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Original Research Article

Comparative Study between Proximal Femoral Nail (PFN) and Proximal Femoral Nail Anti Rotation (PFNA) in Unstable Inter Tronchanteric Femur Fractures in South Karnataka Population

Hariprasad KA[1], Yogananda Gali Hanumaih[2], Gopinath[3], Yogesh Paduvani[4]

[1]Assistant Professor, Department of Orthopaedics, Sri Chamundeshwari Medical College and Research Institute, Channapatna, Karnataka-562160

[2]Assistant Professor, Department of Orthopaedics, Sri Chamundeshwari Medical College and Research Institute, Channapatna, Karnataka-562160

[3]Associate professor, Department of Orthopaedics, Sri Chamundeshwari Medical College and Research Institute, Channapatna, Karnataka-562160

[4]Senior Resident, Department of Orthopaedics, Sri Chamumdeshwari Medical College and Research Institute, Channapatna, Karnataka-562160

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Corresponding Author: Dr. Yogesh Paduvani

Conflict of interest: Nil

Abstract:

Background: The management of inter-tronchateric fractures in the elderly is a great challenge for orthopaedic surgeons to treat. Hence, the latest techniques are required to heal such fractures.

Method: 40 patients with inter-tronchateric fractures aged between 55 to 70 years were studied; 20 were inserted with proximal femoral nails (PFN), and 20 were inserted with proximal femoral 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.

Results: In the comparison of operation details such as duration of surgery, blood loss, and fluoroscopy image has a significant p value ($p<0.001$). In the comparative study of post-operative complications, cut-out Z effect was 2 (4%) in PFN patients, 1 (5%) in PFNA patients, and in re-operative patients, 2 (10%) in PFN and 1 (5%) in PFNA. In shortening > 1 cm, patients were 3 (15%) in PFN and 2 (10%) in PFNA. In varying alignments, 2 (10%) patients are in PFN and 1 (5%) are in PFNA. Mortality was 2 (10%) in PFN and 1 (5%) in PFNA. Persistent pain was 3 (15%) in PFN and 2 (10%) in PFNA; use of a walking aid was in 7 (35%) patients in PFN and 5 (25%) in PFNA; return to pre-fracture status was 11 (55%) in PFN and 13 (65%) in PFNA technique patients; but the Harris hip test was insignificant ($p > 0.60$) when both groups were compared.

Conclusion: The PFNA technique was found to be much better than PFN because of the shorter duration of surgery, less loss of blood volume, a smaller number of image intensifier shoots, a lower mortality rate, and return to pre-fracture study.

Keywords: tronchateric fracture, PFN, PFNA, helical blade.

Introduction

Tronchateric fractures include fractures of the extra-capsular basilar neck region in the region along the lesser tronchater of the femur [1]. It usually occurs in the elderly age group due to low-energy trauma such as accidental falls due to osteoporosis, but high-velocity trauma in young individuals can also result in the same fracture.

The calcar femorale is the vertical wall of hard bone that extends from the postero-medial aspect of the femur shaft to the posterior part of the femoral neck. This hard bone is important because it determines the stability of a fracture. The vast metaphyseal region has an abundant blood supply, contributing to a higher union rate and lesser osteo-necrosis as compared to femoral neck fractures [2]. Such types of fractures typically result from a high-energy mechanism.

There are different types of fixation for tronchateric fractures of the femur, such as pre-proximal nails (PFN) and proximal femoral nail anti-rotation (PFNA). Every fixation has its own complications [3]. Apart from implant-related complications, the most common complications seen in the patients

who are treated are cardio-pulmonary, thrombo-embolic events, and sepsis [4]. Hence, an attempt was made to evaluate and compare the pros and cons of both techniques to justify the better technique.

Material and Method

40 (forty) patients aged between 50 to 75 years admitted to the Department of Orthopaedics at Sri Chamundeshwari Medical College Hospital in Channapatna, South Karnataka - 562160 were studied.

Inclusive Criteria: Acute unilateral tronchateric fractures belonged to AO/ASIF. 31-A1-A2, 31-A3 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 40 patients, 20 were selected for PFN and 20 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 February 2023 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.

