DOI: http://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20184391

Original Research Article

Functional outcome of unstable intertrochanteric fractures managed with proximal femoral nail: a prospective analysis

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Received: 18 August 2018
Revised: 20 September 2018
Accepted: 21 September 2018

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ABSTRACT

Background: Hip fractures are a growing concern for the orthopedic surgeons all over the world because the incidence of hip fractures is increasing dramatically and these fractures impose a significant challenge in their efficient management. The aim of the study was to prospectively analyze the functional outcome of unstable intertrochanteric fractures managed with 'proximal femoral nail'.
Methods: In our institution, we have selected 24 cases of unstable intertrochanteric fractures for this prospective study. All cases enrolled were managed with the proximal femoral nail. These cases were studied from the mechanism of injury, classification, and treatment with the proximal femoral nail and their surgical and functional outcome with or without residual comp.
Results: Patients were followed up for an average period of 8.58 months. The mean Harris hip score was 88.75 at 6th month. The score was excellent in 12 patients, good in 10 patients, fair in 1 patient and poor in 1 patient. In our study of 24 patients with unstable intertrochanteric fracture, the average age incidence was 54.64 years. In the present study male: female was 5:3.
Conclusions: In unstable proximal femur fractures, PFN is a significant advancement in the treatment of unstable trochanteric fractures which has the unique advantages of closed reduction, preservation of fracture hematoma, less tissue damage, early rehabilitation and early return to work.

Keywords: Proximal femur, Intertrochanteric fractures, Subtrochantric fractures, Proximal femoral nail

INTRODUCTION

Intertrochanteric fractures are seen with increasing frequency and severity as the life expectancy of our population increases. Intertrochanteric fractures usually occur in older patients with decreased bone strength and density. Rapid mobilization of these elderly patients reduces the morbidity and mortality rate. Historically, non operative management has resulted in excess rates of medical morbidity and mortality, as well as malunion and nonunion. Non operative management is appropriate only in selected non ambulators who experience minimal discomfort from injury. Being most common among elderly individuals, nowadays these fractures are also commonly seen in younger age group resulting from high energy trauma and often are associated with other fractures.[1,2]

Cummings et al attributed four factors in determining whether a fall in elderly is significant to cause fracture,[3]

- The fall must be oriented such a way that the person lands on or near the hip.

- The protective reflexes must be inadequate to reduce the energy of fall below the critical threshold.
- Muscles and fat acting as local shock absorbers around the hip must be insufficient.
- The bone density at the hip must be inadequate to withstand the fall.

Prophylactic interventions to decrease the risk of falls and aggressive screening and treatment of osteoporotic patients with high risk of fragility fracture are very important. Early postoperative rehabilitation care is more crucial. The overall aim in the management of hip fractures is to bring the patient to pre morbid functional status. Before the introduction of suitable fixation devices, treatment of intertrochanteric fracture was non operative, consisting of prolonged bed rest in traction until fracture union (10–12 weeks).[4,5] This is followed by a lengthy programme of walking training. In elderly people, this was associated with high complication rates. These complications include decubitus ulcers, urinary tract infection, joint contractures, pneumonia and thromboembolic complications, resulting in a high mortality rate. In addition, fracture healing was generally accompanied by varus deformity and shortening because of the inability of traction to effectively counteract the deforming muscular forces.[6] For these reasons, the treatment of intertrochanteric fracture by reduction and internal fixation has become the standard method of treatment.

The commonly available methods of internal fixation are dynamic hip screw and proximal femoral nail. The Proximal femoral nail by its favourable biomechanical properties offers better mechanical stability, early weight bearing, more suitable for unstable fractures and osteoporotic elderly individual.[7]

Aim

The aim of the study is to prospectively analyse the functional outcome of unstable intertrochanteric fractures managed with 'Proximal Femoral Nail'.

METHODS

In this prospective study was conducted in Department of Orthopaedics, Government Rajaji Medical College, Madurai. 24 cases of unstable intertrochanteric fractures cases from 2013 January to 2013 October were included. All cases of unstable trochanteric and subtrochanteric fractures operated by proximal femoral nail during this time period were taken up for study, which were studied prospectively after taking ethics committee approval and informed consent.

Inclusion criteria

Inclusion criteria were all trochanteric fracture classified as unstable by AO classification; age more than 25 years.

