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Comparative study of PFNA vs PFNA 2 in unstable intertrochanteric fractures: A randomised control study of 50 cases

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Abstract
Intertrochanteric fractures management in elderly pose a serious challenge to the new age orthopaedic surgeons. The implants have evolved from extramedullary implants like dynamic hip screw to the intramedullary types of PFNA2 nail. The main goal of fixing such fractures which hardly complicate with non-union are early mobilization of patient in order to prevent complications of prolonged bed ridden status. 50 patients were included in our study from July 2017 to June 2019. 25 patients were treated with PFNA and PFNA2 Nails. We recorded age, sex, mode of injury, associated injuries and comorbidities of patients. Fracture patterns were classified. We found that PFNA2 had less blood loss intraoperatively and better results with respect to nonunion rates, compared to PFNA implant.

Keywords: Comparative, PFNA, intertrochanteric fractures, randomised

Introduction
Globally, proximal femoral fractures have been on the rise with the increase in life expectancy and osteoporosis in the elderly population and road traffic accidents among the younger counterparts [1, 3]. The total number of trochanteric fractures are predicted to reach 1.6 million by 2025 and 2.5 million by 2050. In 1990, 26% of all intertrochanteric fractures were reported in Asia, this figure is estimated to rise to 32% in 2025 and 38% in 2050 [4]. The principal apprehensions of inadequate treatment of trochanteric fractures are associated with possibilities of acute instability and chronic mal-union with post-injury deformity. Intertrochanteric fractures exhibit marginal risk towards disruption of vascular flow to the femoral head. The sub-trochanteric region is subject to relatively high biomechanical stress during normal weight bearing and ambulation; this, in addition to the pull of the muscles attached to the proximal fragment, make sub-trochanteric fractures predominantly challenging to treat with increased rate of complications of non-union and implant failure. The goal for treating such injuries is to reduce displacement and stabilize with implants to allow early mobilization and weight bearing during fracture healing [5].
Extensive reports have been published in extramedullary implant Vs intramedullary imp [lant. [5, 7]. Intramedullary implant has better biomechanical properties and more resistant to failure. [8]. PFNA and PFNA2 are both intramedullary devices with 6 degrees of proximal angulation. The helical blade compacts cancellous bone in femoral head when it is driven inside. This compaction improves femoral head strength and increases stability in cervico-cephalic direction. A single helical blade PFNA2 is technically better for small size femur in Asian population. Biomechanically, helical blade in PFNA2 has better cut-out resistance levels than screws [9].
In this study, we studied the various aspects of PFNA and PFNA2 fixation in Intertrochanteric femur fractures.

Material and Methods
We conducted a randomised prospective case controlled study of 50 each. 25 cases each were operated by PFNA and PFNA2 implant between July 2017 to June 2018. Intraoperative

findings were recorded. Postoperative results with respect to clinical, radiological and functional assessment were done every 2 weeks, 6 weeks, 3 months and 6 months.

Results

We had designated Group A and Group B to cases operated with PFN and PFNA2 Implants respectively. The mean age of our patients was 67.56 ± 15.13 years. Gender distribution showed 40% males and 15% females in Group A and 52% males and 48% females in Group B. Mode of injury was RTA in 24% patients in Group A and 40% patients in Group B, and fall in 76% patients in Group A and in 60% patients in group B. A statistically significant difference was noted in the amount of blood loss in the 2 groups. Blood transfusion was needed in 88% patients treated with PFN compared to 4% treated with PFN A2. In Group A, 8% patients had intraoperative complications and 12% had late postoperative complications. There were no late postoperative complications among patients treated using PFN A2 screws. All patients treated with PFN A2 underwent union whereas non-union was seen in 12% patients treated with PFN. Partial weight bearing within 1.5 months was seen in 56% patients treated with PFN A2 and in 16% patients treated with PFN. Limb length discrepancy was seen in 8% patients treated using PFN and in 12% patients treated using PFN A2. Malunion was seen in 12% patients treated with PFN. The mean HHS (Harris Hip score) in patients in the PFN group was 85.32 ± 12.96 while that of those treated with PFN A2 was 83.36 ± 11.57.

Discussion

Pertrochanteric fractures have high morbidity and lead to multiple complications due to prolonged bed rest (bed sores, pulmonary infections). Osteoporosis makes matters worse both for quality of fixation and implant failures. Early fixation and mobilisation has been the treatment of choice in intertrochanteric fracture femur cases [10]. Earlier implants like Dynamic hip screw worked on principle of controlled collapse. These were extramedullary implants which had high failure rates in lateral wall fractures and reverse oblique fracture pattern. Intramedullary implants proved to have biomechanical advantages [11]. In highly comminuted and old intertrochanteric fractures, cemented hip arthroplasties have been reported [12].

