Proximal Femoral Nailing for Unstable Trochanteric Functional Scores and Complications: A Prospective Study

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Abstract

Purpose: The purpose of the study was to assess the functional outcome and complications pertaining to unstable trochanteric fractures treated by proximal femoral nail

Methods: 11 consecutive unstable type of intertrochanteric and subtrochanteric fractures were selected prospectively between 2007 to 2009 after excluding patients with Commination at the entry point in greater trochanter, Severe co morbidities precluding anesthesia and Open fractures. Parker and palmer mobility score, Barthel index and Salvati-Wilson hip scoring system were used for functional assessment.

Results: The mean Parker & Palmer score was 8.1. The Barthel index at 6 weeks and 3 months were 70 and 90. All patients had excellent or good functional hip scoring according to Salvati-Wilson hip scoring system. Implant related complications occurred in 3 patients.

Conclusion: Proximal Femoral Nail is a better implant for unstable type of intertrochanteric and subtrochanteric fractures as our study shows excellent and good functional results with acceptable implant related complications.

Introduction

Trochanteric fractures have been traditionally subdivided into intertrochanteric and subtrochanteric fractures. In 1949 Evans classified intertrochanteric fractures into stable and unstable types. subtrochanteric fractures are inherently unstable. Before 1960s, treatment for trochanteric fractures was of necessity nonoperative. In elderly patients, this approach was associated with high complication rates. Techniques of operative fixation have changed dramatically since the 1960s. Operative management has consequently become the treatment of choice for intertrochanteric fracture. The sliding hip screw was the most widely used implant for stabilization of both stable and unstable intertrochanteric fractures. Despite this there has been dissatisfaction with use of this type of device to stabilize unstable fracture patterns. This has led to the development of intramedullary hip screw devices, which offers several potential theoretical advantages:

- More efficient load transfer,
- Shorter lever arm decreases tensile strain on the implant
- Incorporates a sliding hip screw mechanism, which allows controlled fracture impaction
- Theoretically requires shorter operative time and less soft-tissue dissection than a sliding hip screw.

The various intramedullary devices avail were Enders nail (condylocephalic nail) and cephalomedullary nails like gamma nail, intramedullary hip screw, trochanteric antigrade nail, proximal femoral nail, trochanteric fixation nail etc. Literature indicates both intramedullary nailing and extramedullary devices has been used in management of intertrochanteric fractures, but with merits and demerits with either of the devices. According to many authors cephalomedullary nail with strong fixation in the proximal femur is the treatment of choice for subtrochanteric fractures. But few authors believe that other devices equally effective or better than cephalomedullary nails. Hence we proposed to study the functional outcome and complications of proximal femoral nailing in unstable intertrochanteric & subtrochanteric fractures.

Patients and Methods

The study was performed in accordance with the ethical standards of the 1964 Declaration of Helsinki and was approved by the Ethical Committee of our Institution. 11 patients presented to department of orthopedics between November 2007 to May 2009 with Closed unstable intertrochanteric & subtrochanteric fractures in adults were included. All 11 patients underwent fixation using proximal femoral nail after getting the informed consent. Intraop fracture reduction was assessed using Baumgaertner 30 classification as good or acceptable or poor. Patients were made to do high situp, isometric quadriceps & deep breathing exercises from 1st post
operative day. Dangling of legs & ROM exercise for knee was taught from day 2. Non weight bearing walking begun with crutches or walker as soon as patients become confident (on an avg at 4-7 days post op). Follow up done from there on at 1st, 2nd, 3rd, 6th months & at 1 year. At each follow up patients were assessed in terms of local wound status, pain, and ambulation status, local part x ray to assess implant position, fracture healing & TAD score. Each patient's Barthel index at 6 weeks & 3 months postoperatively were assessed as an indicator of operative procedure on early functional recovery. Parker & Palmer mobility score 32 at 1 year were calculated. Functional hip scoring assessed using Salvati - Wilson 31 hip scoring system for all patients & results were expressed as excellent, good, fair or poor.

