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Comparative study between proximal femoral nail and proximal femoral nail anti rotation un-stable tronchateric fractures in south Karnataka population – retrospective study

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Abstract
Background: Hip fracture is quite common phenomena in old age and leads to multiple consequences because fracture cannot heal hence require proper and ideal technique as Osteoporosis develops in old age so that patients can lead a normal quality of life.
Method: Out of 60 patients 30 were inserted Proximal Femoral Nail (PFN) and 30 were internal Proximal nail anti rotation (PFNA). The helical blade whole PFN has two screws one large which stabilizes the fractured part of femur and another one is anti rotation while PFNA has helical blade which provides stability and anti-rotation mobility. Both surgeries are similar but instrumentation and techniques differs.
Results: In the comparison study. The mean value of duration of time was 41.2 (SD±6.10) in PFN and 34.18 (SD±5.03) in PFNA t test 4.9 and $p<0.01$. Mean value of loss of Blood (ml) was 75.7 (SD±15.35) in PFN, 58.4 (SD±12.96) in PFNA t test 4.73 $p<0.01$. Fluoroscopy images mean values 27.5 (SD±3.48) in PFN, 16.3 (SD±3.10) in PFNA t test $p<0.001$ of cut out/ z-effect was 3 (10%) in PFN, 1 (3.3%) in PFNA Reoperations were 3 (10%) in PFN and 1 (3.3%) in PFNA. Loss of reduction study has shortening > 1 cm was 5 (16.6%) in PFN and 3 (10%) in PFNA, varus mal alignment was (10%) in PFN, 1 (3.3%) in PFNA, In the outcomes of both techniques mortality was 3 (10%), 2 (6.6%) in PFNA persistent pain was 5 (16.6%) in PFN, 4 (13.3%) in PFNA, use of walking aids 10 (33.3%) in PFN, 7 (23.3%) in PFNA. Return to pre-fracture status, 17 (56.6%) in PFN, 19 (63.3%) in PFNA Harris hip score was more or less similar.
Conclusion: PFNA significantly reduces duration of time, loss of blood, Fluoroscopy imaging, Mortality rates. Hence PFNA is better option in osteoporotic (aged patients).

Keywords: PFN, PFNA, fluoroscopy, tronchateric, helical blade

Introduction
The incidence of tronchateric femoral fractures will continue to rise due to increasing age in the global population [1]. Hip fracture is a severe injury with several consequences, including mortality, morbidity and reduced functional independence that decreases quality of life and leads to considerable economic burden [2]. Normal ambulation after hip fracture is virtually impossible until and unless the fracture has been treated properly. There are two types of internal fixation device available inter medullary nails and extra medullary implants. The dynamic hip screws (DHS) an extra medullary implant has been recognised as the standard device for comparison of 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 neck fragment and a better hold in osteoporotic bone [4]. Hence inter medullary (IM) devices include Proximal Femoral Nail (PFN) and proximal, femoral nail anti-rotation PFN includes, IM nail through which two screws are inserted in the neck of the femur. One is large screw that stabilizes the fracture allowing collapse and other is an anti-rotation screw used to provide rotatory stability to the fracture PFNA in which helical blade instead of two screws. The helical blade is believed to provide stability compression and rotational control of the fracture. Hence attempt was made to compare the both devices and its pros and cons.

Material and Method
60 (sixty) patients aged between 50 to 70 years admitted at Bangalore Medical College and research institute were studied.

Inclusive Criteria
Acute unilateral tronchateric fractures belonged to AO/ASIF. 31-A1-A2, 31-S3 were independent ambulators, prior to injury were included in the study.

Exclusive Criteria
Patients with pathologic fractures, open fractures poly trauma neuro-muscular disorders or patients excluded.

Method
Out of 60, 30 patients were selected for PFN and 30 for PFNA,

and 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 were assessed as per AO/ASIF classification system using orthogonal radiographs. All patients were administered spinal or epidural anaesthesia and positioned supine on a fracture table prior to closed reduction of fracture. The duration of surgery and loss of blood was noted. Every patient received prophylactic antibiotics as pre-operative dosage. Post-operatively every patient of both groups received thrombo-prophylaxis with low molecular weight heparin, first ten days post-operatively or during stay at 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 till 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 Harris Hip score. The duration of study was March-2019 to April-2020.