Figure 1: Proximal femoral nail (PFN)

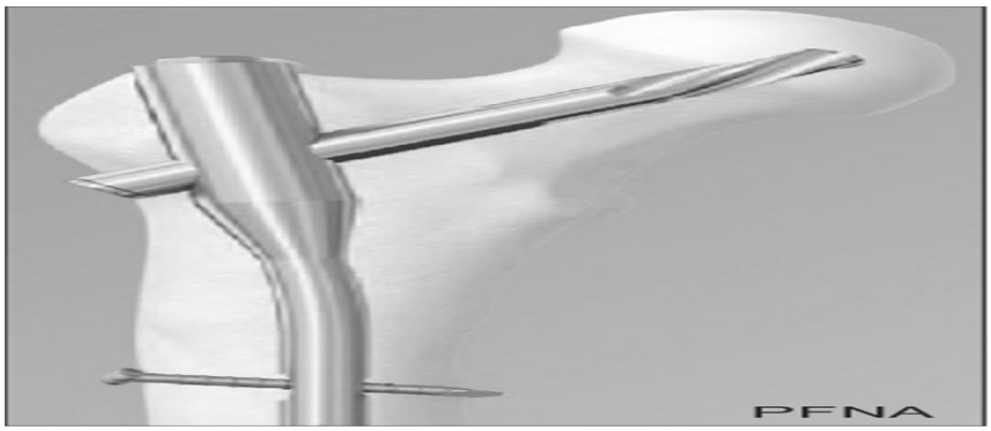

Figure 2: Proximal femoral nail (PFN) antirotation (PFNA) is proximally rounded

Observation and Results

Table 1:

Comparison of Operation Details in Both Groups

- Duration of surgery (minutes) 40.28 (±5.12) in the PFN group and 35.10 (±4.04) in the t test are 3.55 and p<0.001.
- Blood loss (ml): 74.76 (± 14.30) in the PFN group, 56.45 (± 5.04) in the PFNA; t test was 5.40 and p<0.001.
- Fluoroscopy Images: 26.60 (± 3.40) in PFN, 16.32 (± 3.11) in PFNA; t test was 9.97 and p<0.001

Table 2:

Comparison of Post-operative Complications in Both Groups

- Cut-out z effects: 2 in the PFN, 1 in the PFNA
- Re-operation: 2 in PFN and 1 in PFNA

Table 3: Comparative study of loss or reduction in both groups

- Shorting > 1cm: 3 (15%) in PFN, 2 (10%) in PFNA
- Varus Mal-alignment 2 (10%) in PFN, 1 (5%) in PFNA

Table 4: Comparison of Final Outcomes in Both Groups

- Mortality: 2 (10%) in PFN, 1 (5%) in PFNA
- Persistent pain: 3 (15%) in PFN, 2 (10%) in PFNA
- Use of walking aids: 7 (35%) in PFN, 5 (25%) in PFNA
- Return to pre-fracture status patients: 11 (55%) in PFN, 13 (65%) in PFNA

Harris hip fracture: 95.38 (± 9.20) in the PFN, 86.4 (± 6.50) in the PFNA; t test: 0.43; p > 0.43 (p value is insignificant).

Table 1: Comparison of operation details in both groups (Total No's of patients: 40)

Sl. No	Details	PFN (20)	PFNA (20)	t test	p value
1	Duration Time (in minutes)	40.28(±5.12)	35.10(±4.04)	3.55	p<0.001
2	Blood loss (ml)	74.76(±14.30)	56.45(±5.04)	5.40	p<0.001
3	Fluoroscopy Images	26.60(±3.40)	16.32(±3.11)	9.97	p<0.001

