

Outcome of intertrochanteric fracture managed with proximal femoral nail antirotation 2



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ABSTRACT

Background: Intertrochanteric fracture is a common condition seen in elderly population which is managed with operative procedure in the department of orthopedics. The proximal femoral nail antirotation (PFNA) system was developed by the AO/ASIF in 2004 for this fracture that provides optimal anchoring and stability when the implant is inserted into the osteoporotic bone. The main characteristic of the implant is the use of a single blade with a large surface area and insertion of the blade compacts the cancellous bone. **Aims and Objectives:** The aim of the study was to study the functional outcome of intertrochanteric fracture managed with PFNA2. **Materials and Methods:** The prospective and observational study was conducted in patients diagnosed with intertrochanteric fracture admitted in orthopedic ward, Western Regional Hospital, Pokhara. Pre- and post-operative fracture alignment, Harris hip score (HHS), post-operative complications were taken into account. **Results:** Out of 55 cases taken into study, 36 (65.45%) were male and 19 (34.55%) were female. Maximum number of patients allocated in our study falls in 71–80 years group (29%) with least number in age group of 90 years or more (1.9%). Right-sided intertrochanteric fracture were 27 (49%) and left side involved were 28 (51%). Twenty-eight (51%) falls in Type II and 27 (49%) falls in Type III Boyd and Griffin intertrochanteric fractures. There was a marked improvement in fracture alignment after the operation with various parameters taken into consideration. Pre-operative HHS was 5.52 ± 5.38 (Poor) and immediately after the procedure, it was 30.41 ± 3.04 (Poor), 89.86 ± 3.59 (Good) at 6 months, and 95.56 ± 1.257 (Excellent) at 12 months. One case had blade cut out at immediate post-operative period, eight cases had surgical site infection, and five cases had GT fracture. **Conclusion:** This study showed that PFNA2 is an effective operative procedure in management of intertrochanteric fractures by achieving better fixation through bone impaction especially in osteoporotic bone.

Key words: Intertrochanteric fracture; Proximal femoral nail antirotation; Harris hip score

INTRODUCTION

Intertrochanteric fractures involve those occurring in the region extending from the extracapsular basilar neck region to the region along the lesser trochanter proximal to the development of the medullary canal. They are the most frequently operated fracture type, have the highest postoperative fatality rate of surgically treated fractures, and have become a serious health resource issue due to

the high cost of care required after injury.¹ The bone in this area is primarily cancellous and has an excellent blood supply, thereby making the risk of nonunion lower than with femoral neck fractures.² In the age category of 50 years and older, the incidence of these fractures has increased exponentially.³ The proximal femoral nail antirotation (PFNA) system was developed by the AO/ASIF in 2004. The main design characteristic of the implant is the use of a single blade with a large surface area. Insertion of the

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blade compacts the cancellous bone. These characteristics provide optimal anchoring and stability when the implant is inserted into osteoporotic bone.⁴

Aims and objectives

The aim of the study was to study the functional outcome of intertrochanteric fracture managed with PFNA2.

MATERIALS AND METHODS

A prospective and observational study was conducted at Western Regional Hospital, Pokhara after the ethical clearance from the Institutional Review Board of Pokhara Academy of Health Sciences. All the admitted cases of intertrochanteric fractures fulfilling the inclusion criteria were enrolled in the study and were operated with closed reduction and internal fixation (CRIF) with PFNA2. Informed written consent was taken in either Nepali or English language whichever they felt comfortable assuring full confidentiality. A detailed proforma of the participants including name, age, gender, occupation, educational status, marital status, post-operative radiograph, and functional parameters will be assessed and will be filled by the researcher. Physiotherapy will be commenced from 1st post-operative day and weight bearing is allowed as far as tolerated starting from day 2 with crutch. First dressing will be done on 4th post-operative day. Patients will then be kept on follow-up visits (1 month, 6 month, and 1 year) and will be assessed and managed accordingly. Patients (more than 20 years) managed with PFNA2 for closed intertrochanteric fracture (Boyd and Griffin Type II and III) were included in this study. Patients with pathological fracture, neurological and psychiatric disorders, fracture of more than 3-week duration, and open intertrochanteric fracture were excluded from the study. All the participants underwent detailed physical and clinical examination.