Statistical analysis: Comparison of operation details, loss of reduction out comes was compared by using t test and with percentage. The statistical analysis was done in SPSS software. The ratio females and males were 2:1.

Observation and Results

Table 1: Comparison of operation details in Groups

1. Duration of time (in minutes) Mean value 41.2 (SD±6.10) in PFN and 34.18 (SD±5.03) in PFNA t test was 4.9 and p value was highly significant (p<0.001).
2. Blood loss – (in ml) Mean value 75.78 (SD±15.35) in PEN and 58.40 (SD±12.96), t test 4.73 and p value was highly significant (p<0.001).
3. Fluoroscopy Images 27.5 (SD±3.45) in PFN and 16.3 (SD±3.10) in PFNA t test 13.2 (p<0.001) p value highly significant.

Table-2: Comparative study post-operative complications – cut out/z-effect 3 (10%) in PFN and 1 (3.3%) in PFNA
Re-operation 3 (10%) in PFN and 1 (3.3%) in PFNA
Comparative study of loss of reduction shortening > 1cm 5 (16.6%) in PFN and 3 (10%) in PFNA
Comparative study of final outcomes in both groups
Mortality 3 (10%) in PFN and 2 (6.6%) in PFNA
Persistent pain 5 (16.6%) in PFN and 4 (13.3%) in PENA use of walking aids PFNA Return to pre-fracture status 17 (5.6%) in PEN and 19 (63%) in PFNA
Harris Hip score 85.4 (SD±10.22) in PFN, 87.4 (SD±6.52) in PFNA t test 37.9 p>0.18 (Insignificant)

Discussion

The present of comparative study between PFN and PFNA in unstable tronchateric fractures, in south Karnataka population. The comparison of operation details, Duration of time mean value 41.2 (SD±6.10) in PFN, 34.1 (SD±5.03) in PFNA t test 4.9 and p value was highly significant (p<0.001). Bloodless (ml) mean value 75.7 (SD±15.3) in PFN, 58.4 (SD±3.10) in PFNA t test 4.73 p value was highly significant (p<0.00). Fluoroscopy images mean value 27.5 (SD±3.45) in PFN, 16.3 (SD±3.10) in PFNA t test 13.2 p value was highly significant (p<0.001) (Table-1). In post-operative complications the percentage of cut out / z-effect was 3 (10%) in PFN, 1 (3.3%0 in PFNA. Re-operation 3 (10%) in PFN, 1 (3.3%) in PFN (Table-2). The comparison of loss of reduction. Shortening >1 cm 5 (16.3%) in PFN, 3 (10%) in PFNA varus mal alignment, 3 (10%) in PFN, 1 (3.3%) in PFNA. In the comparison of final out comes Mortality was 3 (10%) in PFN 2 (6.6%) in PFNA, persistent pain 5 (16.6%) in PFN, 4 (13.3%) in PFNA use of walking aids 10 (33.3%) in PFN, 7 (23.3%) in PFNA, Retains to pre-fracture status, 17 (56.6%) in PFN, 19 (63.3%) in PFNA. Harris score (1st year post-operatively) mean value 85.4 (SD±10.2) in PFN, 87.4 (SD±6.5 t test 37.9 p>0.18 (Insignificant) (Table-4). These findings are more or less agreement with previous studies [5, 6, 7].

Delayed ambulation is related to the development of Post-operative pneumonia and delirium as well as increased length of hospital stay and cure time [8]. Closed fracture reduction preserves the haematoma, an essential element in fracture healing [9]. PFNA allows the surgeon to minimize soft tissue dissection, thereby reducing surgical trauma, blood loss infection and wound complications [10]. This may be due to the processed helical shaped the PFNA blade tail which could result in reduced skin and fascia stimulation. In addition, PFNA insertion is simpler and less invasive surgical procedure than PFN. Moreover before using PFN (screw) or PFNA (helical blade) instrumentation, the degree of osteoporosis has to be given more important base line or criteria because as age advances, calcar femorale present in the neck degenerate. Hence severe osteoporosis may feel burden of implantation of instrumentation can lead to re-fracture. Assessment of functional outcome post-operatively HH score will confirm the degree or gravity of osteoporosis.

