

Outcome of Treatment of unstable intertrochanteric fractures with proximal femoral nail: A retrospective study

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Abstract

Background: Intertrochanteric fractures occur frequently in older age groups due to osteoporosis. The main aim of surgery is stable fixation that allows to mobilize the patient early. The treatment of choice for trochanteric fracture remains controversial. Treatment of unstable intertrochanteric fracture is still challenging and are being treated successfully with proximal femoral nail. 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.

Method: A retrospective study on 100 patients was conducted with unstable intertrochanteric fractures treated with Proximal femoral nail. Fracture were classified according to the AO classification system. The fixation used a proximal femoral nail (9-11mm in diameter), a lag screw (85-105 mm in length) and a antirotation pin (10-15 mm shorter than the lag screw). Clinical evaluation was done using Harris hip score and radiologically at 6 weeks, 12 weeks, 6 months, 9 months and thereafter every 6 months.

Results: Most of the patients were between 40-60 years (Mean 50.35 years). Most commonly the mode of injury, wrist involvement & fracture type were RTA (50.3%), Right side (60.3%) and AO type C1. Mean pain score & Function score (PRWE) were less among patients where radiological parameters were restored.

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: Unstable Intertrochanteric Fractures, Proximal Femoral Nail, Outcome

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Introduction

Intertrochanteric fractures occur frequently in older age groups due to osteoporosis. The main aim of surgery is stable fixation that allows to mobilize the patient early. The treatment of choice for trochanteric fracture remains controversial [1,2,3]. There are various extramedullary implants and

intramedullary nails available for these type of fractures. The choice of implant mainly depends on the fracture pattern (stable or unstable). Unstable intertrochanteric fractures includes postero - medial cortex comminution or fractures with reverse oblique patterns or fractures with subtrochanteric extension. Fractures without posteromedial cortex disruption or

subtrochanteric extension are considered stable [4,5]. Treatment of unstable intertrochanteric fracture is still challenging and are being treated successfully with proximal femoral nail. 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 on 100 patients was conducted 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 from 1st August 2014 to 15th September 2017. 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. Four patients lost followup after 6 months. Therefore 96 patients were taken for the study. There were 30 females and 18 males with mean age of 62 years (range 34 - 84). 64 patients fractures were caused by trivial trauma and rest were caused by road traffic accident or fall from height. Fracture were classified according to the AO classification system. Forty fractures were classified as A2 type with 18 patients with A2.1, 12 patients with A2.2 and 10 patients with A2.3 type and rest 56 patients were A3 in which 25 were A3.1 and 10 were A3.2 and 21 patients were of A3.3 A2 and 56 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 a

proximal femoral nail (9-11mm in diameter), a lag screw (85-105 mm in length) and a antirotation pin (10-15 mm shorter than the lag screw). Cleveland zones [6] and tip apex distance (TAD) [7] 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) [8] 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 complication (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 [8] 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 62 years (range 34-84). 60 patients were women and 36 were men. There were

56% left and 44% right side hip fractures. Mean operative time was 36 minute (range 25-90 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. 81.4% of cases showed fracture

gap of less than 3mm and 14.6% 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 72% of cases.

Table 1: assessment of fracture gap and garden alignment index.

	No of cases (n)	Percentage (%)
Fracture Gap		
Good (< 3 mm)	78	81.4
Acceptable (3-5mm)	14	14.6
Poor (> 5 mm)	4	4
Garden alignment index (anteroposterior -angle)		
Very good (180^0)	22	22.9
Good (180^0 - 160^0)	50	52.08
Acceptable (160^0 - 150^0)	20	20.83
Poor ($<150^0$) / Lat $<180^0$	4	4.16

Reoperation for treatment or implant related complications was required in two patients. One 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 degree. None had fractures of femoral shaft and greater trochanter.

Clinical outcome was evaluated by Harris hip score (figure 4) and was excellent to good in 87.5% of cases. At last follow up at time of radiological and clinical union 84 patients were fully satisfied with good to excellent results, they were able to walk independently except six patients which needed support to walk.

Radiological union was reported in all patients with malreduction in four 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	40	45.8
Good	44	41.7
Fair	10	10.4
Poor	2	2.1

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 (9). 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 (10). 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 [11]. We observe one cut outs in our series with 72% patients had TAD < 25. Nikoloski et al., also recommended the TAD to be kept between 20-30 mm [12].

Jinet al. [13] 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 [14]. 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. [15] 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 [16]. 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 cases 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 [17]. In our study 45.8% Excellent and 41.7% good results were observed. Several studies like Gardenbroek TJ et al, Sahin S et al, Strauss E et al [18,19,20] have reported successful outcome with low complication rates with PFN in unstable intertrochanteric fractures.

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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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