



SHORT TERM FUNCTIONAL AND RADIOLOGICAL OUTCOME OF PROXIMAL FEMUR NAILING FOR SUBTROCHANTERIC FRACTURES OF FEMUR

Orthopaedics

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ABSTRACT

Background: Using proximal femoral nailing (PFN) for sub-trochanteric fractures (STFs) of femur by orthopedicians showed a mixed response in terms of functional outcome such as stability and anchoring. Hence the present study was undertaken to evaluate functional outcome of proximal femur nailing in STFs of femur at the end of eighteen months. **Method:** Total 43 consecutive patients of either sex, age >18 years, showing STFs on X-rays were included and treated with PFN and were followed up for one and three months to assessed functional outcome. Pain was analyzed separately using the visual analogue scale (VAS). **Results:** Out of 43 patients, 22 were males and 21 were females, in the age group of 23-80 years with the mean age of 52.71±18.03 years. Road traffic accident (RTA) was the commonest mode of injury (81.39%) and right side injury involved more commonly (53.48%). Patients were able to return to pre-trauma function earlier. It was found that 3 patients developed an abductor lurch after the surgery. Shortening was seen in 4 patients at the end of 3 months. Mean pain score at the end of 1 month and 3 months was 7.45±0.71 and 4.45±0.99 respectively. Callus formation was seen in 41 patients out of 43 in x-rays suggesting union at fracture site. **Conclusion:** The present study has proven that PFN for STFs lead to early mobilization in patients and significant decrease in pain as per VAS scale. Thus, PFN is a good implant technique for patients with STFs of the femur.

KEYWORDS

Proximal femoral nailing; Sub-trochanteric fractures; Femur; Functional outcome; Anchoring; Visual analogue scale; Shortening

INTRODUCTION

Proximal femur fracture is a common type of fracture frequently reported in the department of orthopaedics and among them fracture neck of femur and inter-trochanteric fractures are routinely dealt with by the orthopedicians [1]. One of the most important area in the proximal part of femur is the subtrochanteric region and fractures in this region are femoral fractures where the fractures occur below the lesser trochanter to 5 cm distally in the shaft of femur [2]. Subtrochanteric fractures account for 10% to 34% of all hip fractures [3] and these have a bimodal distribution [4] and usually seen in older osteopenic patients following low energy falls and younger patients with high energy trauma. However, the cause of frequent comminution is that these fractures occur at the junction of trabecular bone and cortical bone where the mechanical stress across the junction is highest in the femur [5].

Subtrochanteric fractures of the femur present a challenge for treatment because of the deforming forces on the proximal and distal segments which are difficult to control as the proximal segment is inherently short, decreased vascularity of the region, unfavorable fracture morphology (comminution), strong deforming muscle forces, difficulty in attaining and maintaining reduction during surgery and complications of varus malunion, implant failure, infection and non-union, subtrochanteric fractures of the femur pose a great challenge to the orthopaedic surgeon [6, 7].

Nowadays because of the better understanding of the fracture biology, availability of image intensifiers, newer tricks in reduction methods, availability of biomechanically stable implants and monitored post-operative rehabilitation programs, these fractures are better treated with good patient outcomes [7]. Proximal femoral nailing is a newer technique introduced in the year 1997 by an Orthopedic association and after its introduction few studies showed a mixed response in terms of functional outcome such as stability and anchoring and long term studies had also showed that it helps in preventing the recurrence of fractures. Another added advantage of this procedure is, it is a weight sharing implant rather than weight bearing and very few complications such as malunion or non-union were reported [8, 9]. Hence, the present

study was conducted to evaluate functional outcome of proximal femur nailing in subtrochanteric fractures of femur at the end of eighteen months.