Summary and Conclusion

The present comparative study between PFN and PFNA in unstable tronchateric fractures in south Karnataka population. PFNA is associated with reduction in the duration of time of surgery, intra-operative blood loss; rate of post fixation failure and overall rate of post-operative complication were lesser than PFN. But this demands further genetic, nutritional, musculoskeletal, hormonal study because the factors and exact mechanism of healing of fractures is still un-clear.

- This research paper was approved by ethical committee of Bangalore Medical College and research hospital Bangalore-560004, Karnataka
- No Conflict of Interest
- No Funding

Table 1: Total No. of Patients: 60 Comparison of operation details in both groups

Sl No	Duration	PFN (No 30)	PFNA	t-test	p value
1	Time (minutes)	41-.29 (SD±6.10)	34-18 (SD±5.03)	4.9	P<0.001
2	Blood loss (ml)	75.78 (SD±15.35)	58.40 (SD±12.96)	4.73	P<0.000
3	Fluoroscopy Images	27.50 (SD±3.45)	16.30 (SD±3.10)	13.2	P<0.000

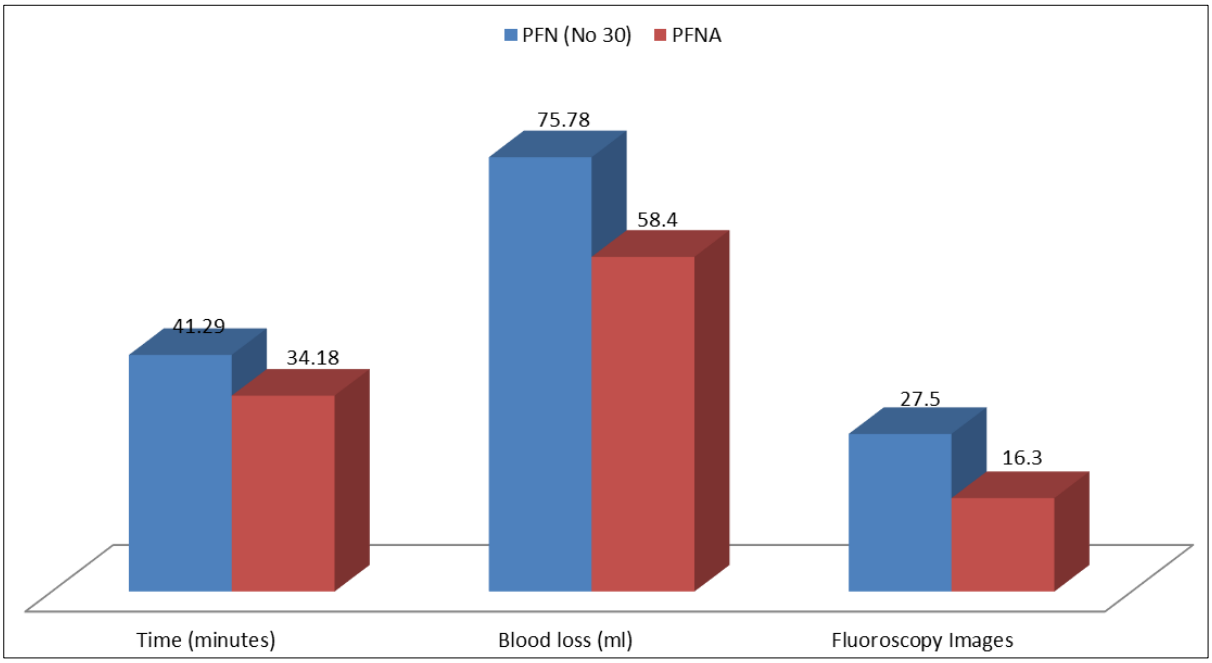

Fig 1: Comparison of operation details in both groups

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

Sl No	Details	PFN (30)	PFNA (30)
1	Cut out/ Z-effect	3 (10%)	1 (3.3%)
2	Re-operative	3 (10%)	1 (3.3%)