The collected data were stored in an electronic database (MS-Excel Sheet). Statistical analyses were performed with statistical software (SPSS 22.0 for Windows). Results were analyzed using appropriate statistical methods. P-value was calculated under the predetermined level of significance (0.05) and confidence interval of 95% was constructed. Results were expressed as percentages, mean±standard deviation and median for variables. Appropriate tables and figures were made during the data analysis.

RESULTS

Fifty-five cases underwent CRIF with PFNA2 out of which 36 patients (65.45%) were males and 19 patients (34.55%) were females. Patients undergoing the procedure falls maximum in age group of 71–80 years (29%) and least in

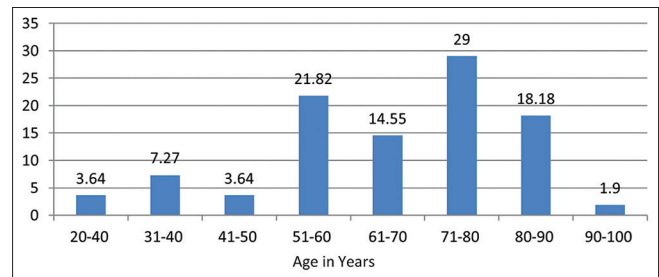


Figure 1: Age distribution

age group of 90–100 years (1.9%) as depicted in Figure 1.

Right-sided intertrochanteric fracture was 27 (49%) and left side involved was 28 (51%) cases. Considering the Boyd and Griffin classification, 28 (51%) were Type II and 27 (49%) were Type III. Pre-operative fracture alignment status was assessed and post-operative fracture alignment status were assessed immediately, 1 months, 6 months, and 12 months. Parameters and the results are shown in Table 1.

Pre-operative Harris hip score (HHS) in our study was 5.52 ± 5.38 which was poor and immediately after the procedure, it was 30.41 ± 3.04 which was still poor followed by 69 ± 2.75 (Poor) at 1 month, 89.86 ± 3.59 (Good) at 6 months and 95.56 ± 1.257 (Excellent) at 12 months which is showed in Table 2.

Average number of Fluoroscopy shots in our study was 11.82 ± 0.3 .

Similarly, one case had blade cut out at immediate post-operative period which was revised, eight cases had surgical site infection which was controlled with antibiotics, and five cases had GT fracture three at immediate post-operative and two at 1-month post-operative, respectively. Results are shown in Table 3.

DISCUSSION

The functional outcome of PFNA2 in treatment of intertrochanteric fractures has been interestingly raised over the years. Similarly, the impact of use of this implant on the fracture stability, operative time, mobilization of the patient, and average hospital stay is also a subject of discussion.

In our study, 55 patients were allotted, male patients 36 (65.45%) were more as compared to female patients 19 (34.55%). Mean age of distribution in our study at the time of injury was 66.4 years. Takigami et al.,⁴ included 50 patients which was comparable to our study that included male 5 (10%) as compared to female 45 (90%) and mean age of distribution in their study was 84 years which

Table 1: Pre- and post-operative fracture alignment status

Deformity	Pre-operative	Post-operative			
		Immediate	1 month	6 months	12 months
Acceptable	0	40	46	48	48
Valgus	9	3	3	1	1
Varus	46	12	6	6	6
Anterior angulation	0	0	0	0	0
Posterior angulation	0	0	0	0	0
Shortening	46	0	4	4	4

Table 2: Pre- and post-operative HHS

Pre-operative (Mean±SD)	Post-reduction (Mean±SD)				P-value
	Immediate	1 month	6 months	12 months	
5.52±5.38	30.41±3.04	69±2.75	89.86±3.59	95.56±1.257	P<0.05

HHS: Harris hip score

Table 3: Pre- and post-operative complications

Complications	Pre-operative	Post-operative			
		Immediate	1 month	6 months	12 months
Implant breakage	0	0	0	0	0
Cut out of the blade	0	1	0	0	0
Infection	0	8	0	0	0
Greater trochanter fracture	0	3	2	0	0
Diaphyseal fracture	0	1	1	0	0

did not match to our study. Regarding the complications, there was one blade cut out in our study which was comparable to their study.

