

Retrospective Assessment of Intertrochanteric Fractures of Femur Managed Using Proximal Femoral Nail

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Abstract

Aim: Study of proximal femoral nail in management of unstable intertrochanteric fractures of femur.

Materials and methods: A retrospective study was conducted in the Department of Orthopaedics, SB Medical College & Hospital, Hazaribagh, Jharkhand, India for 1 year. 100 patients with unstable intertrochanteric fractures AO type 31-A2.1, 31-A2.2, 31-A2.3, 31-A3.1, 31-A3.2, 31-A3.3 were included in study and which had been treated with Proximal femoral nail at our institution.

Results: There were 55% left and 45% right side hip fractures. Mean operative time was 35 minute (range 24-89 min). Average length of follow up period was 12 month. The Cleveland zone 8 (central - inferior) was the most favourable position for lag screw on postoperative radiograph. 82% of cases showed fracture gap of less than 3mm and 15% cases showed fracture gap on acceptable range (3-5mm). Very good to good Garden alignment index was found in 75% of cases.

Conclusion: We have suggested that proximal femoral nail offers advantages for the fixation of unstable intertrochanteric fractures with less operative time. It can be easily inserted and provide stable fixation with less complications.

Keywords: Intertrochanteric, Fractures, Femur.

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Introduction:

Intertrochanteric fractures commonly occur in elderly patients with osteoporosis and its incidence will continue to rise due to the increasing life expectancy. The main aim of surgery is to mobilize the patient early. It is

crucial to use an implant that is minimally invasive, allows early weight bearing, and has low complication rates[1,2].

The types of implant used in these fractures have been divided into extra medullary

implants and intramedullary nails. The choice of implant is mainly determined by the fracture pattern (stable or unstable). Unstable intertrochanteric fractures are those with major disruption of the posteromedial cortex because of comminution or are fractures with reverse oblique patterns or fractures with sub trochanteric extension. Fractures without posteromedial cortex disruption or sub trochanteric extension are considered stable[3,4].

The purpose of this study is to evaluate the functional and radiological outcome and complications of proximal femoral nail in the treatment of unstable intertrochanteric fractures.

Materials and methods

A retrospective study was conducted in the Department of Orthopaedics, SB Medical College & Hospital, Hazaribagh, Jharkhand, India for 1 year.

Methodology

110 patients with unstable intertrochanteric fractures AO type 31-A2.1, 31-A2.2, 31-A2.3, 31-A3.1, 31-A3.2, 31-A3.3 were included in study and which had been treated with Proximal femoral nail at our institution. Patients with fracture AO type 31A1.1, 31A1.2, 31A1.3, patients with medical comorbidities and patients having associated fracture of pelvis of either side or ipsilateral femur were excluded from study. 10 patients lost followup after 6 months. Therefore 100 patients were taken for the study. There were 65 females and 35 males with mean age of 61 years. 70 patients fractures were caused by trivial trauma and rest were caused by road traffic accident or fall from height. Fractures were classified according to the AO classification system. 45 fractures were classified as A2 type with 20 patients with A2.1, 15 patients with A2.2 and 10 patients with A2.3 type and rest 55 patients were A3 in which 24 were A3.1 and

11 were A3.2 and 20 patients were of A3.3 A2 and 55 fractures as A3 based on pre-operative radiograph. All surgeries were carried out within a mean of four days (range 2- 12 days) from date of injury. All patients received prophylactic antibiotic within 1 hour of skin incision. Reduction was achieved by closed manipulation and traction under fluoroscopic guidance. Fracture site was minimally exposed only if reduction by closed means was not successful. The fixation used proximal femoral nail (9-11mm in diameter), a lag screw (85-105 mm in length) and an antirotation pin (10-15 mm shorter than the lag screw). Cleveland zones[5] and tip apex distance (TAD)[6] was used to assess the placement of lag screw in the femoral head.

The fracture reduction was evaluated on the first post-operative radiograph using the Garden Alignment Index (GAI)[7] and fracture gap (mm) measurement. The results were classified using Garden Alignment Index as very good, good, acceptable or poor[8]. The fracture gap was classified as good (0-3 mm); acceptable (3-5 mm); or poor (> 5 mm).

The active quadriceps strengthening exercises, ankle and toe movements and knee mobilisation exercises were started on the first postoperative day. The mean hospital stay was 5 days (range, 3-14). Suture removed on 12th post-operative day. Some complications (intraoperative or postoperative) were also reported during the study period.

The mean follow up period was 12 months (range 9-18). Clinical evaluation was done using Harris hip score[7] and radiologically at 6 weeks, 12 weeks, 6 months, 9 months and thereafter every 6 months. Full weight bearing was allowed once radiological evidence of bone union was evident. Anteroposterior and lateral plain radiographs were taken at every visit to look for the

fracture union, tip apex distance, cut-out or lateral migration of lag screw or antirotation pin.

