International Journal of Research in Orthopaedics
Mir WA et al. Int J Res Orthop. 2021 Mar;7(2):267-270
http://www.ijoro.org

Original Research Article

DOI: https://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20210619

Functional and radiological outcome of osteosynthesis using proximal femoral nail antirotation II system in intertrochanteric femoral fractures

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Received: 19 December 2020
Accepted: 29 January 2021

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ABSTRACT

Background: Intertrochanteric fractures are relatively common injuries in adults and a common source of morbidity and mortality among the elderly. Incidence of fractures is increasing because the general life expectancy of the population has increased significantly during the past few decades. Stable fixation and early mobilization is needed in these fractures to reduce the morbidity and mortality. Extra-medullary implants are biomechanically inferior in these cases. The proximal femoral nail antirotation-II (PFNA-II) is an intra-medullary nail system designed for such fractures. The purpose of this study was to assess the results and complications of PFNA-II in intertrochanteric femur fractures.
Methods: After seeking approval from institutional Ethical committee, this study was conducted on 30 patients attending our emergency department with intertrochanteric femur fractures at SKIMS Medical College Hospital Bemina, Srinagar from February 2018 to June 2019. The patients were treated with proximal femoral nail antirotation-II. Follow up was done at 2, 6, 12 and 24 weeks. The functional outcome was assessed at 6 months follow up using the Harris Hip Score.
Results: Based on the Harris hip score, 18 (60%) patients had excellent results, 10 (33%) had good results and 2 (7%) had Fair results. None of the patients had poor result. Average time to union was 12.27 weeks.
Conclusions: This study found the PFNA-II to be a versatile, easy to use and dependable implant for stable as well as unstable intertrochanteric fractures. PFNA II is distinct advance over the previous methods of treatment, though it has an initial learning curve.

Keywords: Harris hip score, Intertrochanteric fractures, Intra-medullary device, PFNA-II

INTRODUCTION

Intertrochanteric fractures are relatively common injuries in adults and a common source of morbidity and mortality among the elderly. Incidence of fractures is increasing, because the general life expectancy of the population has increased significantly during the past few decades.[1] Nearly nine out of 10 hip fractures occur in patients with age more than 65 years. Intertrochanteric fractures constitute ½ of all the hip fractures. These fractures usually unite if reduction and fixation are properly done as a wide area of bone is involved, most of which is cancellous, and both fragments are well supplied with blood. Although malunions may be a problem, late complications are rare.[1] When a high-energy intertrochanteric fracture produces comminution, a large fragment of the posteromedial wall of the femur, often including the lesser trochanter, splits free. This bony buttress is important to the stability in the intertrochanteric region; therefore, its comminution results in an unstable fracture.[2,3] Both intramedullary and extramedullary implants can be used to manage these fractures. However, the choice of implant is based on the

fracture pattern. Several clinical and biomechanical studies have analysed the results of different implants such as the dynamic hip screw (DHS), the Gamma nail (GN) and the proximal femoral nail (PFN). Those devices have suffered a variety of complications like cut-out, screw back out, implant breakage, femoral shaft fractures and subsequent loss of reduction.[4-7] PFNA-II being an advance over previous nail designs is supposed to circumvent several of these complications.

This study was conducted to assess the results and complications of PFNA-II in intertrochanteric femur fractures.

METHODS

This prospective interventional study was carried out in SKIMS Medical College Hospital, Bemina Srinagar, from February 2018 to June 2019. After seeking approval from the Institutional Ethical Committee, 30 patients with intertrochanteric fractures of femur, meeting the inclusion criteria, were included in the study. Such patients presenting to the emergency department were admitted, stabilized, evaluated and operated.

Inclusion criteria

All sexes, Intertrochanteric fractures: AO/OTA types 31-A1 and 31-A2.

Exclusion criteria

Associated fracture of neck of femur, subtrochanteric extension or associated fracture of shaft of femur. Pathological fractures. Open fractures. Intertrochanteric fracture in a medically unfit patient.

On admission clinical history was taken, which was followed by a detailed general physical and relevant local examination. Any associated life threatening injuries were treated on priority. The clinical evaluation and stabilization was followed by radiological examination of the part which included anterioposterior x-ray of pelvis with both hips and lateral radiograph of affected hip with femur to assess the fracture geometry. The patients were then assessed medically and prepared for surgery. DVT prophylaxis in form of 5000 units of subcutaneous heparin injections given twice daily was started right from day of admission. Heparin was stopped 24 hours before surgery. A bolus dose of antibiotic (1.5 gram intravenous cefuroxime) was given half an hour before the surgery. The surgery was done either under spinal anaesthesia or general anaesthesia as per the anaesthetist's choice. All fractures were treated on fracture table by closed reduction or limited open reduction under C-arm fluoroscopy control.

Blood loss and duration of surgery were noted down. Complications during surgery and follow-up period were noted.

Patients were followed up for a minimum period of 6 months. With each follow up clinical and radiological evaluation was done. Fracture union was determined radiographically as the appearance of a bridging callus on three or four cortices and crossing of trabeculae on the AP and lateral views and clinically as a lack of pain sensation around the fracture site. The functional assessment was done using Harris hip score.[8]

Statistical analysis

Data was entered in Microsoft Excel software, and analysis was done using SPSS version 20.0 software.

RESULTS

Out of 30 patients, male: female ratio was 13:17. The mean age was 64.8 years. We had slightly more left sided fractures with a left:right ratio of 17:13. In our study 26 (87%) patients sustained intertrochanteric fracture due to domestic fall and road traffic accidents were responsible for 4 (13%) fractures.