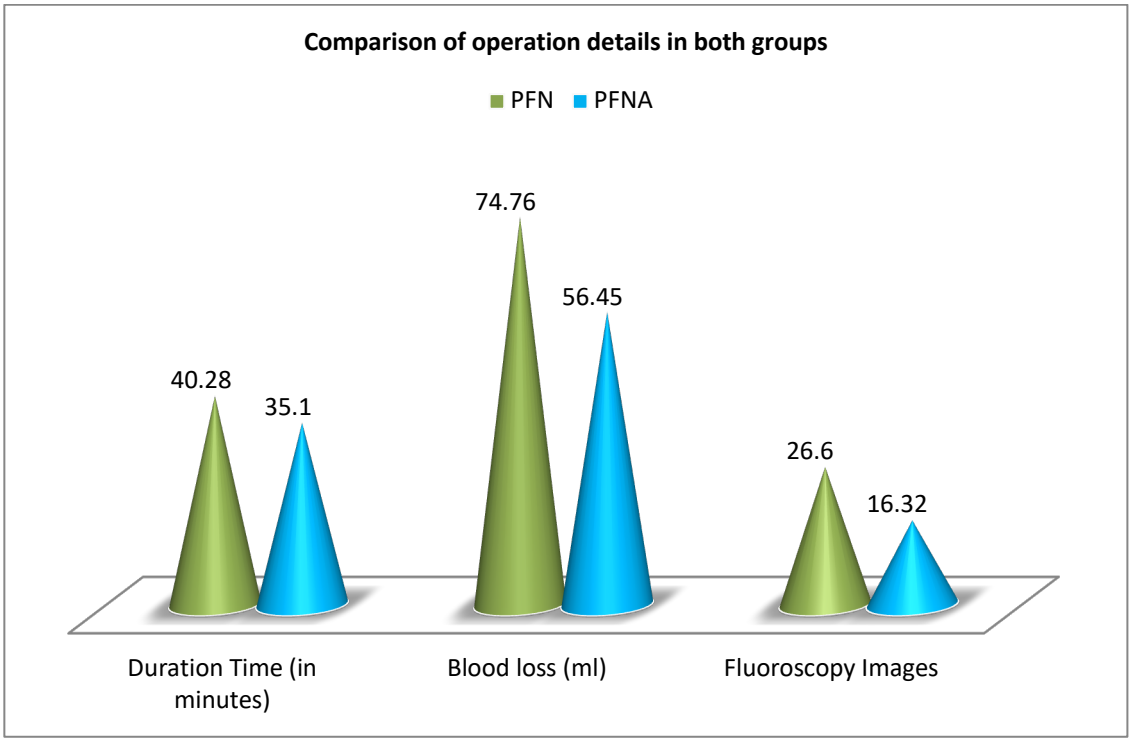

Figure 3: Comparison of operation details in both groups

Table 2: Comparative study of post-operative complications in both groups

Sl. No	Complications	PFN (20)	PFNA (20)
1	Cut out z-effect	2 (10%)	1 (5%)
2	Re-operation	2 (10%)	1 (5%)

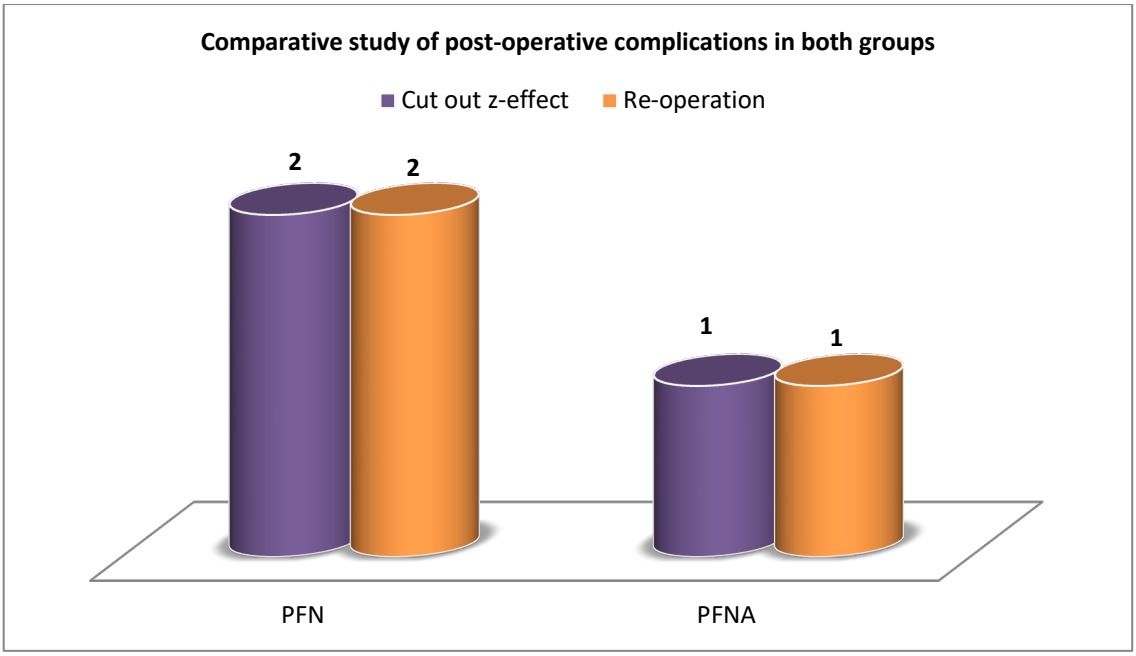

Figure 4: Comparative study of post-operative complications in both groups

Table 3: Comparative study of loss of reduction

Sl. No	Loss of reduction	PFN (20)	PFNA (20)
1	Shortening of > 1cm	3 (15%)	2 (10%)
2	Varus Mal-alignment	2 (10%)	1 (5%)

