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A study of functional outcome in unstable intertrochanteric fractures treated by proximal femoral nailing in Bundelkhand region

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ABSTRACT

Background: Intertrochanteric fractures are the most frequent fractures of the hip joint. This is attributed to the increase in the elderly population in our country, along with osteoporosis being prevalent in these populations. **Aims and Objectives:** The aim of the study is to prospectively analyze the functional outcome of unstable intertrochanteric fractures managed with "proximal femoral nail" (PFN). **Materials and Methods:** The prospective study was conducted on 48 cases of unstable intertrochanteric in Maharani Laxmi Bai Medical College, Jhansi, between June 2022 and December 2023. **Results:** In our study, the mean age of the patient is 36.16 and the most common age group is 41–60 years, 33.33%, and >60 years, 41.67%. In forty-eight cases, 37 (77.08%) were male patients, and 11 (22.92%) were female patients. The Harris hip score patients follow-up after 3 months 8 (16.67%) patients of excellent outcomes, 18 (37.50%) patients of good outcomes, 12 (25.00%) of fair outcomes, and 10 (20.83%) patients of poor outcomes. The Harris hip score patients follow-up after 6 months 24 (50%) patients of excellent outcomes, 20 (41.67%) patients of good outcomes, 2 (4.17%) of fair outcomes, and 2 (4.17%) patients of poor outcomes. **Conclusion:** 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.

Key words: Proximal femoral nail; Intertrochanteric fractures; Proximal femur fracture

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INTRODUCTION

An intertrochanteric femur fracture is one of the most common fractures of the hip, especially in the elderly with osteoporotic bones, usually due to trivial trauma.

The age of patient, osteoporosis, general health, and associated co-morbidities are some of the key factors to be considered for the successful treatment of these fractures.[1,2]

Various types of implants are available for fixation. The ideal internal fixation device should be such that the patient can be mobilized at the earliest without jeopardizing the reduction, stability, and union of the fracture. Recently, intramedullary fixation devices have become increasingly popular because of its biomechanical advantage. Among these implants is the proximal femoral nail (PFN), which was created in 1996 by the AO/ASIF.[3] The primary mechanism of this kind of fixation is a sliding screw in the femoral neck-head fragment that is fastened to an intramedullary nail. Unlike dynamic hip screws (DHS), which are load-bearing devices, this sliding screw serves as a load-sharing device.

Despite being technically demanding surgical procedures these implants are gaining wide acceptance in treating unstable intertrochanteric fractures because of its advantages of being inserted through small exposure, preservation of hematoma, and less blood loss.[4,5]

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Aims and objectives

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

MATERIALS AND METHODS

Ethical

The ethical committee's approval was duly taken. Data were collected in the department of orthopedics from the bedside tickets of the patients after taking a short history and informed consent from the patient.

Source of data

All patients admitted in the surgical wards in all the units of Maharani Laxmi Bai Medical College, Jhansi, diagnosed to have unstable intertrochanteric were included in the study without bias on a serial basis.

Study design

The prospective study was conducted on 48 cases of unstable intertrochanteric in Maharani Laxmi Bai Medical College, Jhansi, between June 2022 and December 2023.

Inclusion criteria

- All trochanteric fractures are classified as unstable by AO classification; age more than 25 years.

Exclusion criteria

- <25 years; 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; and medical co-morbidities precluding the patient from internal fixation
- These cases were studied based on the mechanism of injury, classification, and treatment with PFN and their surgical and functional outcome with or without residual complications.

Statistical analysis

The data were summarized as mean values with standard deviations (SD). The statistical analysis was performed using an unpaired T-test. The Statistical Package for Social Science 21.0 for Windows computer software (SPSS Inc., Chicago, IL) was used for statistical analysis. $P<0.05$ was considered significant.

RESULTS

In our study, the mean age of the patient is 36.16 and the most common age group is 41–60 years, 33.33%, and >60 years, 41.67% (Table 1). In forty-eight cases, 37 (77.08%) were male patients, and 11 (22.92%) were female patients (Table 2). The Harris hip score patients follow-up after 3 months 8 (16.67%) patients of excellent outcomes, 18 (37.50%) patients of good outcomes, 12 (25.00%) of fair outcomes, and 10 (20.83%) patients of poor outcomes. The Harris hip score patients follow-up after 6 months 24 (50%) patients of excellent outcomes, 20 (41.67%) patients of good outcomes, 2 (4.17%) of fair outcomes, and 2 (4.17%) patients of poor outcomes (Table 3 and Figures 1-3).

