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Management of unstable intertrochanteric fractures of femur: An observational outcome assessment

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Abstract

Aim: Study of proximal femoral nail in management of unstable intertrochanteric fractures of femur.
Materials and methods: An observational study was conducted in the Department of Orthopaedics, SSIMS, Bhilai, C.G., India for the period of 1 year. 50 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 54% left and 46% right side hip fractures. Mean operative time was 35 minutes (range 24-89 min). Average length of follow up period was 12 months. The Cleveland zone 8 (central-inferior) was the most favorable position for lag screw on postoperative radiograph. 82% of cases showed fracture gap of less than 3mm and 16% cases showed fracture gap on acceptable range (3-5mm). Very good to good Garden alignment index was found in 76% 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, proximal femoral nail

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 extramedullary 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

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or fractures with subtrochanteric extension. Fractures without posteromedial cortex disruption or subtrochanteric 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

An observational study was conducted in the Department of Orthopaedics, SSIMS, Bhilai, C.G., India for the period of 1 year, after taking the approval of the protocol review committee and institutional ethics committee.

Methodology

55 patients with unstable intertrochantric 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 facture 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. 5 patients lost follow-up after 6 months. Therefore 50 patients were taken for the study. There were 33 females and 17 males with mean age of 61 years. 35 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. 23 fractures were classified as A2 type with 10 patients with A2.1, 8 patients with A2.2 and 5 patients with A2.3 type and rest 27 patients were A3 in which 12 were A3.1 and 5 were A3.2 and 10 patients were of A3.3. 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 a proximal femoral nail (9-11mm in diameter), a lag screw (85-105 mm in length) and an anti-rotation pin (10-15 mm shorter than the lag screw). Cleveland zones [5] and tip apex distance (TAD) [6] were 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 mobilization 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 anti-rotation 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.

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Average age at time of surgery was 61 years. 33 patients were women and 17 were men. There were 54% left and 46% right side hip fractures. Mean operative time was 35 minutes (range 24-89 min). Average length of follow up period was 12 months. The Cleveland zone 8 (central-inferior) was the most favorable position for lag screw on postoperative radiograph. 82% of cases showed fracturegap of less than 3 mm and 16% cases showed fracture gap on acceptable range (3-5mm). Very good to good Garden alignment index was found in 76% 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)	41	82
Acceptable (3-5mm)	8	16
Poor (> 5 mm)	1	2
Garden alignment index (anteroposterior-angle)		
Very good (180^0)	12	24
Good (180^0-160^0)	26	52
Acceptable (160^0-150^0)	10	20
Poor (<150^0)/Lat <180^0	2	4

Reoperation for treatment or implant related complications were required in 3 patients. 2 cases were treated with wound debridement for infection and another underwent removal of lag screw for lateral thigh discomfort (Z-effect or cutout) 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 degree. 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 86% patients were fully satisfied with good to excellent results, they were able to walk independently except 14% patients which needed support to walk. Radiological union was reported in all patients with mal-reduction 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	23	46
Good	21	42
Fair	15	10
Poor	1	2

Discussion

Fractures that are unstable at the intertrochanteric level may be very difficult to treat. Osteosynthesis using dynamic hip screws or a cephalomedullary nail, as well as arthroplasty in selected instances, are some of the therapy options. Although, implant selection in unstable intertrochanteric fractures continues to be controversial. In our investigation, proximal femoral nails were used to repair unstable intertrochanteric fractures. A delay in surgery of up to four days in patients without an acute medical co-morbidity did not increase postoperative mortality, morbidity, or rehabilitation time, according to Moran *et al*. [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 gives 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]. Jin *et 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.

Yaozeng *et 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. Boopalan *et 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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