MATERIALS AND METHODS

After obtaining Institutional Ethical Committee approval and written informed consent from the patients, this study was conducted in the 43 consecutive patients of either sex, age more than 18 years with evidence of subtrochanteric fracture of femur in the x-ray presenting in our hospital. Exclusion criteria were 1) Patients to be operated for compound or pathological fractures; 2) Patients admitted for re-operation; 3) Patients with other fractures interfering with rehabilitation, neurological disorders, multiple injuries (polytrauma), and dropped out patients during the study period and 4) Patients with inability to walk before the fracture.

As soon as the patient with confirmed subtrochanteric fracture on x-ray was seen, necessary clinical and radiological evaluation was done and admitted to the ward after necessary resuscitation and splintage with skeletal traction. Routine blood investigations were done on all patients. All the necessary clinical details were recorded in proforma prepared for this study. Preoperative planning was done, which includes measuring the diameter of the femur at the level of Isthmus for nail diameter and neck shaft angle by goniometer.

Operative Technique:

The patient was placed in supine position on fracture table and closed reduction of the fracture was done and checked under image intensifier. A 5 cms longitudinal incision was taken proximal from the tip of the greater trochanter, (Figure 1). A parallel incision was made in fascia lata and gluteus medius was split in line with the fibres. Tip of greater trochanter was exposed. In AP view on C-arm, the entry point was on tip of greater trochanter. Then medullary canal entered with a curved bone awl; the guide wire was inserted into the medullary canal. Using a cannulated conical reamer, proximal femur was reamed till the level of LT. Once satisfactory fracture reduction was confirmed, an appropriate size nail as determined preoperatively was assembled to insertion handle and inserted manually. A 2.8 mm guide wire was

inserted through the drill sleeve after a stab incision. A second 2.8 mm guide wire was inserted via the drill sleeve above the first one as hip pin. Drilling was done over 2.8 mm guide wire until the drill was 8 mm short of tip of the guide wire. Neck screw was inserted using cannulated screw driver. Similarly, appropriate length hip pin was inserted. Length and position of the screw were confirmed with C-arm image. Distal locking was usually performed with two cortical screws with free hand technique. Locking screws were inserted and position was confirmed with image intensifier. Wound closed in layers under negative suction drain and sterile dressing applied over wound and compression bandage given.

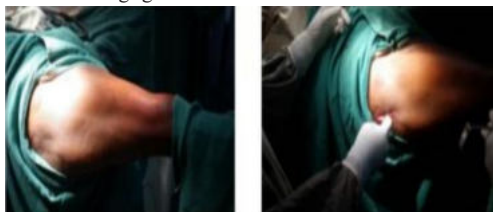


Figure 1: Depicts the position of patient. i.e supine on fracture table, Greater trochanter is palpated and a vertical incision is taken proximal to it in the line of femur shaft

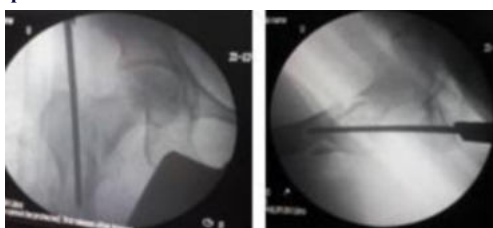


Figure 2: Depicts the entry point of the guidewire on AP and Lateral images. In AP view, guidewire entry is through the tip of greater trochanter. In lateral view, it is centered in the medullary cavity of the femoral shaft. Only after confirmation of the guidewire entry point in both view do we proceed further.

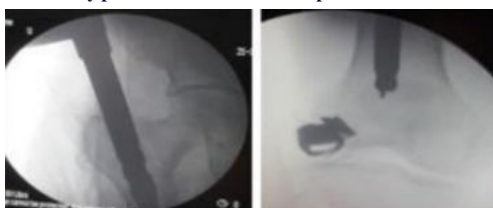


Figure 3: Shows the entry of the nail after the guidewire position is confirmed on AP and lateral images. First figure depicts entry in the proximal aspect. Second figure depicts position of nail in the distal part of femur