Exclusion criteria

Exclusion criteria were less than 25 yrs; malunited fracture; open fractures; pathological fractures of any other cause than osteoporosis; previous wound or bone infections; neurological and psychiatric disorders that preclude reliable assessment; increased femoral bow; medical co morbidities precluding the patient for internal fixation.

These cases were studied on the basis of mechanism of injury, classification and treatment with proximal femoral nail and their surgical and functional outcome with or without residual comp

Descriptive statistics such as mean and standard deviation (SD) for continuous variables, frequencies and percentages were calculated for categorical Variables were determined.

RESULTS

In our study of 24 patients with unstable intertrochanteric fracture, the average age incidence was 54.64 years. In the present study male: female was 5:3. There was a male sex preponderance seen in our study. The mechanism of injury was accidental fall in 13 patients and road traffic accident in 11 patients. None of the patient had any associated injuries. Right hip was involved in 11 patients and left hip was involved in 13 patients. The mean duration between the injury and procedure was 17.28 days. The average operating time was estimated as 58 minutes.

Table 1: Classification.

AO classification	Number of patients	Percentage of patients (%)
Type A1	-	-
Type A2.1	-	-
Type A2.2	9	37.50
Type A2.3	7	29.16
Type A3.1	2	8.33
Type A3.2	-	-
Type A3.3	6	25

In the initial cases our operating time was on the higher range, with experience the operating time reduced. We used short nail in 18 cases and long nail in 6 cases. We used longer nail for unstable reverse oblique and fractures with subtrochanteric extension to minimize periprosthetic fracture from stress raiser effect from the tip of the nail. Mismatch between nail curvature and femoral bow will result in impingement of the tip of the nail over the anterior cortex. We have no cases of femoral shaft fractures. Radius of nail curvature should be ranged 186–300 cm. We have encountered distraction at the fracture site on passing the nail in 4 cases, in these cases the fracture is reduced and temporarily stabilized with a 2

mm 'K' wire passed along the anterior cortex so as not to interfere with the passage of nail. In 3 cases we had encountered with varus reduction. In our study, 9 of our patients had abductor lurch which gradually decrease with time. All of our patients could partial weight bear by the end of 2 weeks. None of the patient was using walking aid beyond 3months. In our series, 6 patients had varus collapse with an average of 10 degree. This is attributed to excessive sliding and collapse secondary to fracture comminution and premature weight bearing. There were 3 cases with failure of derotation screw at the junction of threaded portion and the screw shaft. Among the three, one patient had varus reduction, one had distraction at the fracture site, one patient had associated nail breakage with fracture in varus malunion from premature weight bearing. The patient with implant failure attended the OPD after around 5 months. Even though the patient had implant failure with malunion, the patient had a good functional outcome. The average time for fracture union was 11.12 weeks (range: 8-22 weeks).

Consolidation was observed in all the patients after 5 months. Patients were followed up for an average period of 8.58 months and the results were analyzed by using the Harris hip scoring system. Among these patients union occurred in all patients with no non-union. Malunion occurs in one case with implant failure. The mean Harris hip score was 88.75 at 6th month. The score was excellent in 12 patients, good in 10 patients, fair in 1 patient and poor in 1 patient.

Figure 1: (A,B) Preoperative x-ray; (C,D) immediate post operative picture; (E) 4th weeks post op; (F) 16th week post op.

Table 2: Types of proximal femoral nail used.

Proximal femoral nail	Number of patients	Percentage of patients (%)
Long PFN 135 degree	6	25
Short PFN 135 degree	13	54.16
Short PFN 130 degree	5	20.83

Table 3: Intra operative complications.

Complication	Number of cases
Fracture displacement by nail insertion	3
Failure to get anatomical reduction	1
Difficulty to put derotation screw	3
Breakage of guide wire	1
Breakage of drill bit	0
Varus angulation	3

Table 4: Harris hip score.

Functional outcome	3rd month		6th month	
	Number of patients	Percentage of patients	Number of patients	Percentage of patients
Excellent	2	8.33	12	50
Good	9	37.5	10	41.66
Fair	6	25	1	4.16
Poor	6	25	1	4.16

Table 5: Postoperative complications.

