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Evaluation of factors associated to functional outcomes of intertrochanteric fractures of femur when managed with PFNA2

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Abstract

Background: Aging is an undefiable process and as the population ages, the incidence of hip fracture is anticipated to increase exponentially. Prolonged bed rest further worsens the morbidity and mortality after a hip fracture. Intertrochanteric femur fracture management in elderly needs more attention to reduce malunion and increase early mobilisation to reduce mortality and morbidity. Ideal choice of treatment is internal fixation by intramedullary or extra medullary devices. Intramedullary devices provide more stable proximal femoral anatomical fixation. Between PFN and PFNA; helical blade in PFAN provides more stability, better compression and rotational control with lower cut-out rate.

Aims and Observations

a) To assess the factors for functional outcome of PFNA2.
b) Evaluation of effectiveness and stability of PFNA2.

Material and Methods: In our study, we have taken 32 patients with unstable Intertrochanteric femur fracture between Nov 2020 to Oct 2021 fulfilling inclusion and exclusion criteria were included in this study and underwent closed reduction and internal fixation by PFNA (n=32). Assessment was done in terms of demography, preoperative and intraoperative variables, postoperative parameters mainly functional outcome till 1 year postoperative.

Results: In our study Preoperative variables, AO fracture type were assessed preoperatively. Duration of surgery, blood loss and fluoroscopy imaging were significantly lower in PFNA as compared to PFN. Postoperative complications like cut-out rate, shortening, varus malalignment, return to pre-fracture state were also lower in PFNA group than PFN. Postoperative functional assessment done by Harris Hip Score shows better outcome in PFNA than other fixation devices.

Conclusion: PFNA reduces duration of surgery, blood loss, fluoroscopy imaging as compared to other implants. PFNA also offers better postoperative functional outcome.

Keywords: Deformities, nonunion shaft tibia, joint contractures, aseptic nonunion, ilizarov ring fixator, pseudarthrosis tibia

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Introduction

ITF is mainly fixed with either extramedullary screw-plate devices such as dynamic hip screws (DHS) or intramedullary (IM) nails. Globally, incidence of proximal femoral fractures are increasing day by day as life expectancy and osteoporosis in elderly has been increased worldwide [1, 2, 3]. Surgery is the preferred treatment of choice in view of early mobilization. The basic principle of surgery is to use an implant that is minimally invasive, that has a less operative time and one which allows for early mobilization and weight bearing. The implants used are of two types, extramedullary and intramedullary. The implant to be used is decided on the basis of the type of fracture (stable or unstable). A fracture is said to be unstable if it has comminution of the postero-medial cortex reverse oblique type of fractures and fractures of sub trochanteric extension. Aging is an undefiable process and as the population ages, the incidence of hip fracture is anticipated to increase exponentially. Prolonged bed rest further worsens the morbidity and mortality after a hip fracture.

Number of trochanteric femur fractures are predicted to be 1.6 million by 2025 and 2.5 million by 2050. Similarly number expected to be 32% in 2025 and 38% in 2050 [4].

Earlier inadequate trochanteric fracture treatment leads to acute instability and chronic malunion with deformity and functional restriction.

With advance of orthopaedic treatment, surgical fixations are replacing conservative treatment to achieve accurate anatomical and stable reduction with rigid internal fixation to start early mobilisation and to prevent complications.

The strength of fracture fixation mainly depends on

a) Bone quality
b) Fracture geometry
c) Reduction
d) Implant design & placement.

Intramedullary implants provide lesser surgical exposure, minimal blood loss, may require increased fluoroscopy exposure.

Biomechanically, intramedullary implants allow stable anatomical fixation without abductor arm shortening or changing the proximal femoral anatomy.

In PFNA, helical blade instead of conventionally used two screws, provides better stability, compression as well as rotational control. Hence less chance of cut-out and implant failure rate.

Material & Methods

The study was conducted, Department of Orthopaedics, Maharaja Agrasen Medical College, Agroha, Haryana, India. between Nov 2020 to Oct 2021, a prospective study of 32 patients conducted in a tertiary care centre. In which, 32 cases were operated by PFNA2. Intraoperative data as duration of surgery, blood loss, number of fluoroscopy images taken were documented. Clinical and radiological assessment of fracture union/complications for all the patients were done pre & post operatively at 6 weeks, 3 months, 6 months. Harris Hip Scoring system was used at 6 month for the functional outcome assessment.

Results

Mean age was 67.33 years. Gender distribution showed 69% female & 31% male. AO fracture type 31A-2.2 were maximum number of cases (72%) as in Table 1.

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Table 1: Gender distribution

Characteristic	PFNA (N=32)
Mean Age (Years)	67.33
Range (Min to Max)	56-79
Females	22(69%)
Males	10(31%)
31A-2.2	23(72%)
31A-2.3	5(16%)
31A-3.1	2(6%)
31A-3.2	2(6%)

The mean operative time was 49 minutes. Blood loss during the surgical procedure was very minimal and significant difference noted than other implants, as in table 2.

