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ORIGINAL RESEARCH

Outcome following proximal femoral nailing with helical head screw for intertrochanteric and subtrochanteric fractures

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ABSTRACT

Introduction: Intertrochanteric femur fracture is one of the most common fractures of the hip especially in the elderly with osteoporotic bones, usually due to trivial trauma. Dynamic Hip Screw (DHS) is still considered the gold standard for treating intertrochanteric fractures by many. Proximal femoral nail is a relatively newer implant designed to treat unstable intertrochanteric fractures. The present study was conducted to evaluate functional outcome in intertrochanteric femur fractures treated by proximal femoral nailing. Intertrochanteric fractures are seen commonly in two patient groups, older osteopenic patients after a low-energy fall and younger patients involved in high-energy trauma. Early surgical intervention is advocated in the majority of these patients to reduce the complications associated with long-term immobilization.

Methods: The present study is a prospective study performed on in this study proximal femoral nailing with helical head screw is used to achieve initial stability and early mobilization of the patients to avoid complications. In 60 patients undergoing proximal femoral nailing with helical head screw for intertrochanteric fractures the results of surgery were meticulously followed. Functional outcome was assessed by modified Harris hip score at the end of 6 months postoperatively.

Result: Total 60 patients were included,30 were females and 30 were males. Age group ranged from 18 to 90 years. Maximum patients (40.81%) were between 60 to 70 yrs age group. 57.12%of patients had Evans type I fracture and the rest (42.88%) had type II fracture. Excellent outcome observed in 30.6% patients, good in 44.9%, fair outcome in 14.2% and only 10.2% had poor outcome among 60 patients.

Conclusion: It is concluded from our study that use of PFN for treatment of intertrochanteric fractures provides a good functional outcome along with advantages in terms of minimal blood loss, early weight bearing and few complications. It is the implant of choice for unstable intertronchanteric fractures. Our study concludes that proximal femoral nailing with helical head screw is the best method of treatment for intertrochanteric fracture as it leads to lesser complications.

Key words: Proximal femoral nail, intertrochanteric fractures, proximal femur fracture

INTRODUCTION

An intertrochanteric (IT) femur fracture is an extra-capsular fracture between greater and lesser trochanters. It accounts for nearly 50% of all proximal femur fractures and is a major cause of disability in the elderly. The incidence of IT femur fracture is gender and race dependent varying demographically [1]. Several epidemiological studies in Asian countries suggest increasing incidence and general life expectancy during the last few decades [2]. In 1997, Gulberg *et al*. suggested that the worldwide incidence of hip fractures would double to 2.6 million by 2025 and 4.5 million by 2050 [3]. The incidence of proximal femoral fractures among females is two to three times higher than the incidence of such fractures in males [4]. Hagino *et al*. reported a lifetime risk of hip fractures for individuals at 50 years of age of 5.6% for men and 20% for women [5]. Cummings *et al*. noted that neither age-related osteoporosis nor the increasing incidence of falls with age sufficiently

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explains the exponential increase the hip fracture with aging [6].

Unstable IT fractures are those where there is poor contact between fracture fragments (especially medial and posterior cortices), comminution, and fracture pattern, such that the weight-bearing forces tend to displace the fracture further or a reverse oblique type [7]. The treatment has evolved and changed over a period of time, from conservative to operative, from open reductions and fixations to closed reduction and fixation and newer minimally invasive techniques. Among the treatment modalities, there are two types of devices, i.e., intramedullary and extramedullary. Intramedullary devices, such as the gamma nail (GN) and proximal femoral nail (PFN), have the same theoretical advantage over the dynamic hip screw (DHS) because they do not depend on the screw fixation of a plate to the lateral cortex, which can be a worrying part in osteoporotic bone. For PFN, Fogagnolo*et al.* found that the intraoperative technical or mechanical complication rate is as high as 23.4% [8].

The most common mode of injury in these type of fractures are either due to injuries resulting from high energy, falling from height or a low mechanism injury such as an accidental fall that commonly occurs in elderly [9, 10]. Diagnosis is confirmed by the x-ray picture that reveals atypical subtrochanteric fractures that include a transverse fracture patterns with a minimal commination, lateral cortical thinking, and a posteromedial spike[11].There is no role of non-operative management in sub-trochanteric fractures as is leads to increased morbidity and mortality and the definitive management is early surgical intervention. Over the past two to three decades subtrochanteric fractures are mainly treated with plates and screws such as dynamic hip screws, condylar screws or cephalo-medullary nails[12].Proximal femoral nailing is a newer technique introduced in the year 1997 by an Orthopaedic association and after its introduction few studies were conducted to assess its efficacy in terms of stability, anchoring, dynamic locking and option for secondary locking that helps in the prevention of later 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[13, 14].Though few studies have been conducted in assessing the efficacy of proximal femoral nailing but not much had been done in South India and so the present study was conducted to assess the operational outcome of proximal femoral nailing among patients with intertrochanteric and subtrochanteric fractures.