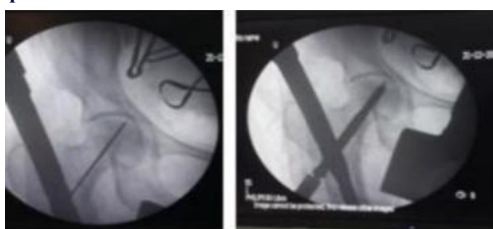


Figure 4: Depicts passing of first screw in the femoral head after nail has been placed inside. A guidewire is passed in the second hole inside the femoral head, its direction is confirmed on image intensifier. After confirming position of the guide wire, cannulated drill bit is used to drill over the guide wire. Length of the screw is measured. Second image shows screw being passed over the guidewire



Figure 5: Depicts passing of the anti-rotation screw. A guide wire is inserted over the hole proximal and parallel to the second hole. Its position is confirmed under image intensifier. Once position is confirmed, cannulated drill bit is used to ream over the the guide wire, appropriate screw length is selected Second image shows the screw being inserted.

All surgeries were performed in our institute by a single surgeon. Patients were discharged after the completion of the hospital treatment and called for follow up at outpatient department, at one month and three months interval post operatively. At each follow up, clinical examination, functional scoring and radiographs of operated hip were taken to assess the fracture union and implant condition. (AP Pelvis and lateral). Pain was analyzed separately using the visual analogue scale (VAS). Gradation of patients as per VAS scale was 1) Mild 0-3; 2) Moderate 4-6; 3) Severe 7-10.

RESULTS

A total of 43 patients were enrolled in the study, of them 51.16% were males and 48.83% were females. Majority of patients were in the age group of 51-60 years and 61-70-years (20.93% each) with mean age of patients was 52.71 ± 18.03 years, ranged from 23 to 80 years. The demographic details of patients is shown in table 1.

Table 1: Demographic profile of patients (n=43)

Demographic data	No. of patients	Percentage
Age group (years)	21-30	08
	31-40	05
	41-50	03
	51-60	09
	61-70	09
	71-80	08
Gender	Males	22
	Females	21

Out of 43 patients, 10(23.25%) patients had comorbidity of which hypertension was the commonest one (50%). Right side injury was involved more commonly than left side. Road traffic accident (RTA) was the most common mode of injury found in 81.39% of patients as shown in table 2.

Table 2: Comorbidities of patients, side of injury and mode of injury

Parameters	No. of patients	Percentage
Comorbidities	DM	03
	HTN	05
	DM+HTN	02
Side of Injury	Right	23
	Left	20
Mode of Injury	RTA	35
	Trivial	08

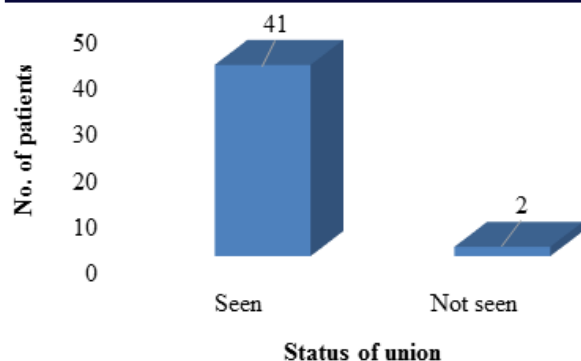
Patients were able to return to pre-trauma function earlier. It was found that 3 patients developed an abductor lurch after the surgery. Shortening was seen in 4 patients at the end of 3 months. The other details of functional outcome of patients is depicted in table 3.

