

Functional outcome of proximal femoral nail for the treatment of peri-trochanteric fracture of femur in a tertiary care hospital

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Abstract

Objectives: To assess results of proximal femoral nail in the treatment of peri-trochanteric fracture of femur.

Methods: This study included 90 patients of proximal femur fracture admitted in our institute. The patients were informed about the study in all respects and informed consent was obtained from each patient.

Results: Results were evaluated using the Harris Hip Score. We had 45(50%) excellent, 31(34.44%) good, 12(17.8%) fair and 2(2.22%) poor results.

Conclusion: The Proximal Femoral Nail Can Be Considered The Most Rational Method of Treating Intertrochanteric and Sub-trochanteric Fractures, Especially the Unstable and Reverse Oblique Type. Also the learning curve is relatively less and hence can be performed well by most of the surgeons. Thus we can conclude that the Proximal Femoral Nail is after proper training and technique, a safe and easy implant option for treatment of complex peri-trochanteric fractures.

Keywords: Peri-trochanteric fracture, proximal femoral nail

Introduction

Proximal femur fractures are common in the old age group. These fractures unite readily with conservative lines of treatment and there is no fear of complications like avascular necrosis of head and its sequel of osteoarthritis. In trochanteric fractures treated without surgical interventions, mal-union with coxa-vara deformity resulting in shortening of limb and limping are commonly seen ^[1]. Various operative procedures with different implants have been described for the treatment of proximal femur fractures. Earlier active treatment was usually delayed for as long as 3 to 4 weeks which lead to secondary complications. The primary goal of the treatment has to be early mobilization to avoid secondary complications, which can be achieved by open reduction and internal fixation. Intertrochanteric femur fractures may be repaired with either a sliding hip screw or a trochanteric nail. The hip screw has been considered

the device of choice because fracture union predictably occurs. A problem with sliding hip screws is collapse of the femoral neck leading to loss of hip offset and shortening of the leg and it had not good results in lateral wall comminuted fractures. Although some sliding is expected, too much shortening is detrimental to hip function. Therefore a new intramedullary device-Proximal Femoral Nail was designed in 1996 which gives an advantage of minimally invasive surgery [2]. Here is an effort to study the results of Proximal Femoral Nail in the management of proximal femur fractures by analysing the factors which influence post-operative mobility.

Materials and Methods

This study included 90 patients of proximal femur fracture admitted in our institute. The patients were informed about the study in all respects and informed consent was obtained from each patient.

Inclusion criteria

1. Patient who has been diagnosed as having intertrochanteric and sub-trochanteric fractures.
2. Patients more than 20 years of age.
3. Patients who are fit for surgery.

Exclusion criteria

1. Skeletally immature individuals.
 2. Patients unfit for the surgery.
 3. Patients with pathological fractures.
 4. Patients admitted for re-operation.
 5. Patient not giving written consent for surgery.
- Patients admitted with Intertrochanteric fracture were examined and investigated with X-ray pelvis with both hips AP and Lateral view (whenever possible). Skin traction was applied to all the patients. All the patients were operated using Proximal Femur Nail.

Results

The study involved 90 confirmed cases of Intertrochanteric and Subtrochanteric fractures of either sex. All the cases were treated with the proximal femoral nail. The study involved patients above 20 years of age. The age distribution was from 22 to 87 years. The average age was 60.73 years, the largest group of patients being from 61-70 years? There were 33 females and 57 males in the study. Most common cause of injury was fall down followed by road traffic accidents. 70 patients had intertrochanteric fracture whereas 20 patients had sub-trochanteric fracture. Time between Injuries to operative intervention was within 3 days of injury for 85 patients while 5 patients had an interval of more than 3 days. The average operative time was 60.11 minutes.