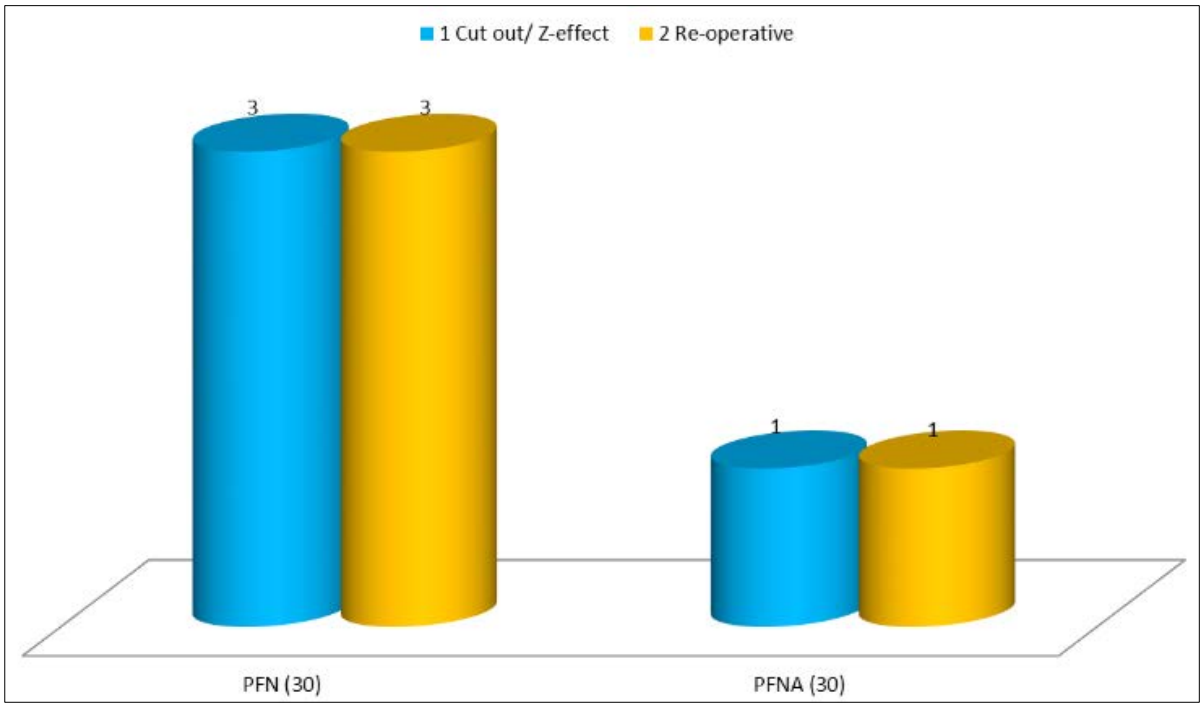

Fig 2: Comparative study of post-operative complications in both groups

Table 3: Comparative study of loss of reduction

Sl No	Loss of reduction	PFN (30)	PFNA (30)
1	Shortening > 1 cm	5 (16.6%)	3 (10%)
2	(Varus)mal alignment	3 (10%)	1 (3.3%)