S. No.	Complications	Number of patients
1	Shortening	9
2	Superficial infection	1
3	Deep infection	1
4	Varus collapse	6
5	Lateral slide of proximal screws	6
6	Non union	0
7	'Z' effect	1
8	Implant failure	1
9	Mortality	0

DISCUSSION

The successful treatment of intertrochanteric fractures depends on many factors: the age of the patient, the patient's general health, the time from fracture to treatment, concurrent medical treatment and the stability of fixation. The appropriate method and the ideal implant used for these fractures are still debated with proponents of the various approaches each claiming advantages over others. Many internal fixation devices have been recommended for the treatment of these fractures, including extramedullary and intramedullary implants.[8,9]

All of our patients could partial weight bear by the end of 2 weeks. None of the patient was using walking aid beyond 3months. In a study Pajarinen et al showed that the uses of PFN have a positive effect on the speed at which walking is restored.[10]

n our series, 6 patients had varus collapse with an average of 10 degree. This is attributed to excessive sliding and collapse secondary to fracture comminution and premature weight bearing. There was lateral slide of lag screw in 9 cases. Lateral slide occurs more often in PFN than Gamma nail due to restricted sliding mechanism in gamma nail from rigid femoral neck screw nail assembly.[11,12] This is also a factor for increased incidence of screw cut out seen in gamma nail which is rare in PFN. Herera et al in a comparative study of 250 pertrochanteric fractures treated with the simple GN or the PFN system (125 fractures in each group) reported a statistically significant difference in the incidence of neck screw cutout (4%) and fracture below the nail (3.2%) in the GN group, whereas in the PFN group there was a higher incidence of secondary varus (7.2%) and collapse at the fracture site due to screw migration (8%).[13]

The screw breakage is secondary due to increased stress from the fore mentioned contributing factors. Domingo et al prospectively evaluated 295 patients in whom the majority (59%) had an 31A2 intertrochanteric fracture and reported technical complications in 12% of the patients during the operation, 27% in the immediate postoperative period and late complications in 4%.[14] Banan et al reported a higher technical failure rate (8.7%) due to cut-out, 1 case of implant failure and 2 cases of fracture below the tip of the nail after a second fall, out of 60 patients with exclusively unstable trochanteric fractures.[15]

One case had deep infection with secondary 'Z' effect. Initially we have done wound debridement and put the patient on parenteral antibiotics according to the culture sensitivity. The infection had settled and the inward migrated derotation screw is removed. The lag screw is tightened. Patient put on non weight bearing. Werner et al was the first that introduced the term Z-effect, detected in 5 (7.1%) of 70 cases.[16] The incidence of cut-out of the neck screw in this study was 8.6%.

Schipper et al found a mean score of 66.80 (standard deviation=17.94) with a proximal femoral nail of PFN® type after one year.[12] According to Pajarinen et al, patients who underwent osteosynthesis with a cephalo medullary nail, in unstable trochanteric fractures, presented a significantly faster return to their previous level of walking.[17]

Herrera et al reported on a study involving 250 patients treated with the PFN and Gamma nail cephalo medullary nails, in which around 50% of the patients had recovered their previous walking capacity, one year after the surgery.[11] In the present study, we assessed the recovery of walking ability over the course of time. The greatest evolution in the quality of walking occurred over the first three months after the operation, such that none of our patients are walking with walking aid. In short, the PFN has distinct advantages over DHS and it has proved to be a better implant with adequate surgical technique. The requirement and follow up based changes in design of PFN from the pioneer Gamma mail will certainly decrease the complication rates and increases all the postulated advantages of intramedullary devices used in the treatment of trochanteric fractures.

CONCLUSION

Finally, we conclude that the PFN is a significant advancement in the treatment of unstable trochanteric fractures which has the unique advantages of closed reduction, preservation of fracture hematoma, less tissue damage, early rehabilitation and early return to work.

Osteosynthesis using a PFN, used in unstable trochanteric fractures, resulted in low rates of clinical complications, excellent stabilization, few mechanical complications and adequate functional results. Thus the treatment of unstable intertrochanteric fracture with PFN had a more favourable outcome and it is the ideal implant of choice for unstable intertrochanteric fractures at present.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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Cite this article as: Mandice CJ, Khan R, Anandan H. Functional outcome of unstable intertrochanteric fractures managed with proximal femoral nail: a prospective analysis. Int J Res Orthop 2018;4:945-9.