Section: Orthopaedics

Original Research Article

COMPARATIVE STUDY BETWEEN PROXIMAL FEMORAL NAIL (PFN) AND INTERNAL PROXIMAL FEMORAL NAIL ANTI ROTATION (PFNA) IN UNSTABLE TRONCHANTRIC FRACTURES IN MAHARASHTRA POPULATION

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Abstract

Background: Intertronchateric fractures of the femur are quite common in adults and in old age due to degeneration of the calcarfemorale. It is popularly called a nail inserted by nature. Hence, proper techniques are necessary to maintain normal functions of the hip joint. **Materials and Methods:** Patients with intertronchateric fractures aged between 55 to 70 years were studied; 30 were inserted with proximal femoral nails (PFN), and 30 were inserted with proximal nail anti-rotation (PFNA). The helical blade of the whole PFN has two screws, one large, which stabilizes the fractured part of the femur, and another is anti-rotation, while the PFNA has a helical blade, which provides stability and anti-rotation mobility. Both surgeries were the same, but the instruments and techniques differed. **Result:** In the study of comparative details of surgeries, the p value is highly significant for these parameters. The least percentage of post-operative complications, loss of reduction, mortality, least persistent pain, and use of walking aids were observed in the PFNA group as compared to the PEN group. **Conclusion:** It is observed that the PFNA technique is more efficacious and safer than the PEN technique because of the shorter duration of surgery, the smaller quantity of blood loss, and the higher mortality rates.

INTRODUCTION

Incidence of tronchanteric femoral fractures will continue to rise in adults.[1] A hip fracture is a severe injury with several consequences, including mortality, morbidity, and functional independence, that decreases the quality of life and leads to economic burden.[2] Normal ambulation after a hip joint fracture is virtually impossible until and unless the fracture has been treated properly. There are two types of internal fixation devices available: intermedullary nails and extra-medullary implants. The dynamic hip screws (DHS), an extra-medullary implant, have been recognized as the standard device for comparison in surgical and clinical trials.[3] The proximal femoral nail anti-rotation (PFNA) system is an intramedullary nail implant designed of PFNA, and improved sliding properties of the femoral neck result in fewer perforations of the head and neck fragments and a better hold in osteoporotic bone.[4] Hence, intermedullary (IM) devices include proximal femoral nail (PFN) and proximal femoral nail anti-rotation. PFNA includes an IM nail, through which two screws are inserted in the neck of the femur. One is a large screw that stabilizes the fractures, allowing collapse, and the other is an anti-rotation stability screw used to provide rotator stability to the fracture PFNA, which uses a helical blade instead of two screws. The helical blade is believed to provide stability, compression, and rotational control of the fracture. Hence, an attempt was made to evaluate and compare both methods, and the pros and cons of both methods were noted.

MATERIALS AND METHODS

60 (sixty) patients aged between 50 to 75 years admitted to the orthopaedic department of DY Patil

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Medical College Hospital and Research Centre, Pimpri Pune, Maharashtra-411018 were studied.

Inclusive Criteria:
Acute unilateral tronchanteric fractures belonged to AO/ASIF. 31-A1-A2, 31-S3 were independent ambulates prior to injury and were selected for study.

Exclusive Criteria:
Patients with pathological fractures, open fractures, polytrauma, and neuro-muscular disorders were excluded from the study.

Method:
Out of 60 patients, 30 were selected for PFN and 30 for PFNA. Written consent was obtained from every patient. The surgical procedure was similar in both groups except for the techniques and instrumentation used in either system. Types of fractures assessed as per the AO/ASIF classification system using orthogonal radiographs All patients were administered spinal or epidural anesthesia and positioned supine on the fracture table prior to the closure of the fracture. The duration of surgery and loss of blood were noted.

Every patient received prophylactic antibiotics as a pre-operative dosage. Post-operatively, every patient in both groups with low molecular weight heparin, the first ten days post-operatively or during the stay at the hospital, whichever is shorter duration, followed aspirin for 4 weeks. All patients were allowed to touch down weight-bearing ambulation using a walking frame starting from the first post-operative day until six weeks. Clinical and radiological assessment of fracture union or complication for every patient was carried out pre-operatively or post-operatively at 6 weeks, 3 months, 6 months, and 1 year. Functional evaluation was done at year post-operatively by using the Harris Hip score.

The duration of the study was from December 2022 to January 2024.

Statistical analysis:
Comparison of operation details, post-operative complications, loss of reduction details, and final outcomes were carried out by using the t test and classified by percentage. The statistical analysis was done in SPSS software. The ratio of males and females was 2:1.