Results

At final follow up, union was found in all patients radiologically trabeculae crossing fracture site atleast three cortices in two views and clinically with no tenderness at fracture site. Average age at time of surgery was 61 years. 65 patients were women and 35 were men. There were 55% left and 45% right side hip fractures. Mean operative time was

35 minute (range 24-89 min). Average length of follow up period was 12 month. The Cleveland zone 8 (central - inferior) was the most favourable position for lag screw on postoperative radiograph. 82% of cases showed fracture

gap of less than 3mm and 15% cases showed fracture gap on acceptable range (3-5mm). Very good to good Garden alignment index was found in 75% of cases (Table 1). TAD was less than 25mm in 70% of cases.

Table 1: assessment of fracture gap and garden alignment index

	No of cases (n)	Percentage (%)
Fracture Gap		
Good (< 3 mm)	82	82
Acceptable (3-5mm)	15	15
Poor (> 5 mm)	3	3
Garden alignment index (anteroposterior -angle)		
Very good (180 ⁰)	23	23
Good (180 ⁰ -160 ⁰)	52	52
Acceptable (160 ⁰ -150 ⁰)	21	21
Poor (<150 ⁰) / Lat <180 ⁰	4	4

Reoperation for treatment or implant related complications was required in 3 patients. 2 case was treated with wound debridement for infection, and another underwent removal of lag screw for lateral thigh discomfort (Z effect or cut out) after fracture union. Delayed healing was observed in two patients with poor reduction. Anterior thigh pain was complained by two patients. Secondary varus developed in one patient on final follow up of 5 degrees. None had fractures of femoral shaft and greater trochanter.

Clinical outcome was evaluated by Harris hip score and was excellent to good in 88% of cases. At last, follow up at time of radiological and clinical union 85 patients were fully satisfied with good to excellent results, they were able to walk independently except 5 patients which needed support to walk. Radiological union was reported in all patients with malreduction in 2 patients with Garden Alignment Index <150 degree in lateral view.

Table 2: Results According to Harris hip Score

Harris hip score	Number (n)	Percentage (%)
Excellent	46	46
Good	42	42
Fair	10	10
Poor	2	2

Discussion

Unstable intertrochanteric femoral fractures are quite difficult to manage. Various treatment modalities include osteosynthesis with dynamic hip screws or cephalomedullary nail and arthroplasty in selected cases. However, choice of implant for unstable intertrochanteric fracture is still debatable. In our study unstable intertrochanteric fractures treated with proximal femoral nail. Moran et al. reported that a delay in surgery of up to four days in patients without an acute medical comorbidity does not increase postoperative mortality, morbidity, or duration of the rehabilitation[8]. In our study, the time from fracture to surgery was on average 3.7 days. Proximal femoral nail is fixed with two screws; the lag screw give compression at fracture site and carry most of load whereas smaller screw provides rotational stability. If antirotation screw is longer than lag screw, vertical forces would increase on antirotation screw and start to induce cut-out or Z-effect. Schipper IB et al., concluded that if antirotation screw was 10 mm shorter than the lag screw, percentage of total load carried by antirotation screw ranged from 8 to 39% (mean 21%), no cut-out of femoral head or fracture displacement were observed. In our study anti rotation screw was 10-15 mm shorter than the lag screw[9]. Geller et al. reported 44% incidence of cut outs in intertrochanteric fractures fixation with TAD of > 25 mm and no cut out seen with TAD of < 25 mm[10]. We observe one cut outs in our series with 70% patients had TAD < 25. Nikoloski et al., also recommended the TAD to be kept between 20-30 mm[11]. Jinet al.[12] preferred long proximal femoral nail over the shorter nail when there is excessive anterior curvature of the femur. In our study, we noticed impingement of tip of nail to the anterior cortex in two cases due to excessive bowing and short femur length in Indians.

We use long proximal femoral nail in all cases.

Yaozenget al. reported 6 intra operative femoral shaft fractures in their series of 107 intertrochanteric fractures[13]. In our study, we did not notice any intra operative fracture of shaft femur. Risk of this complication can be reduced by adequate reaming of femoral canal especially when using longer nails. Boopalanet al.[14] reported 21% incidence of intra operative lateral wall fractures in 31 unstable intertrochanteric fracture fixations. Study suggested that lateral wall fracture does not affect fracture union. Gotfried reported 24 cases of lateral wall fractures in their study[15]. He observed varus malalignment with medialisation of femoral shaft on x-ray in all these cases. We reported 6 cases of intra operative lateral wall fractures, out of which 1 case developed secondary varus collapse of 5 degrees. None of these fractures required reoperation.

G.N. Kiran Kumar et al evaluate the outcome of proximal femoral nail antirotation II by using Harris hip score and found Excellent and good results were found in 78% of cases[16]. In our study 46% Excellent and 42% good results were observed. Several studies like Gardenbroek TJ et al, Sahin S et al, Strauss E et al. [17-19]. have reported successful outcome with low complication rates with PFN in unstable intertrochanteric fractures Our study supports this finding and suggesting that proximal femoral nail is a reasonable treatment option in unstable trochanteric fractures.

Conclusion

We have suggested that proximal femoral nail offers advantages for the fixation of unstable intertrochanteric fractures with less operative time. It can be easily inserted and provide stable fixation with less complications. However, operative technique should be proper for achieving fracture stability and to avoid major complications.

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