MATERIALS & METHODS

A prospective study was conducted for a period of one year at a tertiary care hospital in Karnataka. The study was started after getting approval from the institutional ethics committee. Patients with IT & subtrochanteric hip fracture admitted in our hospital were included as our study subjects. Patients with open fractures were excluded from the study and a total of 60 patients were taken as our study sample. Proper informed consent was taken from all patients involved in the study. A semi-structured questionnaire was designed to collect the socio-demographic details and the clinical history from all the patients with subtrochanteric fractures. For all patients the operative procedure was done under spinal/epidural anaesthesia. After placing the patient on the fracture table, using longitudinal traction technique the fracture is reduced and the affected limb is slightly adducted in such a way it helps in facilitating the proximal femoral nail insertion through greater trochanter.

Operative techniques according to the fracture were done accordingly to each patient respectively. After fixing the appropriate sized nail on the insertion device the nail was then slowly introduced manually into the shaft of femur with a help of guide wire using C-arm. The hip pin was initially introduced just about 25 mm medial to the fracture line, and then the neck screw was inserted according to the size required. Depending on the type of fracture, distal interlocking was done. The stability of the procedure was assessed and wounds were closed in layers after placing a negative suction drain. Post-operatively patients were treated with analgesics and antibiotics and proper wound dressing was applied. Transfusion requirements, adverse events and length of hospital stay were recorded for each patient.

Post-operatively the operated limb was kept in an elevated position in order to reduce swelling and facilitate drainage. Mobilization was initiated based on the patients fracture pattern, in non-comminuted fractures weight bearing was initiated early whereas in comminuted fractures it was delayed till the formation of callus. All the patients were followed up at an interval of three months for a period of one year and in each follow-up visit the functional outcome was assessed in the form of walking, squatting, sitting and rising from chair. Any complication if occurred was also recorded.

All the data were entered and analysed using SPSS version 24. Mean and standard deviation was derived for all parametric variables and percentage was calculated for all frequency variables, chi-square test was used to derive the statistical inference considering $p<.05$ as statistically significant.

RESULT

Age group were highest in the age 50-70 years, rest all are as given below

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Table 1: Details

Age group	Males	Females	Total
< 30	4 (6.67%)	3 (5%)	7 (11.67%)
30-50	4 (6.67%)	6 (10%)	10 (16.67%)
50-70	18 (30%)	15 (25%)	31 (55%)
> 70	4 (6.67%)	6 (10%)	10 (16.67%)
Total	30 (50%)	30 (50%)	60 (100%)
Mean ± SD	53.7 ± 7.2	58.5 ± 7.8	56.4 ± 7.4

Table 2: Table details: Duration of surgery is as follows:

Time to surgery	No. of cases	Percentage	Mean ± SD
0-7 days	39	65%	5.8 ± 4.2
1-2 weeks	19	31.67%	
> 2 weeks	2	3.33%	
Total	60	100%	

Majority in 0-7 days

DISCUSSION

In IT & Subtrochanteric fractures of femur the commonest mode of injury is because of high energy trauma and due to its complex stress configuration these fractures commonly occurs in the area of least resistance in the proximal femur[14].Further the unstable fractures occurring at this region impose a significant challenge to the operating surgeon as fixing these fractures becomes technically difficult and improper technique might lead on to primary fixation failure.

The entry point of the PFN is at the tip of the greatertrochanter, so it reduces the damage to the hip abductors unlike the gamma nail which is inserted through thepyriformis fossa and with a derotation screw reduces the chances of cutout as compared to the gamma nail. Proximal fractures, and the long PFN for more distal fractures. Sub trochanteric fracture may be fixed by either a standard or a long implant. These fractures are associated with higher failure rates when they are fixed with normal length PFN. The reasons for this is due to intrinsic instability of the sub trochanteric fractures. The fracture presents a more difficult reduction because the proximal fragment has a tendency to flex anteriorly due to the action of the psoas muscle and shorter distance from locking screw hole to the fracture site.

We had 60 patients of which 30 patients had subtrochanteric fracture. These fractures required a long PFN (length 300-400 mm) fixation and 30 patients were treated with the regular length PFN (length 180-240 mm).

The advantages of intramedullary device over extramedullary ones are less extensive surgical approach and thereby reducing the operative time and intraoperative blood loss.