Results

Among the 11 patients 6 were males and 5 were females. 6 of them due to simple fall, 4 were due to RTA & 1 was spontaneous (pathological due to plasmacytoma). 6 Patients had intertrochanteric & 5 patients had subtrochanteric fractures. 4 of the intertrochanteric fractures belonged to Evans type I-comminuted, unstable variety & 2 belonged to Evans type II(reverse oblique). 4 of the subtrochanteric fractures belonged to type V Seinsheimers variety & 1 belonged to type IIB Seinsheimers variety as depicted in the chart below. Medical comorbidities requiring treatment before surgery encountered in 3 patients. The mean Pre-injury Parker & Palmer mobility score was 8.7. Three dimensional reconstrutional CT-Scan evaluations done in 2 patients due to gross comminution of the subtrochanteric and intertrochanteric region( mainly to assess the entry point). Closed reduction achieved in 9 patients. Open reduction required in 2 patients. The reduction was good in 10 of the 11 (91%) patients and acceptable in 1 patient. The reduction was considered good, acceptable or poor –according to the modified criteria of Baumgaertner et al.30. Mean operative time was 189 mins (range-120-220 mins; including preparation time). Average blood loss was 374.5 ml (100-1000 ml). The mean fluoroscopy time was 96 secs (varied between 66 to 150 secs). In all patients both the cervical screws inserted except in one patient in whom due to lack of space in the neck a Knowels pin was used as the derotation screw. Both distal locking done in 9 of the 11 patients. In 2 patients only 1 distal locking done. All were static locking. In 1 patient cerclaging was done at distal locking site due splintering of fracture. One patient developed stitch abscess, which was drained & treated with appropriate antibiotics. One patient had serous oozing from distal locking wound, but, C/S was negative & it subsided over a period of week without any intervention. One patient was immobilized in hip spica prophylactically as there was intraoperative splintering at distal locking site. 6 patients were able to walk non weight bearing with crutches or walker during the 1st 10 days of postoperative period. (patients with associated distal radius fracture were mobilized only after 4 weeks). Mean duration of hospital stay was 43.5 days (21 to 120 days). Average follow up period was 11.1 months (3 months to 22 months). No wound related compiliation on follow up. All patients who came for follow up complained of mild to moderate pain at trochanter region for 1st 3 months especially on doing physiotherapy. Among patients who completed 1 year follow up, 2 patients (28.5%) had persistent mild pain at the upper lateral thigh aspect on squatting. The average shortening of the operated limb after fracture healing was 1.1 cms (range 0.5-2.5 cm). 1 patient required shoe raise. Partial weight bearing started in 6 of 9 patients who turned up for follow up at 6 weeks. All 11 were able to do full weight bearing at 6 months of postop. 8 of the 11 patients (72.7%) were able to squat and sit cross leg at their final follow up. The mean Parker & Palmer mobility score at 1 year was 8.1 (6-9). Barthel index at 6 weeks & 3 months postoperative period was 70 & 90 respectively. 36.3% of our patients had excellent & 66.7% of our patients had good functional results according to Salvati-Wilson scoring system (table-1).

66.6% (6/9) patients were able to climb the stairs & 50% (5/10) were able to squat and sit cross leg at their final follow up. The mean Parker & Palmer mobility score was 8.3. 66.7% of our patients had good functional results according to Salvati-Wilson scoring system. Among patients who completed 1 year follow up, 2 patients had persistent mild pain at the upper lateral thigh aspect on squatting. The average shortening of the operated limb after fracture healing was 1.1 cms (range 0.5-2.5 cm). 1 patient required shoe raise. Partial weight bearing started in 6 of 9 patients who turned up for follow up at 6 weeks. All 11 were able to do full weight bearing at 6 months of postop. 8 of the 11 patients (72.7%) were able to squat and sit cross leg at their final follow up. The mean Parker & Palmer mobility score at 1 year was 8.1 (6-9). Barthel index at 6 weeks & 3 months postoperative period was 70 & 90 respectively. 36.3% of our patients had excellent & 66.7% of our patients had good functional results according to Salvati-Wilson scoring system (table-1).