A prospective study carried out by Kumar et al.,⁵ that included 20 patients with age group ranging from 45 to 85 years which was unlike our study which included 55 patients with age group ranging from 20 to 100 years. In their study, Type II Boyd and Griffin was predominant which was similar to our study that consisted 28 (51%) cases. Average HHS in their study at 6 months was 82.3 (Good) which was comparable to our study which was 89.86±3.59 (Good).

A prospective and interventional study done by Gill et al.,⁶ included 62 patients with age ranging from 54 to 94 years (mean 78.2, SD=09.11). The mean duration of follow-up was 14.3 months which was comparable to our study of 12 months. Varus collapse and limb shortening >1 cm were observed in three patients which was comparable to our study that included six cases of varus collapse and four cases of limb shortening. The average HHS at the end of study showed a mean value of 82.8 (SD=8.6) and ranged from 65 to 94 with 46 (74.2%) patients having excellent to good outcome which was unlike to our study at the end of 12 months that had score of 95.56±1.257 (Excellent).

Mallya et al.,⁷ conducted a similar type of observational study in 40 patients with age group above 50 years that included

20 male and 20 female patients which was unlike our study. Similarly, regarding the complications, three patients had varus collapse at the end of 6 months which was similar to our study. The average modified HHS in Group L at 6-month follow-up was 71.94 (Fair) and 76.8 (Fair) in Group M (P=0.84) which was unlike our study that had score of 89.86±3.59 (Good) (P<0.05). This study considered two entry portal for the nail, one being Group M for medial entry point (5 mm medial to the greater trochanter tip) and Group L for lateral entry point over greater trochanter based on anteroposterior view of the X-ray; however, on lateral view of the X-ray, the entry point was in the center. Our study considered modified GT as entry portal on anteroposterior view of the X-ray and center on the lateral X-ray.

A similar 1 year study done by Dr. Hareshkumar Prabhatbhai Parmar and Dr. Vishwash G Sharma⁸ included 42 patients above 70 years with mean age of 76 years with female: male ratio of 1.3:1 (20 F, 15 M) which was unlike our study. Their study included 57% left and 43% right sided intertrochanteric fracture which was unlike our study that included 49% right and 51% left side. Regarding the complications, their study had one surgical site infection which was unlike our study (8) and one had blade cut out which was similar to our study.

A prospective study carried out by Mehta⁹ in 2022 included 60 cases encompassing 37 (61.67%) males and 23 (38.33%) females with a M: F ratio of 1:0.62 which was comparable

to our study. Functional outcome was excellent to good in 41 (68.33%) patients whereas fair outcome was seen in 12 (20%) and poor outcome in 5 (8.33%) patients, respectively. Very poor outcome was seen in 2 (3.33%) patients. Functional outcome in our study using HHS at the end of 1 month was 51% (Poor) and 49% (Fair), at the end of 6 months was 56.37% (Good) and 43.63% (Excellent).

Limitations of the study

The limitations of the study were small sample size with study being performed in one center. Operations were performed by different orthopedic surgeons so results may vary according to expertise. Duration of follow-up is only of 1 year which is short to make a comment on the functional outcome. Moreover, Singh's index also was not taken into account to assess the bone status which may have a profound effect on the final outcome.

CONCLUSION

PFNA2 is an effective intramedullary load sharing device for intertrochanteric fractures in the old age group (71–80 years) with male preponderance and left side slightly more than right. Type II fractures were comparable with Type III fractures and fracture alignment was not acceptable preoperatively however, acceptable alignment was achieved at 1-year period suggesting the good outcome of PFNA2. Mean HHS was excellent at 12-month post-operative period. However, PFNA2 brings implant related complications suggesting many challenges.

We conclude that PFNA2 can be a safe and effective procedure in the management of patients with intertrochanteric fractures.

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Authors' Contributions:

KRG- Concept and design of the study and prepared first draft of manuscript; **RW**- Interpreted the results; **JP**- Reviewed the literature concept; **SA**- Manuscript preparation; **SG**- Statistical analysis and interpretation; **YNB**- Revision of the manuscript; and **MP**- Data Collection.

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