Table 1: Functional results based on Harris hip score

Harris Hip Score		Number of Patient
<70	Poor	2
71-79	Fair	12
80-89	Good	31
90-100	Excellent	45

The average radiological union time for Intertrochanteric fracture was 15.8 weeks and for Sub-trochanteric fracture was 16.7 weeks. The average Partial Weight Bearing walking time was 7.17 weeks ranging from 6 weeks to 10 weeks and the average Full Weight Bearing walking time was 11.17 weeks ranging from 10 weeks to 14 weeks. 1 patient had non-union at the end of follow up. In 6 patients with long spiral fracture, encirclage wiring was done by opening the fracture site to hold fragments. 3 patients had early post-operative infection which was resolved with antibiotics and dressing. 5 patients with screw back-out were treated by inserting a new screw of smaller size. 1 patient had non-union. 1 patient had the “z effect” at the end of 9 months, managed by removal of the implant.

Discussion

Reviewing the literature, it was seen in different series that the time taken for surgery was variable and dependent on number of factors like the type of fracture, bone structure of the patient, the skill of the operating surgeon etc. and not solely on the implant used but nevertheless the surgical time for PFN is less than extra medullary fixations. In our series the average duration of surgery in Intertrochanteric and sub-trochanteric fracture was 58.29 minutes and 66.5 minutes respectively which was less than the time taken for extra medullary fixation. This was uniformly seen in most of the series. Though PFN was preferably done as a close surgery but if the reduction was not acceptable than a mini open reduction followed by PFN may be done. In our series, as and when needed we had resorted to mini open reduction. As compared to extra medullary fixation the amount of blood loss during PFN was less because it is essentially a close procedure and even when open reduction was done, the soft tissue dissection was much less than extra medullary fixation [52]. This decreases the morbidity and preserves the biology thus improving the union chances and decreases the rate of complications. We had 3 cases of superficial infection of which were cured by antibiotics and dressing. 5 patients with screw back out were treated by inserting a new screw of smaller size. There was one non-union (1.11%) in our study. Non-union rates of 28% (Rahm *et al.*) [42], 10% (Erhan *et al.*) [53] for Angled plate have been reported. Similar studies with PFN have reported non-union rates of 0% (Sheng *et al.*) [50]. In our patient bipolar was done and the patient is now ambulatory. 1 patient had the “z effect” at the end of 9 months, managed by removal of the implant. The average radiological union time for intertrochanteric fracture in our study was 15.8 weeks.

Study	Average Union Time(weeks)
Li <i>et al.</i> [54]	12.5
Zhang <i>et al.</i> [55]	15.7
Karapinar <i>et al.</i> [56]	14.0
In Our Study	15.8

Harris hip score

Results were evaluated using the Harris Hip Score. We had 45(50%) excellent, 31(34.44%) good, 12(17.8%) fair and 2(2.22%) poor results.

Study	Excellent (90-100)	Good(81-89)	Fair(70-79)	Poor(<70)
Timothy <i>et al.</i> [57]	24.2%	51.5%	15.2%	9.1%
Jose A <i>et al.</i> [58]	58.8%	29.4%	8.8%	2.9%
Rajesh kapila <i>et al.</i> [59]	24%	56%	12%	8%
In Our Study	50%	34.44%	17.8%	2.22%

Advantages of Proximal Femoral Nail:

1. Less operative time thus reducing the cost
2. No or less need of transfusion of blood
3. Less hospital stay
4. Early return to daily activities.

