Study of surgical management of Trochanteric and sub trochanteric fractures with proximal femoral nailing – A study of 40 cases

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ABSTRACT

Introduction: Intertrochanteric and subtrochanteric fractures are devastating injuries that most commonly affect elderly, but it is not uncommon in younger age. Trochanteric fractures in elderly are due to trivial fall where as in younger population it is due to high energy trauma. Treatment of these fractures especially sub trochanteric fractures is highly challenging, because there is high risk of malunion, delayed union (No-Union), implant failure, etc. There are various methods of treatment available but Proximal Femoral Nail (PFN) which is centromedullary collapsible device with additional rotation stability is biomechanically more stable implant.

Materials and Methods: Our study consists of 40 patients, of which 30 are trochanteric fractures and 10 are sub trochanteric fractures. In our series maximum age was 92 years and minimum age was 26 years and the mean age was 61.4 years, most of the patients were between 60 to 75 years. All the patients were treated with PFN after proper preoperative evaluation and planning. Post surgery patients were followed up at regular intervals of 4 weeks till there is fracture union and thereafter once in 8 weeks till one year. At every visit patient was assessed regarding hip and knee functions and fracture union.

Results: In our study average time for union was 14.6 weeks. We had one case of shortening of 1cm with near normal range of hip motion. There were no cases of non union or implant failure. Mean Harris Hip score was 89.8, which is comparable to that of Karn et al.92 (2011)

Conclusion: This study was done to analyze the surgical management of peri trochanteric fractures of femur using proximal femoral nail fixation. Good to excellent results were seen in 100% cases of trochanteric fractures and 87.5% cases of sub trochanteric fractures. From this study, we consider that PFN is an excellent implant for the treatment of peri trochanteric fractures of femur.

Keywords : Trochanteric fracture, Sub trochanteric fracture, delayed union, non union, Proximal Femoral Nail.

INTRODUCTION

Intertrochanteric and sub trochanteric fractures most commonly affect elderly due to trivial fall, whereas in younger population it is due to high energy trauma. Sub trochanteric fractures account for 10% - 26% of hip fractures. Closed methods of treatment have largely been abandoned, rare exception to this is medically unstable patient who is an extremely poor anaesthetic and surgical risk. One goal of operative treatment is strong, stable fixation of the fracture fragments. Kaufer, Mathews and Sonstegard listed the following variables as those that determine the strength of the fracture fragments-implant assembly; (1) bone quality, (2) fragment geometry, (3) reduction, (4) implant design and (5) implant placement.

The surgeon can control only the quality of the reduction and the choice of implant and placement, because most patients with Intertrochanteric fractures have considerable osteopenia, with the quality of bone for the purchase of fixation within the femoral head and neck less than the desirable. There are various methods of treatment available, but PFN which is centromedullary collapsible device with additional rotation stability is biomechanically more stable with added advantages of small incision and less blood loss.

MATERIALS AND METHODS: Our study consisted of 40 patients of this 30 had Intertrochanteric fractures and 10 sub trochanteric fractures. In our series maximum age was 92 years and minimum age was 26 years. We have excluded pathological, open fractures, periprosthetic fractures and paediatric hip fractures. After admission, routine investigations were done like CBP, blood grouping, typing, FBS, PLBS, serum Creatinine, serum electrolytes, urine for Albumin sugar, Chest X-ray, ECG, 2D echo etc. X-Ray of Pelvis with both hips AP view and a lateral view on the affected side were taken. All the patients were evaluated for associated medical problems and were referred to respective departments and necessary treatment was given. All were operated on elective basis after

proper preanaesthetic checkup. Blood transfusion and cardiac evaluation was done in necessary patients. All cases included in our study were fresh fractures. They underwent surgery at the earliest possible.

OPERATIVE TREATMENT (PFN): After meticulous pre operative planning and pre anaesthetic checkup all patients were treated on elective basis. Under suitable anaesthesia (Spinal Anaesthesia), patient was placed in supine position on fracture table with 100-150 adduction of the affected leg. The unaffected limb is abducted as far as possible. Closed reduction of fracture is done and checked with "C" arm both AP and Lateral view. The patient is prepared and drapped, prophylactic IV antibiotic given to all patients 30 minutes before surgery. The tip of the greater trochanter is located by palpation in thin patients or using 'C'arm, a 5cm longitudinal incision given starting from tip of Greater trochanter. A parallel incision is given in fascia lata and Gluteus medius is split in line with the fibres. Once greater trochanter is exposed, entry point is made on tip. Guide wire is passed (Figure 1), checked under 'C' arm. Reaming is done over guide wire using protected sleeve. Standard 250mm nail determined preoperatively is assembled to the insertion handle and inserted manually as far as possible into the femur. This step is done carefully without hammering with gentle twisting movements of the hand until the hole for 8mm screw is at the level of the inferior margin of the neck.