RESULTS

[Table 1] Comparison of Operation Details in Both Groups

- Duration of time (minutes) 42.26 (±5.10) in the PFN group and 35.18 (±5.03) in the t test are 3.84 and p<0.001.
- Blood loss (ml): 74.75 (± 13.60) in the PFN group, 58.36 (± 11.90) in the PFNA; t test was 4.98, p<0.001.
- Fluoroscopy Images: 26.46 (± 3.46) in PFN, 15.30 (± 3.10) in PFNA; t test was 13.1; p<0.001

[Table 2] Comparative of Post-operative Complications

- 4 (13.3%) in the PFN group, 2 (6.66%) in the PFNA group
- Re-operation 4 (13.3%) in PFN and 2 (6.66%) in PFNA

Image 1: Proximal Femoral Nail (PFN)

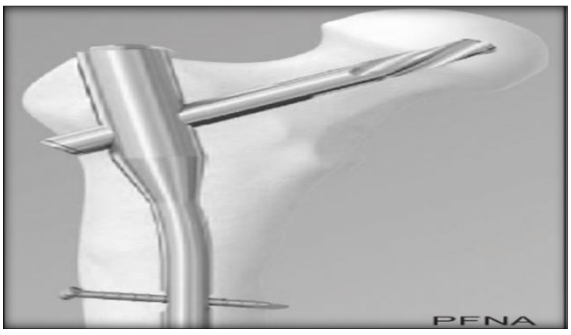

Image 2: Proximal Femoral Nail Antirotation (PFNA) is proximally rounded

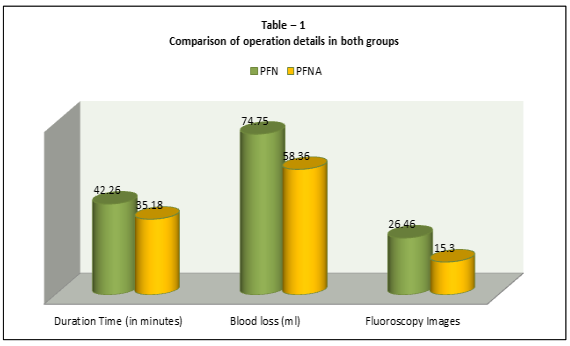

Figure 1: Comparison of operation details in both groups

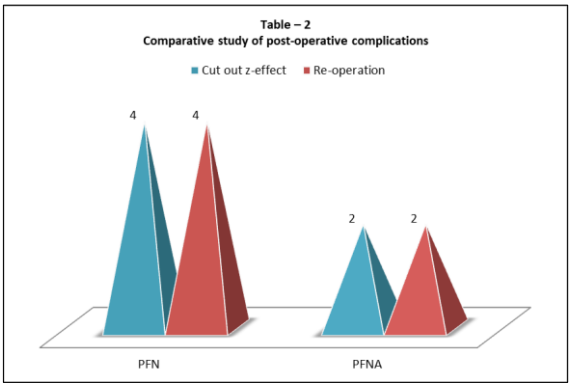

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Figure 2: Comparative study of post-operative complications

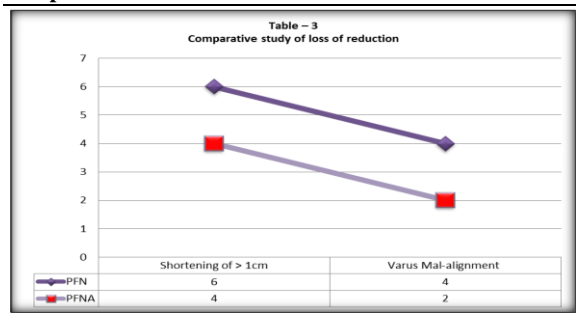

Figure 3: Comparative study of loss of reduction

[Table 3] Comparative study of loss or reduction in both groups

- 6 (20%) in PFN, 4 (13.3%) in PFNA
- Varus Mal-alignment 4 (13.3%) in PFN, 2 (6.66%) in PFNA

[Table 4] Comparison of Final Outcomes

- Mortality: 4 (13.3%) in PFN, 2 (6.6%) in PFNA
- Persistent pain: 6 (20%) in PFN, 4 (13.3%) in PFNA
- Use of walking aids: 10 (33.3%) in PFN, 6 (20%) in PFNA
- Return to pre-fracture status patients: 16 (53.3%) in PFN, 18 (60%) in PFNA
- Harris Hip score (1 year post-operation): 43.2 (± 5.11) in the PFN group, 43.6 (± 3.30) in the PFNA patient; t test was 0.18; and p > 0.55 (p value is insignificant).