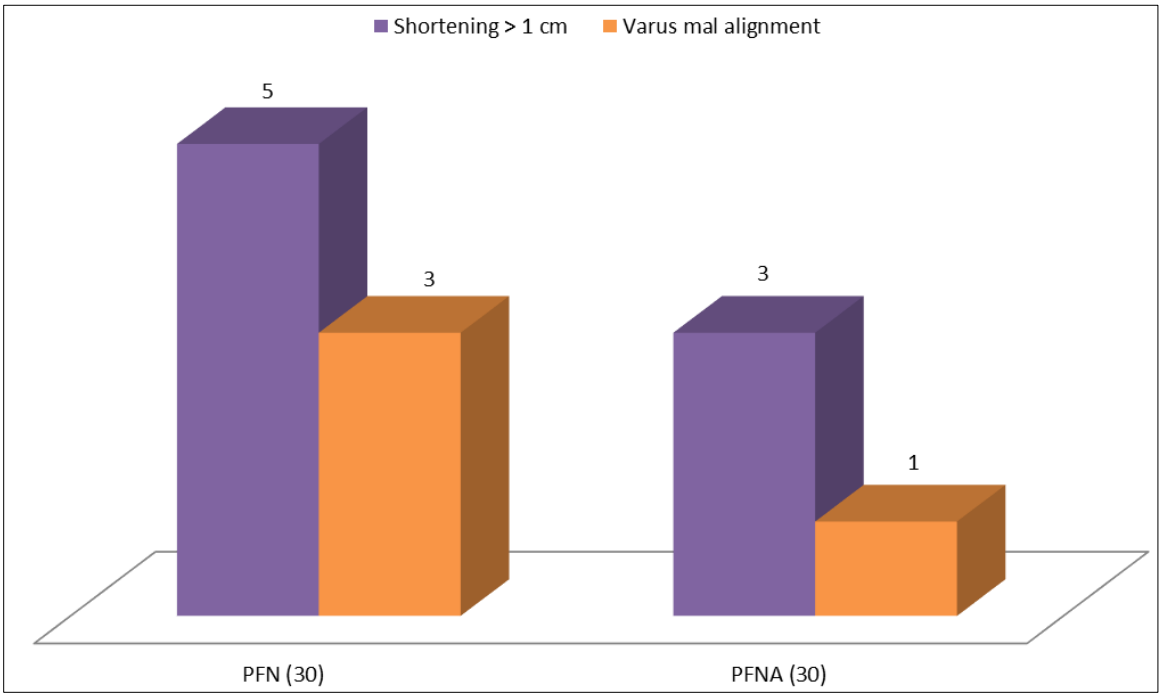

Fig 3: Comparative study of loss of reduction

Table 4: Comparison of Final out comes in both groups

Sl No	Particulars	PFN (30)	PFNA (30)	p value
1	Mortality	3 (10%)	2 (6.6%)	--
2	Persistent pain	5 (16.6%)	4 (13.3%)	--
3	Use of walking aids	10 (33.3%)	7 (33.3%)	--
4	Return to pre-fracture status	17 (56 %)	19 (63.3%)	--
5	Harris Hip Score (1 year post-operatively)	85.4 (SD±10.22)	87.4 (SD±6.52)	p>0.18

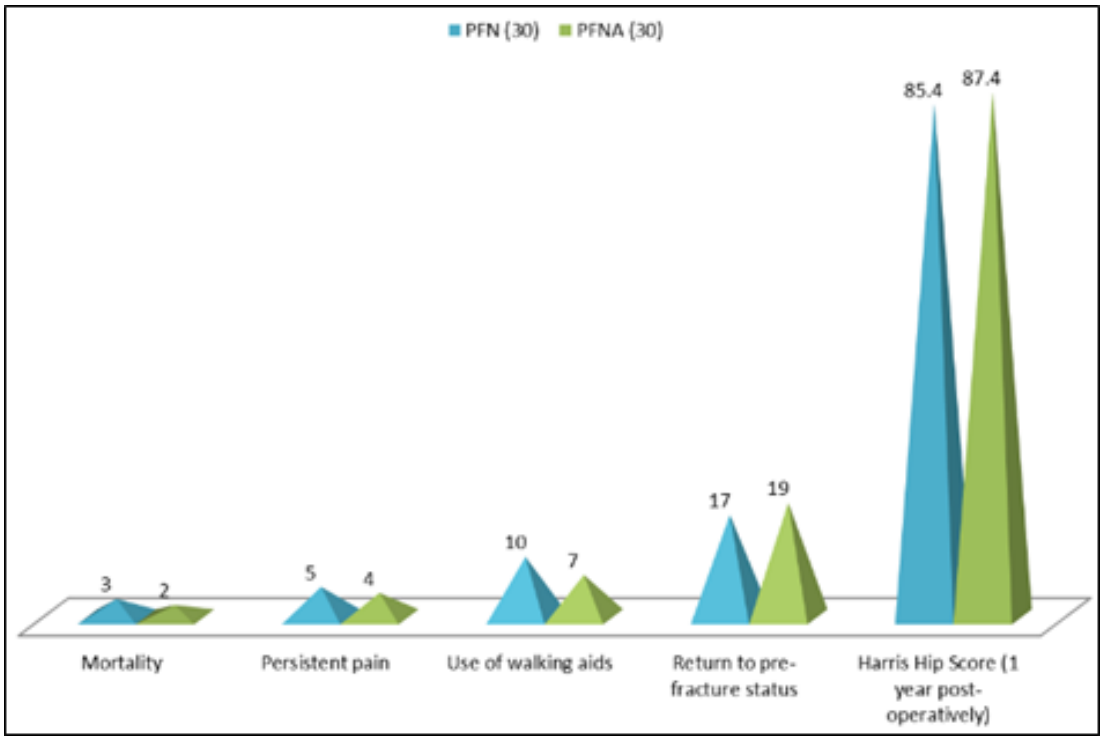

Fig 4: Comparison of Final out comes in both groups

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