Table 3: Functional outcome of patients

Various modalities	1-month Follow up	3-month Follow up
Status of Pre-trauma function	Yes	00 (0.0%)
	No	43 (100%)
Status of Abductor Lurch	Yes	03 (6.97%)
	No	40 (93.02%)
Status of leg shortening	Yes	04 (9.30%)
	No	39 (90.69%)
Status of sitting cross-legged	Yes	0 (0.0%)
	No	43 (100%)
Status of Squatting	Yes	00 (0.0%)
	No	43 (100%)

The mean pain score as per VAS score at the end of 1 month was 7.45 ± 0.71 and at the end of 3 months it was 4.45 ± 0.99 . There was a significant decrease in pain as per VAS score (p value < 0.05). Callus formation was seen in 41 patients out of 43 in x rays suggesting union at fracture site as depicted in figure 6.

Figure 6: Status of union seen on radiological assessment



DISCUSSION

Subtrochanteric fractures of femur are difficult to treat due to the large deforming forces acting on the fracture fragments. Treatment of these fractures have evolved over time starting from conservative treatment to newer implants. Conservative treatments lead to longer immobilization time, higher chances of deep vein thrombosis, pressure sores and hence high mortality. Various implants have thus been designed to manage these fractures [10].

In the present study total 43 consecutive patients of either sex, age >18 years, showing STFs on X-rays were treated with PFN and were followed up for one and three months to assessed functional outcome. The mean age of the patients operated for subtrochanteric fractures was 52.71 ± 18.03 years and it is almost similar to the study done by Sharma S et al [11], where they quoted the mean age as 53 years and also other studies done by Paramesha KC et al [5] and Kandasamy KG et al [12] had mentioned the mean age as more than 50 years. As quoted by previous studies [5, 11-15] in current study males were more in number (51.16%) than females (48.84%). This may be due to the increase in the incidence of fractures in younger male patients due to high energy trauma. Right side (23 patients) was involved more commonly than the left side (20 patients) which is comparable with the earlier studies [5, 15]. The majority (81.39%) of the subtrochanteric fractures were caused by road traffic accidents in the younger age group. Similar finding is reported in other studies [5, 11-15]. Increasing urbanization, rise of vehicular traffic, non-obedience of traffic rules, rash driving, preponderance of outdoor activities and rash/drunken driving in males explains our observations. Road traffic accidents affect all age groups and all genders, however more than 83% of the victims are males [16]. In Kumar M et al series RTA was the major cause of proximal femur fractures (86%) [17]. The most common comorbidities in patients with STFs were hypertension and diabetes mellitus. Similar finding is reported in Kandasamy KG et al [12] and Seenappa et al [13] study.

In present study, we have compared the functional outcome of patients treated by PFN by assessing various modalities like returning to pre trauma function, presence of abductor lurch, shortening, decrease in pain as per VAS scale, ability to sit cross legged and to squat. It was found that at 1 month follow up no patient went back to his pre trauma functional state but at the end of 3 months, 37 patients had returned to their pre trauma function and 6 were yet to return to their pre trauma functions. It was found out that 3 patients developed an abductor lurch after the surgery. Shortening was seen in 4 patients at the end of 3 months. Krishna CSR et al [14] and Kapila R et al [15] study reported shortening in two cases. There was a significant decrease in pain as per VAS score (p value < 0.05). It was found out that no patients were able to sit cross legged at the end of 1 month and at the end of 3 months, 40 patients were able to sit cross legged. There was no patients could squat at the end of 1 month, and 10 patients could squat after the end of 3 months. These findings are correlated with the Krishna CSR et al study [14]. Callus formation was seen in 41 (95.34%) patients out of 43 in x-rays suggesting union at fracture site.

CONCLUSION

The present study has proven that PFN for STFs lead to early mobilization in patients and significant decrease in pain as per VAS scale. Patients were able to return to pre trauma function earlier. Only 4 patients developed shortening which was compensated by heel raise. Thus, PFN is a good implant technique for patients with STFs of the femur. Longer term studies with larger number of patients and comparative study with other implants are needed to identify long term

advantages of each implant over the other.

Limitations

This study was very small comprising of only 43 patients. So it was impossible for us to come for any statistical correlation. The follow period was so small, a long term follow up of these patients could have been more significant. We did only functional assessment using radiological outcome.

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