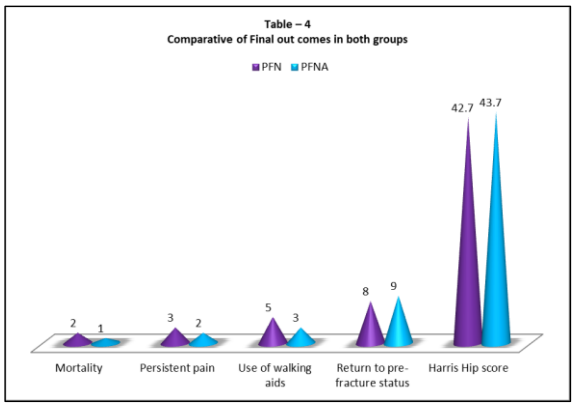

Figure 4: Comparative of Final out comes in both groups

Table 1: Comparison of operation details in both groups

Sl. No	Details	PFN (30)	PFNA (30)	t test	p value
1	Duration Time (in minutes)	42.26 (±5.10)	35.18 (±5.03)	3.89	p<0.002
2	Blood loss (ml)	74.75 (±3.46)	58.36 (±11.90)	4.98	p<0.001
3	Fluoroscopy Images	26.46 (±3.46)	15.30 (±3.10)	13.1	p<0.001

Table 2: Comparative study of post-operative complications

Sl. No	Complications	PFN (30)	PFNA (30)
1	Cut out z-effect	4 (13.3%)	2 (6.66%)
2	Re-operation	4 (13.3%)	2 (6.66%)

Table 3: Comparative study of loss of reduction

Sl. No	Loss of reduction	PFN (30)	PFNA (30)
1	Shortening of > 1cm	6 (20%)	4 (13.3%)
2	Varus Mal-alignment	4 (13.3%)	2 (6.66%)

Table 4: Comparative of Final out comes in both groups

Sl. No	Final out comes	PFN (30)	PFNA (30)
1	Mortality	2 (13.5%)	1 (6.6%)
2	Persistent pain	3 (20%)	2 (13.3%)
3	Use of walking aids	5 (33.3%)	3 (20%)
4	Return to pre-fracture status	8 (53.3%)	9 (60%)
5	Harris Hip score (1 year post-operatively)	42.7 (±5.12) (t test 032)	43.7 (±3.32) P value p>0.53 (Insignificant)

DISCUSSION

Present a comparative study between PFN and PFNA intra-tronchanteric fractures. The duration of surgery was (min) fractures 42.26 (±5.10) in PFN and 35.18 (±5.03) in PFNA; the t test was 3.84 and p<0.001. The blood loss (ml) was 74.75 (± 13.60) in PFN and 58.36 (± 11.90) in PFNA; the t test was 4.98 and p<0.001. Fluoroscopy images: 26.46 (± 3.46) in PFN, 15.30 (± 3.10) in PFNA. [Table 1] Present comparative post-operative complications in both groups cut out the z effect. 4 (13.3%) in PFN, 2 (6.66%) in PFNA, Re-operation 4 (13.3%) in PFN and 2 (6.66%) in PFNA. [Table 2] Comparative loss or reduction: 6 (20%) in PFN, 4 (13.3%) in PFNA, and various mal-alignments 4 (13.3%) in PFN, 2 (6.66%) in PFNA. [Table 3] Comparison Study of Final Outcomes 4 (13.3%) in PFN, 2 (6.6%) in PFNA, persistent pain 6 (20%) in PFN, 4 (13.3%) in PFNA, loss of walking aids 10 (33.3%) in PFN, 6 (20%) in PFNA, Return to pre-fracture status 16 (53.3%) in PFN, 18 (60%) in PFNA, In Harris Hip score (1 year post-operation): 43.2 (± 5.11) in PFN, 43.6 (± 3.30) in PFNA, t test was 0.18; p value is p>0.85 (p value is insignificant) [Table 4,

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Figure: 1 & 2]. These findings are more or less in agreement with previous studies.[6-8]

Delayed ambulation is related to the development of post-operative pneumonia, delirium, and an increased length of hospital stay and care time.[9] Closed fracture reduction preserves the hematoma, an essential element in fracture healing.[10] PFNA allows surgeons to minimize soft tissue dissection and therapy, reducing surgical trauma, blood loss, infection, and wound complications.[11,12] This may be due to the processed helical-shaped PFNA blade tail, which could result in reduced skin and fascia stimulation. In addition, the PFNA insertion was a simpler and less invasive surgical procedure than the PFN technique. Moreover, using PFN (screw) or PFNA (helical blade) instrumentation, the degree of osteoporosis has to be given a more important base line or criteria because, as age advances, the calcar femorale present in the neck degenerates. Hence, severe osteoporosis may feel the burden of the implantation of instrumentation, which can lead to fracture. Assessment of functional outcome post-operatively, Harrison A hip score will confirm the degree or gravity of osteoporosis.

CONCLUSION

Present a comparative study between PFN and PFNA in unstable fractures in the Maharashtra population. PFNA is associated with a reduction in the duration of surgery, intra-operative blood loss, the rate of post-fixation failure, and post-operation failures, which were the least common in PFNA techniques. But this study demands further genetic, nutritional, musculoskeletal, and pathophysiological studies because the exact mechanism of healing fractures of bone is still unclear.

Limitations: Due to the tertiary location of the research center, the small number of patients, and the lack of the latest techniques, we have limited findings and results.

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