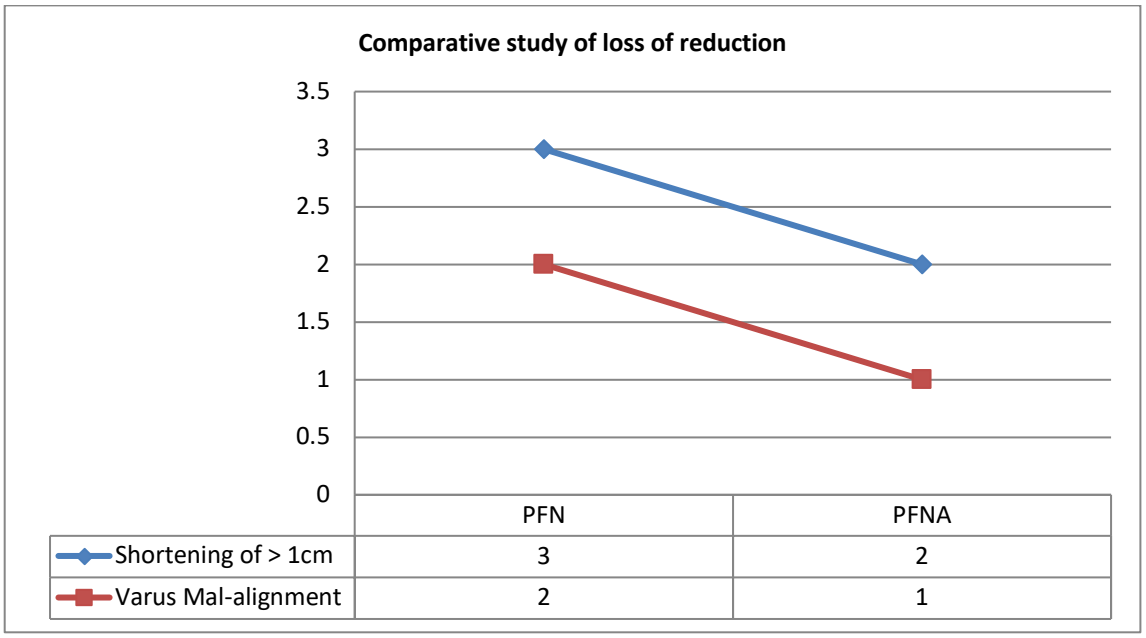

Figure 5: Comparative study of loss of reduction

Table 4: Comparative of Final out comes in both groups

Sl. No	Final out comes	PFN (20)	PFNA (20)
1	Mortality	2 (10%)	1 (5%)
2	Persistent pain	3 (15%)	2 (10%)
3	Use of walking aids	7 (35%)	5 (25%)
4	Return to pre-fracture status	11 (55%)	13 (65%)
5	Harris Hip score (1 year post-operatively)	85.3 (±9.20) (t test 0.43)	86.4 (±6.50) P value p>0.60 (Insignificant)