Discussion

The study is a prospective design, comprising of 11 patients, of them 6 were males & 5 were females.
Preoperative CT scan with 3D reconstruction evaluation was done in 2 patients with comminuted subtrochanteric fracture. Closed reduction obtained 9 patients, among that 8 (88%) were in good position and 1 was in acceptable position (according to Baumgaertner et al.). 2 patients required open reduction. In 1 patient due to guide wire break at fracture site, open reduction done to retrieve the guide wire. In other patient closed reduction was not acceptable & fracture line extended distally till distal screw slot, in which case additional stabilization done with a cerclage. After facing this difficulty we decided to follow the rule of working distance of 5 cm from the distal fracture site to distal locking screw slot as suggested by many authors. In our study the average fluoroscopy time was 96.9 secs and average blood loss was 374.5 ml, which were comparable to other studies using PFN. In our study none of the patients required revision. 1 patient required reoperation for proximal lateral thigh pain due to back out of lower cervical screw after fracture consolidation. Post operative wound complication of our study was also similar to other studies. Many of the studies mention a fracture healing time of 3 – 4 months. The longest healing time of 17 months was documented in the study by Si Yong Park et al. in treating trochanteric fractures [31-A3.1(6.5%), 31-A3.2(34.8%), and 31-A3.3(58.7%)] using PFN in 46 patients. In our study the fracture healing time was 3.4 months. None of the patients had non union. Many of the studies mention that weight bearing being allowed gradually around 6 weeks period when callus formation is adequate. In our study also we followed delayed controlled weight bearing at an average period of around 6 weeks when adequate callus formation occurred in all patients. We had encountered few implant related complications. In 1 patient back out of lower neck screw occurred at 1 year of follow up. The patient underwent elective removal of the screw as fracture has consolidated well. Another patient had nail broken at the distal locking screw slot site at 10 months of follow up. Patient did not had trauma & asymptomatic at device failure site. This patient found to have both the distal screws being out of the slot on follow up radiography, as it was missed in initial few months. Both the patients otherwise functionally not affected & returned to their previous profession. None had screw cut out, nail tip fracture or Z-effect. Similar and many other types of implant related complications been mentioned in the literature. The tip-apex distance was used to describe the position of the screw. The tip-apex distance (TAD), expressed in millimeters, is the sum of the distances from the tip of the lag screw to the apex of the femoral head on both the AP and lateral radiographic views. The utility of the TAD was demonstrated by Michael R. Baumgaertner et al. in a series of 198 intertrochanteric fractures. No lag screw cut-out occurred when the TAD was 27 mm or less. Conversely, lag screw cut-out rate increased to 60% when the TAD was more than 45 mm. The mean TAD score in our study was 26.3, none of the cases had screw cut out.

Functional parameters:

Independence of walking at 1 yr (using Parker & Palmer mobility scoring system) has been used as the most common mobility assessing system. Po-Cheng Lee et al. 2007 (RTRN & DCS) - At the 2 year follow-up, the mean mobility score was 7.5 (Parker & Palmer mobility score). Mean mobility score significantly differed according to the presence of associated injury (p = 0.05) and significantly correlated with the duration of hospital stay. In our study the average Parker & Palmer score at 1 year was 8.1. There are various scoring systems being used in literature for assessing overall functional outcome in hip fracture patients (Harris hip scoring 34, charnley scoring 35, Merle d'Aubigné score system 36, Barthel ADL Index 37, Salvati-Wilson scoring systems 31 etc). Among that Barthel index & Salvati-Wilson scoring systems being used in our study. Barthel index takes into account of the most of daily activities of life. It also gives a feed back on the impact of treatment & rehabilitation in fastening the recovery as it is used at 6 weeks & at 3rd month postop. The disadvantage with Barthel index was scores are not being graded. Salvati-Wilson scoring systems consider pain, walking ability & hip movements, apart from functional assessment. The merit of this system was, it also grades the scores as excellent, good, fair & poor which will be useful for understanding. In our study we used both the systems & the results are tabulated above. Using Barthel ADL index our study shows mean score of 70 at 6 weeks post op and 90 at 3rd month post op. 8 patients (72.7%) recovered >90 % of their preinjury Barthel index values, which was comparable to other studies which used the same index ,like Fogagnolo F et al 38 (2004) using PFN -66.6%. To conclude Proximal Femoral Nail is a suitable implant for unstable type of intertrochanteric and subtrochanteric fractures as our study shows excellent and good functional results with acceptable implant related complications.

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Illustrations

Illustration 1

Fig 1
Illustration 2

Fig 2
Illustration 3

Back out of Lag Screw (after fracture healing)
Illustration 4

1 Year Post op (implant failure; but fracture consolidated)
Illustration 5

showing Salvati-Wilson hip scoring for our patients

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<th>Patients</th>
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