Insertion of the guide wire for neck screw and hip pin: These are inserted with the help of the aiming device tightly secured to the insertion handle and using the drill sleeve system. A 2.8mm guide wire (Figure 2) is inserted through the drill sleeve after a stab incision with its position in the caudal area of the femoral head for neck screw. This guide wire inserted 5mm deeper than the planned screw size. The final position of this guide wire should be in the lower half of the neck in AP view and in centre of neck in lateral view. Proper positioning of the nail will aid in proper anteversion of the neck screw as there is inbuilt anteversion in the hole on the nail. A second 2.8mm guide wire (Figure 2) is inserted through the drill sleeve above the first for hip pin. The tip of this guide wire should be 5mm deeper than the planned hip pin but approximately 25-20mm less deep than planned neck screw. Drilling is done over the guide wire with 6.5mm drill bit to a depth up to the length of hip pin previously measured. After reaming the same length 6.5mm hip pin (Figure 3 & 4) is inserted with the help of hexagonal cannulated screw driver. Similarly appropriate sized neck screw inserted after reaming. Finally distal locking is done using two cortical screws. Lavage is given using normal saline and incision is closed in layers. Sterile dressing is applied over the wound.

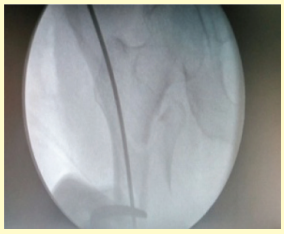
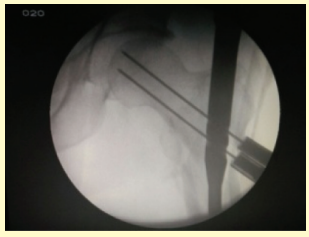

Figure1. Figure showing passage of guide wire
Figure2. Figure showing insertion of guide wire


Figure3. Figure showing insertion of neck & hip screws
Figure4. Figure showing insertion of neck & hip screws

RESULTS

Mean duration of surgery was 75 minutes and average blood loss was 130 ml, radiation exposure was 90 seconds in our study. We took more exposure time in comminuted fractures with difficult reduction; duration of surgery was more for sub trochanteric fractures. One patient had left knee (ipsilateral) effusion with fracture surgical neck of Humerus (Simple) on right which was managed conservatively. One patient had ipsilateral compound grade-II communitted fracture tibia treated with external fixator. One patient had ipsilateral fracture clavicle with fracture of 4, 5, 6 ribs, both were treated conservatively. Open reduction was done in few cases before passing the guide wire.

In our study we encountered certain complications intraoperatively; one patient had iatrogenic fracture of lateral cortex of proximal fragment due to wrong entry point. We had one occasion of drill bit breakage; in three cases we could not achieve complete anatomical reduction. In one case fracture fixation was in varus angulation. Post operatively we had one case of wound infection which was treated with antibiotics and regular antiseptic dressing. We encountered two cases of delayed union and one case of varus malunion. In our study average duration of hospital stay was 9 days; mean time for full weight bearing was 14.6 weeks. All patients were followed at 4 weeks interval till union occured, there after every 8 weeks till one year. Functional results were assessed using Harris hip score system (Maximum possible-100, pain relief-44, function-

47, range of motion -5, absence of deformity-4). Anatomical results were assessed by presence or absence of deformities, shortening, hip and knee range of motions.

DISCUSSION

The treatment of fracture of the proximal femur is still associated with some failures. The reasons are disregard for biomechanics, over estimation of the potentials of surgical techniques or new implants or poor adherence to established procedures. High stress concentration that is subject to multiple deforming forces, slow healing time decreased vascularity, high incidence of complications reported after surgical treatment compels the surgeon to give a second thought regarding selection of the proper implant. The most common current modes of fixation are Blade plate systems, Sliding-screw system and intramedullary devices. From the mechanical point of view, a combined intra medullary device inserted by means of minimally invasive procedure seems to be better in elderly patients[1,2]. Closed reduction preserves the fracture haematoma essential element in the consolidation process.

Intramedullary fixation allows the surgeon to minimize soft tissue dissection there by reducing surgical trauma, blood loss, infection and wound complications. PFN is a novel, modern intramedullary implant based on experience with the gamma nail. The arbeitsegemeinschaft fur osteosynthesegragen (AO ASIF) in 1996, therefore developed the proximal femoral nail with an antirotational hip pin together with a smaller distal shaft diameter which reduces stress concentration to avoid these failures. Proximal femoral nail has all advantages of an intramedullary device, such as decreasing the moment arm, can be inserted by closed technique, which retains the fracture haematoma an important consideration in fracture healing, decrease blood loss, infection, minimizes soft tissue dissection and wound complications[3,4].