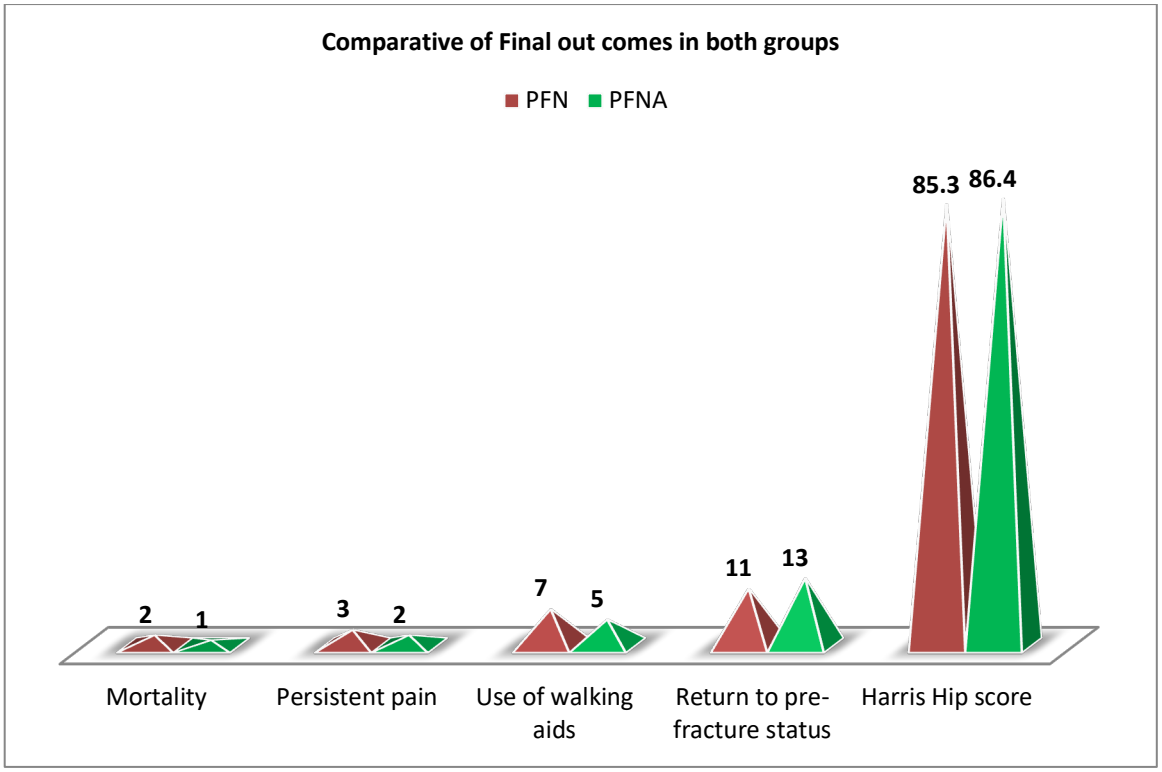

Figure 6: Comparative of Final out comes in both groups

Discussion

Present a comparative study of the PFN and PFNA techniques in inter-tronchateric fracture of the femur in elderly people. The comparison of operations and details. The duration of surgery (minutes) was 40.28 (±5.12) in PFN and 35.10 (±4.04) in PFNA; the t test was 3.55 and $p<0.001$. The blood loss (ml) was 74.76 (± 14.30) in PFN and 56.45 (± 5.04) in PFNA technique, t test 5.40 and $p<0.001$. Fluoroscopy image usage was 26.60 (± 3.40) in PFN and 16.32 (± 3.11) in the PFNA technique; the t test was 9.97 and $p<0.001$ (Table 1).

In the comparative study of post-operative complications in both groups, cut out/z effect 2 (10%) in PFN technique, 1 (5%) in PFNA, Re-operation 2 (10%) in PFN technique, and 1 (5%) in PFNA (Table 2). In a comparative study of loss of reduction, shorting >1 cm was 3 (15%) in the PFN technique, 2 (10%) in the PFNA, and various mal-alignments were 2 (10%) in the PFN technique and 1 (5%) in the PFNA (Table 3).

Comparison of final outcomes in both groups: Mortality was 2 (10%) in PFN, 1 (5%) in PFNA technique, persistent pain was 3 (15%) in PFN technique, 2 (10%) in PFNA technique, and use of a walking aid 3 (15%) in PFN technique, 2 (10%) in PFNA, Return to pre-fracture status: 11 (55%) in PFN, 13 (65%) in PFNA technique patients. The Harris Hip score was 85.3 (± 9.20) in PFN and 86.4 (± 6.50) in PFNA technique patients; the t test was 0.48, $p > 0.66$ (the p value is insignificant). It indicates the Harris hip score remains the same in both techniques (Table 4) (Figures 1 and 2). These findings are more or less in agreement with previous studies [6,7,8].

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]. 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 outcomes post-operatively, Harrison A hip score will confirm the degree or gravity of osteoporosis.

Summary and Conclusion

A comparative study between PFN and PFNA in unstable intertrochanteric fractures was conducted in the South Karnataka population. PFNA is associated with a reduction in the duration of surgery, less intra-operative blood loss, lesser rate of post-fixation failure, and post-operation failures, as compared to

PFN techniques. But this study demands further genetic, nutritional, musculoskeletal, and pathophysiological studies because the exact mechanism of healing of fractures of bone is still unclear.

Limitation of Study:

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.

This research paper was approved by the ethical committee of Sri Chamundeshwari Medical College Hospital in Channapatna, South Karnataka-562160.

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