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.[6,7]

All of our patients could partial weight bear by the end of 2 weeks. None of the patients was using a walking aid beyond 3 months. In a study, Pajarinen et al. showed that the uses of PFN have a positive effect on the speed at which walking is restored.[8]

In our series, six patients had varus collapse with an average of 10°. This is attributed to excessive sliding and collapse secondary to fracture comminution and premature weight bearing. There was a lateral slide of the lag screw in nine cases. Lateral slide occurs more often in PFN than gamma nail (GN) due to the restricted sliding mechanism in GN from rigid femoral neck screw nail assembly.[9,10] This is also a factor for an increased incidence of screw cut out seen in GN which is rare in PFN. Domingo LJ et al., in a

Table 1: Age distribution

Age (in years)	Number of patients	Percentage
26–40	12	25.00
41–60	16	33.33
>60	20	41.67
Total	48	100

Table 2: Sex distribution

Sex	Number of patients	Percentage
Male	37	77.08
Female	11	22.92
Total	48	100

Table 3: Harris hip score

Functional outcome	3rd month		6th month	
	Number of patients	Percentage	Number of patients	Percentage
Excellent	8	16.67	24	50.00
Good	18	37.50	20	41.67
Fair	12	25.00	2	4.17
Poor	10	20.83	2	4.17

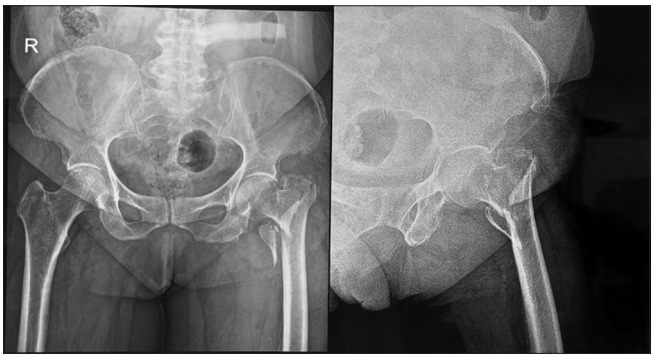

Figure 1: Pre-operative

Figure 2: Post-operative

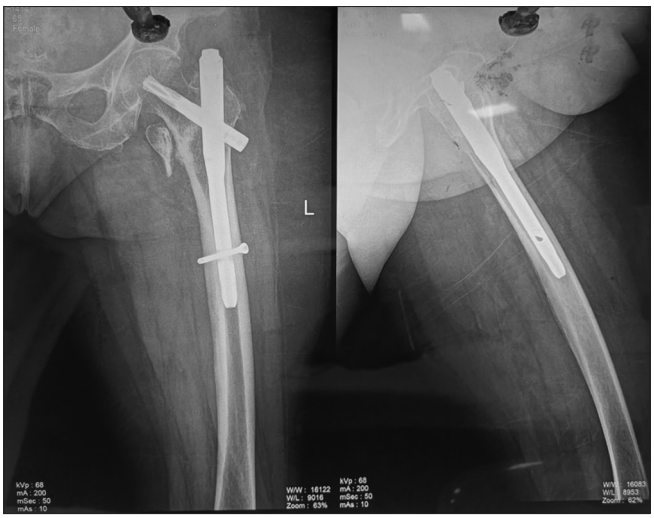

Figure 3: After union

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 fractures 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%).[11]

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 a 31A2 intertrochanteric fracture and reported technical complications in 12% of the patients during the operation, 27% in the immediate post-operative period and late complications in 4%.[12] Banan et al. reported a higher technical failure rate (8.7%) due to cut-out, one case of implant failure, and two cases of fracture below the tip of the nail after a second fall, out of 60 patients with exclusively unstable trochanteric fractures.[13]

One case had a deep infection with a 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. The patient was put on non-weight bearing. Werner-Tutschku et al. were the first that introduce the term Z-effect, detected in 5 (7.1%) of 70 cases.[14] The incidence of cutout of the neck screw in this study was 8.6%.

Schipper et al. found a mean score of 66.80 (SD=17.94) with a PFN of PFN® type after 1 year.[10] 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.[15]

Herrera et al., reported on a study involving 250 patients treated with the PFN and GN cephalon medullary nails, in which around 50% of the patients had recovered their previous walking capacity, 1 year after the surgery.[9] 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 3 months after the operation, such that none of our patients are walking with a

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 the design of PFN from the pioneer GN will certainly decrease the complication rates and increase all the postulated advantages of intramedullary devices used in the treatment of trochanteric fractures.

Limitations of the study

This was a single-centered study.

CONCLUSION

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.

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PM, SA, and PG- Concept and design of the study prepared the first draft of the manuscript; interpreted the results; reviewed the literature and manuscript preparation; concept, coordination, preparation of the manuscript, and revision of the manuscript.

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