Concentration of stress is drastically reduced by the specially designed intramedullary nail tip. The helical blade in PFNA2 has 2 advantages. It compacts the already weak cancellous bone from the femoral head rather than being removed which happens in femoral screws. It also has more contact surface area with the femoral cancellous bone, than conventional screws [13].

Loo *et al* has reported a study with 62 patients of Intertrochanteric and Subtrochanteric femur fractures, operated with PFNA and PFNA2 implants. They had reported that 83.9% of patients were able to gain preoperative mobility status by 6 months following surgery. Although they had no cases of helical blade cutout, they reported 3 cases having lateral protrusion of sliding blade [9].

Bajpai in his study of 77 cases had found that both implants (PFN- screw vs helical) were similar with respect to time of surgery, functional assessment, duration of hospitalization and blood loss [14].

Our study aligns more with findings of study done by Harshwardhan *et al*, which shows less operative time, minimal blood loss, early weight bearing and less union time in cases operated using Helical blade PFNA2 implant [15].

But our study has limitations too. The sample size is small. The cases were done at a multiple surgeons, causing surgeon bias [15, 16].

More randomised control studies with larger sample size over a large population would make the consensus clear and pave a path for more confident recommendations for management of intertrochanteric fractures.

Good intraoperative reduction of fracture fragments, optimal position and length of femoral screw or helical blade are still the most important factors for successful outcome of these surgeries [17].

In conclusion, PFNA2 is better implant in terms of intraoperative complications, blood requirements and union rates.

Table 1: Full weight bearing status of postoperative patients.

Full weight bearing	Group A		Group B		p-value*
	No.	%	No.	%	
Up to 3 months	8	32	16	64	0.0235
>3 to 6 months	17	68	9	36	

*Calculated using the chi-square test. P<0.05 considered statistically significant

Table 2: Intraoperative complications.

Intraoperative complications	Group A		Group B	
	No.	%	No.	%
	2	8	0	0
Guide wire breakage	1	4		
Iatrogenic fracture	1	4		
No	23	92	25	100

Table 3: Intraoperative blood loss.

Blood loss	Group A		Group B		p-value*
	No.	%	No.	%	
<100 mL	3	12	11	44	0.01174
≥100 mL	22	88	14	56	

*Calculated using the chi-square test. P<0.05 considered statistically significant

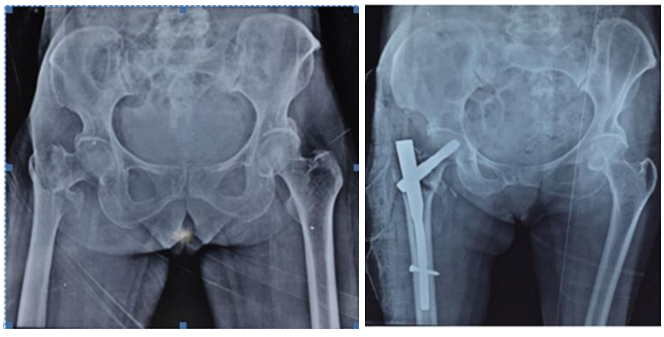

Fig 1: Preoperative and Postoperative x-rays of PFNA2 Fixation

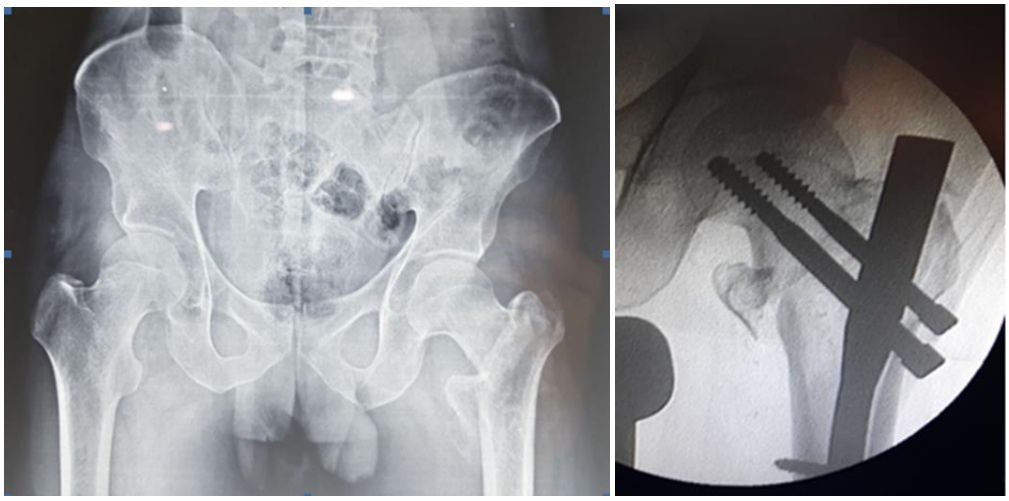

Fig 2: Preoperative and post-operative x-rays of PFNA Fixation

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