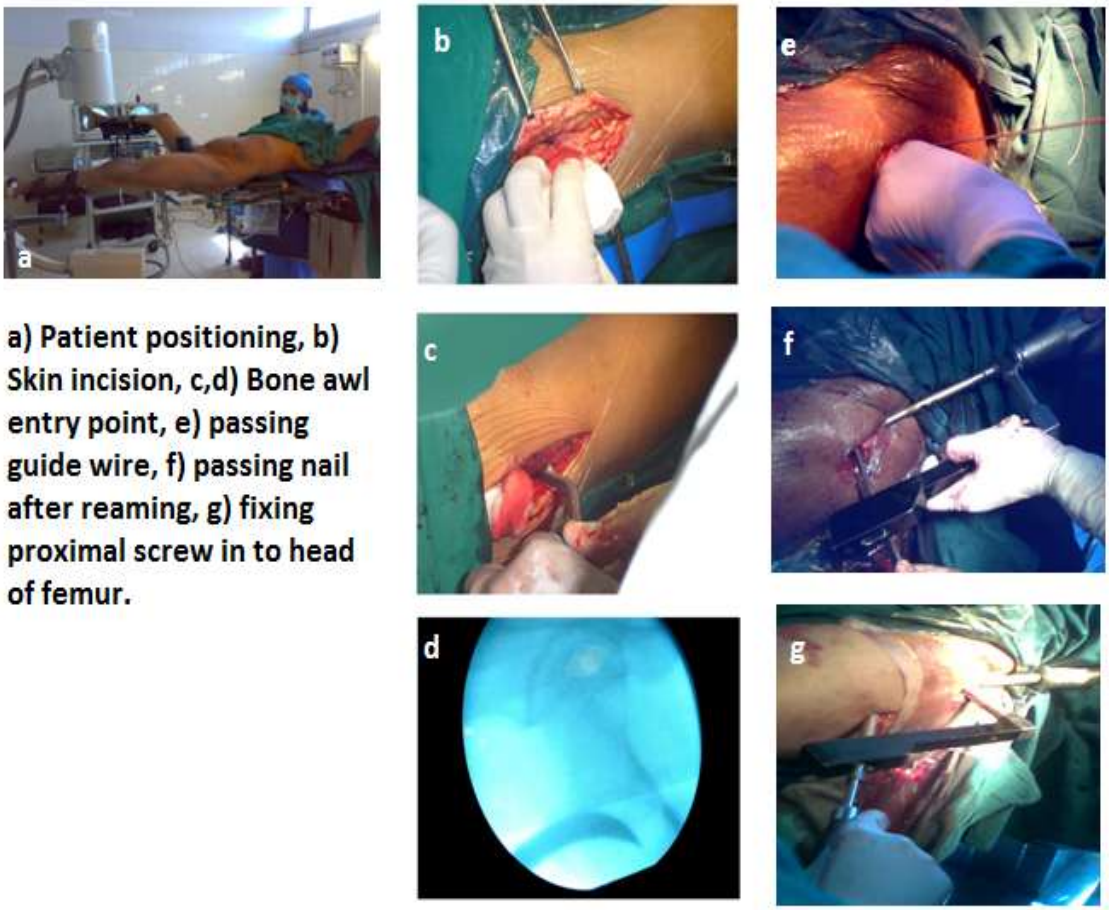
Figure 1: Method of insertion of PFN



a) Patient positioning, b) Skin incision, c,d) Bone awl entry point, e) passing guide wire, f) passing nail after reaming, g) fixing proximal screw in to head of femur.

Figure 2: Intra op C arm images showing locking of nail

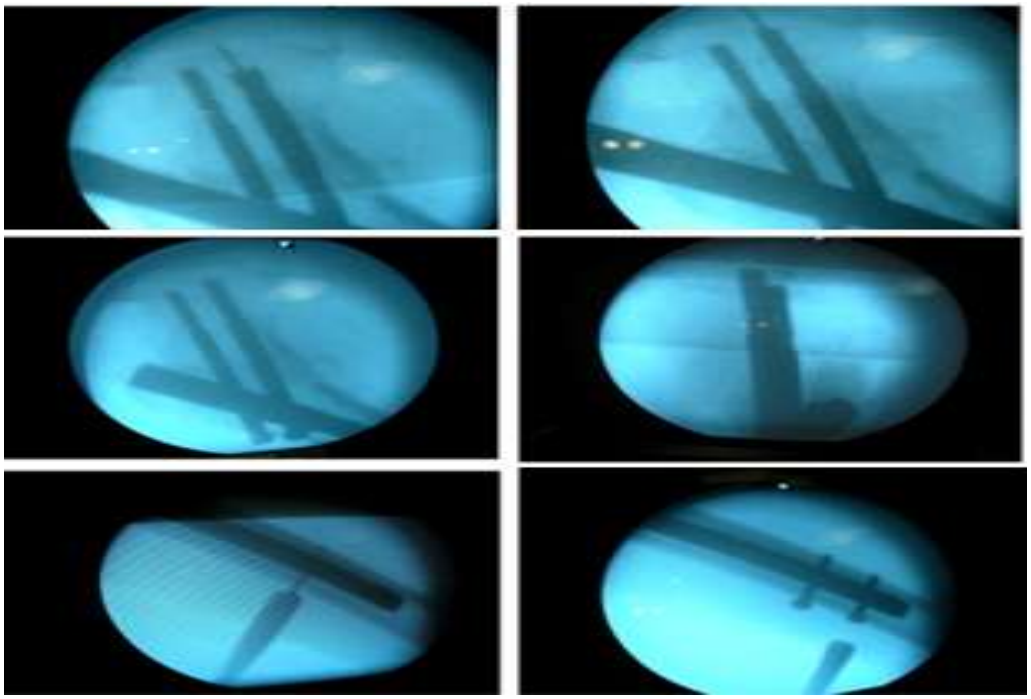


Figure 3: Pre and post op x rays

Figure 4: Functional outcome at 2 years

Type of fracture	Number of cases	Percentage
1	0	0%
2	6	15%
3	3	7.5%
4	1	2.5%

Table-1: Distribution of trochanteric fractures based on Boyd and Griffith Classification

Type of fracture	Number of cases	Percentage
1	0	0%
2A	0	0%
2b	9	22.5%
2c	6	15%
3a	12	30%
3b	3	7.5%
4	0	0%
5	0	0%

Table-2: SUBTROCHANTERIC FRACTURES ARE CLASSIFIED ACCORDING TO SEINSHEIMER CLASSIFICATION