Dynamic hip screw introduced by Clawson in 1964 remains the implant of choice due to its favourable results and low rate of complications. It provides controlled compression at the fracture site. Its use has been supported by its biomechanical properties which have been assumed to improve the healing of the fracture. But Dynamic hip screw requires a relatively larger exposure, more tissue trauma and anatomical reduction. All these increase the morbidity, probability of infection and significant blood loss. It also causes varus collapse leading to shortening and inability of the implant to survive until the fracture union. The plate and screw device will weaken the bone mechanically. The common causes of fixation failure are instability of the fractures, osteoporosis, lack of anatomical reduction, failure of fixation device and incorrect placement of the screw. We found the proximal femoral nail to be more useful in unstable and reverse oblique patterns due to the fact that it has better axial telescoping and rotational stability. It has shown to be more biomechanically stronger because it can withstand higher static and several fold higher cyclical loading than dynamic hip screw. So the fracture heals without the primary restoration of the medial support. The implant compensates for the function of the medial column. The gamma nail is associated with specific complications like anterior thigh pain, fracture at the tip of the nail. But the Proximal femoral nail is long and it has a smaller diameter at the tip which reduces the stress concentration at the tip. Its position is near to the weight bearing axis so the stress generated on the implant is negligible. Proximal femoral nail also acts as a buttress in preventing the medialisation of the shaft. The entry point of the proximal femoral nail is at the tip of the greater trochanter so it reduces the damage to the hip abductors unlike the nails which have entry through piriformis fossa. The hip screw and the anti-rotation cervical screw of the Proximal femoral nail adequately compress the fracture, leaving between them adequate bone block for further revision should the need arise.

Conclusion

The Proximal Femoral Nail Can Be Considered The Most Rational Method of Treating Intertrochanteric and Sub-trochanteric Fractures, Especially the Unstable and Reverse Oblique Type. Also the learning curve is relatively less and hence can be performed well by most of the surgeons. Thus we can conclude that the Proximal Femoral Nail is after proper training and technique, a safe and easy implant option for treatment of complex peri-trochanteric fractures.

Case 1



Fig 1: Pre Op X Ray

Fig 2: Post Op X-ray

Fig 3: 2 year F/U



Fig 4: 2 Year F/U



Fig 5: 2 Year F/U



Fig 6: 2 Year F/U

Case 2



Fig 1: Pre Op X Ray



Fig 2: Post Op X ray



Fig 3: 1 Year F/U



Fig 4: 1 Year F/U



Fig 5: 1 Year F/U



Fig 6: 1 Year F/U

Case 3



Fig 1: Pre Op X Ray



Fig 2: Post Op X-ray



Fig 3: 1 year F/U



Fig 4: 1 Year F/U



Fig 5: 1 Year F/U

Case 4



Fig 1: Pre Op X-Ray



Fig 2: Pre Op X-Ray



Fig 3: Post Op X ray



Fig 4: 1 Year F/U



Fig 5: 1 Year F/U



Fig 6: 1 Year F/U

Case 5



Fig 1: Pre Op X Ray



Fig 2: Post Op X-ray

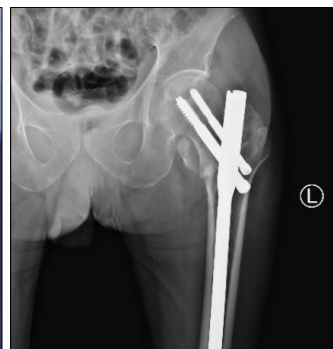


Fig 3: 1 Year F/U



Fig 4: 1 Year F/U



Fig 5: 1 Year F/U



Fig 6: 1 Year F/U

Case 6



Fig 1: Pre Op X Ray



Fig 2: Post Op X-ray

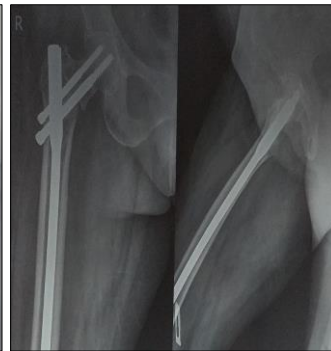


Fig 3: 1 Year F/U



Fig 4: 1 Year F/U



Fig 5: 1 Year F/U

Case 7



Fig 1: Pre Op X Ray



Fig 2: Post Op X-ray



Fig 3: 1 Year F/U



Fig 4: 1 Year F/U

Fig 5: 1 Year F/U

Fig 6: 1 Year F/U

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