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Outcome of Proximal Femoral Nail Antirotation II fixation of Peritrochanteric Fracture of Femur

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ABSTRACT

Background: Intramedullary fixation is biomechanically superior to extramedullary fixation for fracture of peritrochanteric region of femur in elderly which is often complicated due to associated osteoporosis. Helical blade of proximal femoral nail antirotation II has stronger purchase in the head of femur preventing rotation and cutout. This study was done to evaluate the outcome of Proximal Femoral Nail Antirotation II fixation in B.P. Koirala Institute of Health Sciences.

Methods: Retrospective review of the data of 100 traumatic peritrochanteric fracture cases operated between March 2017 and March 2018 was done for study. Cases lost to follow-up, deaths and incomplete functional outcome (VAS, HHS), intraoperative and postoperative data were excluded. Total of 71 cases were included in the study.

Results: Mean age of patients was 65 (±14) (range:19 to 86) years and were operated for intertrochanteric (54), subtrochanteric (16) and neck of femur (1) fractures. Trivial fall on ground was the commonest mechanism of injury (43 of 71). Mean injury to surgery time was 7 (±7) days and mean duration of hospital stay was 5.92 (±4) days. Mean blood loss during surgery was 132.61 (±21) ml and mean surgical time was 56 (±8) minutes. Mean visual analogue scale (VAS) Score was 7 at 2 weeks, 3 at 6 weeks and 1 at 12 weeks. Mean harris hip score was 80 (±10) at 6 months.

Conclusions: Proximal femoral nail antirotation II is a reliable implant system to use for fixation of proximal femoral fractures with a good functional outcome and low complication rates.

Keywords: Harris hip Score; helical blade; intramedullary fixation; peritrochanteric fracture; proximal femoral nail antirotation

INTRODUCTION

Intramedullary fixation of peritrochanteric femur fractures has shown biomechanical, biological and intraoperative advantage over extramedullary fixation allowing faster postoperative restoration of walking.[1-4] The helical blade of proximal femoral nail antirotation (PFNA) holds firmly with the femoral head cancellous bone as it compresses the bone rather than removing it, thus reducing rotation and cutout unlike gamma nail and dual-screw proximal femoral nail (PFN), ensuring safer immediate full weight bearing postoperatively.[5-10] Along with easy and safe implantation system, PFNA has shown its superiority amongst different implants used for fixation of peritrochanteric fractures.[11-14] Geometry and size adapted PFNA has gained popularity in Asian population (hence the name PFNA II) with reduced lateral cortical impingement and wall fracture.[15,16]

This study aimed at evaluating the outcome of PFNA II fixation in B.P. Koirala Institute of Health Sciences with respect to visual analogue scale (VAS) score, harris hip score (HHS) and complication rate.

METHODS

Retrospective review of the data of peritrochanteric fracture cases (basicervical Neck, intertrochanteric and subtrochanteric) operated between March 2017 to March 2018 (1-year period) with proximal femoral nail antirotation (PFNA II) fixation in B.P. Koirala Institute of Health Sciences (BPKIHS) was done. There were 100 cases of PFNA II fixation for such fractures during the one-year period. All the cases were fixed with nails of either 200mm or 240 mm length and diameter ranging between 9mm and 11mm. After ethical clearance from the IRC, data collection was done. After excluding 5

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deaths and 24 cases not having adequate intraoperative, postoperative and functional outcome data of 6 months follow-up, 71 cases were included in study and data reviewed from the hospital Medical Records section. Demographic data, preoperative, intraoperative and postoperative data, clinical outcome data including VAS score and Harris hip score (HHS) along with fracture union time and complications were recorded in Microsoft Excel sheet 2016 and analysed using the Analysis ToolPak. Fracture union was determined at routine follow-up with loss of pain at fracture site clinically along with signs of bridging callus and trabecular crossing of fracture in X-ray.

RESULTS

Mean age of patients was 65 (range: 19 to 86) years. Most of the patients were in 7th decades of life, followed by eighth decade. The most common cases were intertrochanteric fractures, followed by subtrochanteric. Trivial fall on ground from standing height or from chair/bed resulted in most of the fractures (46 of 71 cases, ie 65%), with road traffic accidents comprising 12 (17%) cases (Table 1).

Table 1. Age, sex, fracture type,mode of injury, associated injury, perambulatory status of the patient with fracture.

Demographic/ Preoperative Parameters		Percent
1. Age	Mean: 65±14 years	
2. Age Group	7th decade>8th decade	
3. Sex distribution	M: F= 36:35	
4. Fracture types	Intertrochanteric: 54	76
	Subtrochanteric: 16	22.5
	Neck of Femur: 1	1.4
5. Modes of Injury	Fall on Ground: 43	60.5
	Road Traffic Accident: 12	16.9
	Fall from Height: 7	9.8
	Fall from Stairs/Ladder: 5	7.0
	Fall from Chair/Bed: 3	4.2
	Hit by Tree: 1	1.4
6. Associated Injury	Spine (D8 Burst) Fracture: 1	
	Head Injury: 1	
	Colle's Fracture: 1	
7. Preinjury ambulatory status	Normal= 35	49.3
	Independent community= 23	32.4
	Neighborhood= 9	12.7
	Household= 4	5.6

The surgery time was 56(±9) (Range: 40-75) minutes and mean blood loss was 132(±21) (Range: 100-180) ml. Mean fracture union time was 13 (±3) weeks, except for two cases which did not unite, one due to helical blade back-out and the other due to over distraction during fixation (Table 2,4). Mean Harris hip score (HHS) at 6 months was 80±10 (Table 3). Of the 71 patients, our study showed that 49 (69%) cases reached the pre-operative ambulatory capacity at 6 months.