Table 1: Patient demographics.

Male:female	13:17
Age in years (mean)	64.8
Side (left:right)	17:13
Mode of trauma	
Domestic fall	26
Road traffic accident	4
AO type	
31-A1	5
31-A2	25

In our study 31-A2 fractures were the most common ones holding a share of 83% and 31-A1 fractures comprised 17%. All fractures were closed. Comorbidities were present either alone or in combination in 11 (37%) patients.

Table 2: Operative details.

Reduction	
Closed	24
Limited open	6
Mean blood loss (ml)	115.3
Average operation time (min)	66.5
Mean fluoroscopy (No.)	28
Mean hospital stay (days)	9.2

Closed reduction was initially tried in all cases and was successful in 24 cases. 6 cases needed limited open reduction. Mean duration of surgery (reduction + incision to closure) was 66.5 minutes. Mean blood loss was 115.3 ml. Average number of fluoroscopy shots was 28. Mean duration of stay in hospital was 9.2 days.

Table 3: Complications.

Bed sores	3
Infection	
Superficial	2
Deep	0
Cut out	0
Varus malunion	2

Local complication occurred in 2 patients in the form of superficial infection which subsided with antibiotics. Bed sores occurred in 3 patients. Majority of the patients 28 (93%) had achieved union by 15 weeks. Rest 2 (7%) also achieved union over the next 2 weeks. Average time to union was 12.27 weeks. Mean Harris hip score in our study was 91.4. Patients with Harris hip score of 90-100 were considered to have an excellent result, those with a score of 80-89 were considered good and those with a score of 70-79 were considered fair in terms of outcome.

Table 4: Functional assessment using Harris hip score.

HHS	No. of patients	Percentage
Excellent (90-100)	18	60
Good (80-89)	10	33
Fair (70-79)	2	7

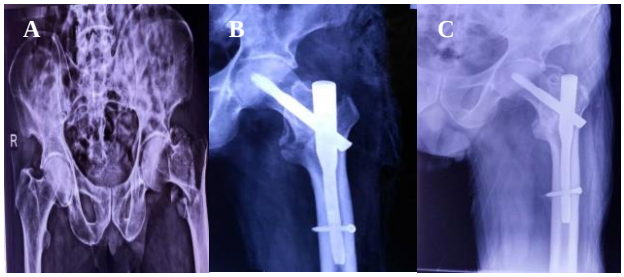

Figure 1: Pre op radiograph (A), 2-weeks follow-up x-ray (B), Final follow-up x-rays(C).

Figure 2: Case result.

DISCUSSION

Intertrochanteric fractures are very frequently encountered by orthopaedicians and are considered forgiving and probably this attitude is responsible for the high rates of subtle complications in these fractures. The complications include varus malunion and shortening. Even if surgery of intertrochanteric fracture is performed impeccably, results can still be poor if adequate rehabilitation is not performed.[9] Management of intertrochanteric fractures is done in 3 stages. First is the surgical management, second post-operative rehabilitation, and third is treatment of the underlying causes i.e. osteoporosis, when present. No step is less important in the holistic management of these fractures. Various intramedullary and extramedullary implants are available and excellent results have been reported with their use. Dynamic hip screw remains the work horse for intertrochanteric fractures in developing countries, while intramedullary devices have taken over in developed countries. Everyone lists the merits of his favourite technique over the other, but a universal consensus over the superiority or the selective uses of either has not been arrived at. Intramedullary devices nevertheless are rapidly gaining popularity especially in the unstable fractures; because of their mechanical and biological advantages.[10] The modern intramedullary devices like the PFNA-II have been refined over the years to overcome the shortcomings of the previous intramedullary devices while retaining their advantages, like closed fracture treatment, less dissection and maintaining the fracture haematoma.

In our study mean blood loss was 115.3 ml. This is comparable with other studies.[11,12] Duration of surgery was around 50 minutes in most of the studies in litertature, but in our study average duration of surgery was 61.5 minutes.[11,13,14] This was because of a learning curve. Like most of the studies, we did not encounter any case of blade cut-out or significant varus collapse, suggesting a good purchase of helical blade.[15-17] Helical blade during its insertion compacts the trabecular bone around it and decreases its susceptibility of yielding to strain. A study done on cadaveric bones by Goffin et al concludes that bone compaction caused during insertion of helical blade decreases the chances of cut outs.[18] There were 2 cases of wound infection among the patients analysed, and both were superficial infections.

The limited exposure needed when utilising a PFNA-II device compared to extramedullary devices like the dynamic hip screw (DHS) can partly explain the relatively low rate of infection. Our complication rates were similar to those reported in the literature.[16,17,19] The average Harris hip score in our study was 91.4 which is slightly higher than other studies.[11,12,16] This is probably because of lower mean age, stable fracture patterns selected in our study and lesser physical and functional demand in our elderly population as compared to other studies. In our study mean time to union was 12.27 weeks which is comparable to other studies.[19,20]

CONCLUSION

This study found the PFNA-II to be a versatile and dependable implant in intertrochanteric fractures. This technique involves less dissection and preservation of fracture haematoma which eventually had a bearing on union time. Closed reduction technique resulted in less blood loss and less surgical site infection rate. More over PFNA-II is an ideal implant for stable as well as unstable intertrochanteric fractures and is a distinct advance over the previous methods of treatment, though it has an initial learning curve.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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Cite this article as: Mir WA, Rather MN, Rashid R. Functional and radiological outcome of osteosynthesis using proximal femoral nail antirotation II system in intertrochanteric femoral fractures. Int J Res Orthop 2021;7:267-70.