In our study the average operative time was 76 minutes and an average blood loss of 200 ml per patient. This reduced operating time and less blood loss during surgery led to no perioperative and postoperative blood transfusion. At 6 months follow up 45 (75%) patients in our study had no pain.

In our study with intramedullary nailing using theproximal femoral nail antirotation prevented post-operative varus/valgus collapse at the fracture site. At one year follow up we had 27 patients (45%) had no loss of flexion, 30 patients (50%) had flexion loss not more than 21 degree.

In this study, we found that at an average of 4 months, 48patients (80%) showed complete radiological union at the fracture site. The average radiological union time for intertrochanteric fractures was 19.4 weeks and sub-trochanteric fractures was 20.2 weeks which was similar to previous studies. The hip screw and the anti-rotation cervical screw of the PFN adequately compress the fracture, leaving between them adequate bone block for further revision should the need arise.

In our study, we used the cephalomedullary interlocked nailing PFN with a helical blade for head-neck fixation which offers more rotational stability than the first generation PFN.10 We used the standard PFN for more as quoted in the previous studies the best treatment for these fractures is fixing the fractures with dynamic hip screws (DHS) but still the failure rate was shown as upto 20%[15, 16].Fracture instability, presence of osteoporosis, lack of anatomic reduction, implant failure, and placing the lag screw in an incorrect position in femoral head were found to be the most common causes for fixation failure[17].The most common preference among orthopedicians is intramedullary fixation because of its advantages like minimal soft tissue injury and wound complications. Among the various procedures in intramedullary fixation introducing a proximal femoral nail is a newer technique in which the nail tip is specially shaped to reduce the stress and further it prevents low energy fracture at the tip of the implant, along with this it also reduces the lever arm distance at the time of reactionary forces generated in the hip joint movements[18].Knowing these advantages the present study was done to assess the operational outcome of patients treated with proximal femoral nails for fractures in the subtrochanteric region of femur.

In the present study the mean age of the patients operated for subtrochanteric fractures was 56 years and it is almost similar to the study done by Sandeep Sharma *etal*., where he quoted the mean age as 53

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years and few other studies done by C.Bouldinetal, I.C.Schipperetal and T.Pavelka *et al*. had mentioned the mean age as more than 70 years and as quoted by previous studies males are more in number than females[19, 20, 21, 22].In our study the commonest mode of injury was road traffic accidents followed by accidental fall and all the earlier studies had also quoted these two as the major mode of injury with slight variations in the percentage[19, 20, 21, 22].

In the current study Seinsheimer classification was followed for classifying the subtrochanteric fractures and under this classification type III A was found to be the most common type and a similar results was also shown in the studies done by Sandeep Sharma et al and Seinsheimer*etal*.[19, 23]In our study the time interval between the onset of injury and the surgery performed was 5.8 days and it is almost in par with he studies done by I.B.Schipper, C.Bouldin and D.M.Rahme[20, 22, 24].The average time taken for the surgery was 90 mins and most of the previously done studies had shown the average time of the procedure varied between 60 and 90 mins as it depends on the skill of the surgeon and certain factors related to patients[20, 22, 24].In the current study the complete union of the fracture was seen in 14.5 weeks, whereas the study done by VivekPradhanetal had shown the mean weeks for complete union as 13.88 weeks and most of the other studies also ranged between 13.5 and 14.5 weeks[25].In our study no serious postoperative complications line malunion or union were reported only superficial wound infection and anesthesia related complications had occurred, whereas a study done by Sandeepetalhad shown non-union in 3.5% of the patients and few studies done by D.M.Rahme *et al*. and W.M.Gadegone*et al*. it was 12% and 13% respectively[19, 24, 26].In the present study excellent outcome results was achieved by 12 months in 100% of the patients who had come for follow-up and the outcome was based on their ability to squat, walk for 15 meters and rising up chair, in most of the previously done studies the results was shown that excellent outcome was achieved in almost 90% of the patients in 8 to 12 months[19, 20, 21, 22, 23, 24].

CONCLUSION

Fracture union was observed in almost all the cases with a very good postoperative functional outcome for patients who had regular follow-up. Proximal femoral nail is a better option in unstable intetrochanteicfractures as it offers better control of rotation, length and a proximal purchase during fixation. It provides various advantages like reduced operating time, blood loss and minimal soft tissue insult. Restoration of medial cortical continuity and preservation of lateral wall in intramedullary nailing gives good results in unstable intertrochanteric fractures. PFN with helical blade long is an effective treatment for sub trochanteric fractures.

Proximal Femoral Nailing is a good implant technique for patients with subtrochanteric fracture of the femur as it is almost like a closed technique with better stability and early mobilisation. The operation being technically demanding if the operating surgeons are adequately trained it is considered as a truly minimal invasive procedure.

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