In an experimental study, gotze et al (1998) compared the lodability of osteosynthesis of unstable per and sub trochanteric fracture and found that the PFN could bear the highest loads of all devices. Simmermacher et al (1999), in clinical multicentric study, reported technical failures of PFN after poor reduction, malrotation or wrong choice of screws in 5% of the cases. In our study poor reduction occurred in three cases, one with varus malreduction [Table 1]. A cut out of the neck screw occurred in 0.6% cases in the study conducted by Simmermacher, but we did not encounter such complication in our study.

Anatomical fracture reduction was found in 86% of the patients and full weight bearing stability was achieved in 94%. In our study acceptable anatomical reduction was obtained in 85% cases. However, Simmermacher et al (1999) had no cases of intraoperative fracture displacement using the PFN mainly in 31-32 fractures. In our study we had no case of intra operative fracture displacement after nail insertion. In comparison to gamma nail, we found no fracture of the femoral shaft and no break in the implant. W M gadegone & Y S Salphale in 2007 reported a study on PFN - an analysis of 100 cases of proximal femoral fractures with an average follow up of 1 year, post operative radiographs showed a near-anatomical fracture reduction in 88% of patients. The fracture consolidated in 4.5 months. No perceptible shortening was noted. Of the patients 82% had full range of hip motion[5,6,7].

In our study we had 85% near normal anatomical fracture reduction and fracture consolidated in 14.6 weeks. One case we had shortening of 1cm with near normal range of hip motion. We encountered no non-union and implant failure cases. Metin Unun et al in 2009, in a study of 35 patients reported long term radiographic complications following treatment of unstable Intertrochanteric femoral fractures with the proximal femoral nail and effects on functional results[8]. Reduction was assessed as good or acceptable in all the patients. Complete union was achieved in all but two patients.

The mean Harris hip score was 82.1.The results were excellent in 11 patients (31.4%), good in 15 patients (42.9%), fair in 7 patients (20%) and poor in two patients (5.7%) [Table 2]. Radiographic complications mainly included secondary varus displacement in 9 patients(25.7%). Secondary varus displacement was due to cut-out of the proximal screws (n=2), screw loosening due to collapses of the fracture site(n=2) and reverse z-effect(n=5). Radiological complication chiefly include 3 cases of varus malunion. We had no implant failure or reverse z-effect. Mean Harris hip score 89.8. The aim of the study was to study the epidemiology of proximal third fracture femur in adults and anatomical and functional outcome with this newer method of intramedullary fixation with PFN[9,10].

The assessment criteria for the efficiency of surgical technique included duration of surgery, number of intra operative complications, blood loss and radiographic screening time; clinical assessment includes post operative walking ability. Hip and knee function, fracture union time and implant bone interaction. In our study, peri trochanteric fractures were more common due to slip and fall. Age ranged from 26 to 92 years with mean age of 61.4 years. Males were more common contributing the 75% of cases. Right sided fractures were more common in our study accounting for 55% of cases. In our study trochanteric fractures contributed 75% of cases, out of which body and griffin type 2 consisted of 60%, and 30% were type 1, 10% type 3. Subtrochanteric fractures accounted for 25% of

cases, Seinsheimr type 3a consisted of 40% cases, followed by 2b of 20%.

The mean duration of radiation exposure was 90 seconds, mean duration of surgery was 75 minutes and mean blood loss was 130 ml. In the intraoperative period, one patient had fracture of lateral cortex of the proximal fragment; there was one case of drill bit breakage. The mean duration of hospital stay was 10 days; mean time for full weight bearing was 14.6 weeks. Post operatively all patients were ambulatory of which three of them required walking aids. Over all 92.3% of our cases had excellent to good results.

Table 1: Mechanical complications of PFN system

	C Bolding et al	Dominigo Et al	Simmermacher et al	Present Study with PFN
No.of Patients	55	295	191	40
Cutout	2	4	1	0
Z effect	3	-	-	0
Reverse Z effect	2	-	-	0
Implant failure	-	-	1	0
Lateral cortex fracture	-	1	-	5%
Re operation rate	18%	3%	7%	0%
Duration of Surgery	68min	77min	46min	75min
Bony union	100%	100%	98%	100%
Failure of fixation	0%	11%	0%	0%
Delayed union	-	-	2%	5%
Open reduction	10%	-	34.65	7.5%

Table 2: Comparision of mean Harris hip score in present study with other studies.

	Year of study	Mean Harris Hip Score
Karn et al (n=60)	2011	92
Metin unun et al(n=35)	2009	82.1
Our study (n=40)	2012-2014	89.8

In our study, mean Harris Hip Score was 89.8,Which is comparable to that of karn et al(2011).

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