Table 2: Indicating blood loss while surgical Procedure

Operative Detail	PFNA(N=32)
Mean Duration	49
Range	40-70
Blood Loss < 100ML	12(37.5%)
Blood Loss > 100ML	20(62.5%)
Mean Image	18
Range	15-25

Fig 1

Fig 2

Fig 3

Preoperative and Postoperative x-rays of PFNA2 fixation in 80 years old female, as in Figure 1, 2, 3.

Fig 4

Fig 5

Preoperative and Postoperative x-rays of PFNA2 fixation in 70 years old female, as in Figure 4, 5.
The mean number of images taken intraoperative was significantly lower in PFNA2.
The cut out/z-effect rate was 6.25% in PFNA2 cases.
Complications such as shortening more than 1 cm were noted in 12.50% PFNA2 cases, varus malalignment were 6.25% in PFNA2 cases as in Table 3.

Table 3: Complications

Postoperative Complications	PFNA (N=32)
Cut Out/Z-Effect	2(6.25%)
Shortening > 1 CM	4(12.5%)
Varus Malalignment	2(6.25%)

26 patients in PFNA were returned to pre fracture status.
The mean Hip Harris Score at 6 month post-operative of PFNA2 cases were well accepted and satisfactory as in Table 4 and Figure 6.

Table 4: Final Results

Final Outcome Measures	PFNA (N=32)
Return to Pre Fracture Status.	26 (81.25%)
Mean Harris Hip Score at 1 Year	92.6

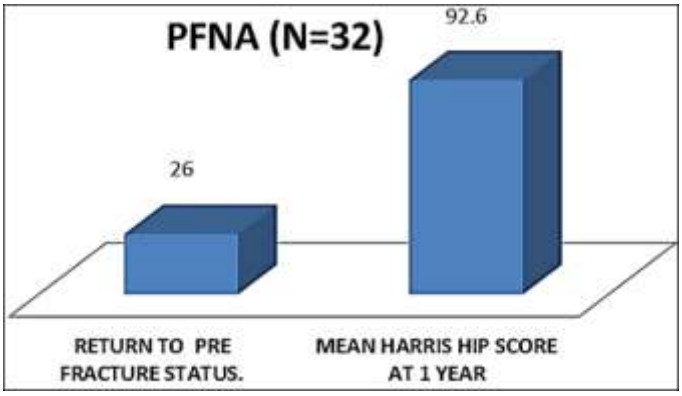

Fig 6: Final Results of our study

Discussion

Several studies compared the clinical outcomes after treatment with DHS or IM nail for ITF; nonetheless, the results were inconclusive. Because of its advantage, IM nailing is usually recommended for the fixation of unstable biomechanical ITF. The most important difference from the conventional PFN was the introduction of a helical blade that was thought to reduce the cut-out. This was achieved partially; the incidence of cut out was reduced. However, the most common cause of failure was still cut through of the screw [4, 13]. Intertrochanteric femur fracture in elderly increases morbidity and also increases complications due to prolonged bed rest (bed sore, deep venous thrombosis, pulmonary infections), in elderly patients, osteoporosis is leading cause for worsening of quality of fixation thus increases implant failure rates. Aim of intertrochanteric femur fracture management is mainly early fixation and mobilization **[5].** Intramedullary implants provide more biological advantages than extramedullary implants [6]. Mean operation time, blood loss and intraoperative fluoroscopy images were lower in PFNA cases than PFN because of the use of helical blade in PFNA over dual screws in PFN. Zeng *et al.* noted that PFNA fixation reduces duration of surgery, complication rate, implant failure and intraoperative blood loss as compared to PFN [7].

Takigami *et al*. concluded that surgical time and operative blood loss were lower with use of PFNA than PFN [8].

Similar results were found in our study

In our study, total 3 cut-out cases reported where 2 cases in PFN and 1 case in PFNA. 20% cases in PFN and 13% in PFNA showed shortening >1cm similarly lower rate of varus malalignment noted in PFNA patients.

Andrej in his study recommended a TAD (tip apex distance) of 20- 30 mm in case of helical blade as compared to conventional screws and also found that cut out rates were higher if tad was >30 mm or < 20 mm [9].

More *et al*. observed that PFNA is implant of choice for intertrochanteric femur fracture fixation in elderly [10].

However other studies reported cut-outs in the range of 5-25%. Even though the helical blade was thought to reduce the cut through, medial cut-through of the subchondral bone still occurred [10-12, 13].

Jin and Mereddy and Bauer C suggested the use of a longer nail than the shorter one to encounter excessive femoral shaft curvature. In our case series, we found impingement of nail tip (170mm length) to the anterior cortex in about 2 cases due to increased anterior bowing and short femoral length in Indian population [14, 15].

The mean harris hip score at 1 year postoperative showed better results in PFNA patients than PFN.

Conclusion

Surgical fixation by PFNA showed significant benefits in terms of duration of surgery, intraoperative blood loss, complications and functional outcome.

The prospective nature of the study strengthened the study whereas smaller sample size and shorter duration of follow-up are limiting factors.

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Conflict of Interest: None declared

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