Table 2. Duration of hospital stay, amount of blood loss, surgical time, VAS score, Harris Hip Score and Fracture Union time of patient with fracture.

Outcome Parameters	
1. Duration of Hospital Stay	Mean: 6±4 days
2. Amount of Blood Loss	Mean: 133±21 ml
3. Surgery time	Mean: 56 ± 8 mins
4. Mean Visual Analogue Scale (VAS) score	2 wks: 7.04±0.84 6 wks: 3.13±1.19 12 wks:1.08±0.94
5. Harris Hip Score (6 months)	80±10
6. Fracture Union time	Mean: 13±3 weeks

Table 3.

Harris Hip Score	Frequency	Percentage
Excellent	16	22.5
Good	22	31
Fair	22	31
Poor	11	15.5
Total	71	100

Table 4. Complications after fixation of fracture.

Complications	Frequncy	Percentage
Superficial Infection	2	
Deep Infection	1	
Implant (Helical Blade) Back out	1	
Non-Union	1	
Total	4	5.6%

DISCUSSION

Study aimed at evaluating the outcome of proximal femoral nail antirotation (PFNA II) fixation of the proximal femoral fractures with functional outcome parameters like HHS and Visual Analogue Scale (VAS) Score along with rate of union and rate of complication of surgery. The results of this study were compared with similar studies done elsewhere.

The treatment of proximal femur fractures using


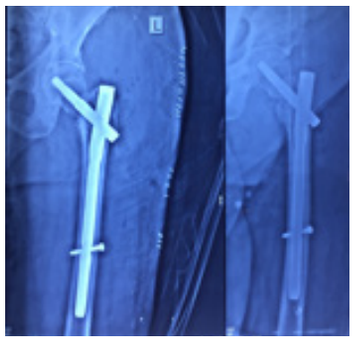


Figure 1(a) Figure 1(b) Figure1(c)

Figures 1. 80 years old female with Intertrochanteric Fracture of left femur (1a), Fixation with PFNA II (1b) and Helical blade backout at 12 weeks (1c).




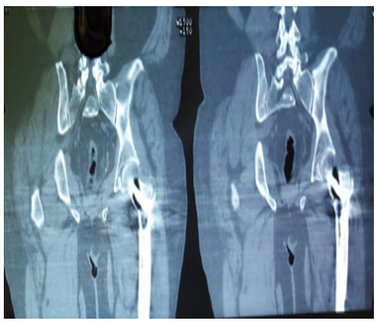

Figure 2(a) Figure 2(b) Figure 2(c) Figure 2(d)

Figures 2. 47 years male with intertrochanteric fracture of left femur (2a), fixed with PFNA II fixation in distraction mode (2b), showed no signs of healing at 6 months in X-ray and CT scan (2c, 2d) as an indication of Non-union.

appropriately positioned sliding hip screw with side plate assembly, namely dynamic hip screw (DHS) and dynamic condylar screw (DCS) were the mainstay of fixation for stable and unstable proximal femur fractures, respectively.[17,18] But, intramedullary devices, like Gamma nail, PFN, PPFNA have proved to be more effective biomechanically in managing such fractures, especially in unstable intertrochanteric and subtrochanteric fractures, along with advantages with respect to reduced surgery time, reduced blood loss and reoperation rate.[3,5,19-22] These intramedullary implants are associated with reduced early as well as late reoperation rate from complications associated with fixation failure, screw cut-out, non-union of fractures and medialization of femoral shaft with reduced neck length[23]. They have also allowed faster restoration of postoperative walking ability.[4,21,24,25] However, Gamma nail and proximal femoral nail (with hip pin and neck screw) are associated with unique complications of penetration of femoral head due to screw “cut out” and “Z-effect” in PFN where the superior screw migrates medially into hip joint and inferior one migrates laterally producing prominence of screw that irritates the Tensor Fascia Lata producing pain.[26,27] Helical blade in PFNA impacts the cancellous bone of the femoral head and has a strong hold to the head, hence reducing the risk of screw cut-out in osteoporotic bones as seen in sliding hip screw, Gamma nail and PFN.[9,10,19,28] Due to all these advantages, PFNA has been a revolutionary implant in fixation of these fractures.[12] It has been studied with respect to the intraoperative parameters and post-operative surgical outcome in other Asian countries with proven benefits as that of western world with some design adaptations (PFNA II).[11,13,29-32] However, PFNA II is relatively newer implant in use in our setup. Retrospective review of the data of 71 patients treated with PFNA II from March 2017 to March 2018 revealed several important findings in our population which will be helpful to guide management of proximal femur fractures in our setup.

Commonest mechanism of injury represented trivial trauma with fall from standing height on ground and fall from chair/bed comprising 65% of all cases. Higher impact injury including fall from height, stairs, ladder and road traffic accident represented 35% of all cases. Mereddy et al reported 48 out of 62 patients (77.42%) with fracture from low energy injury.[10] The higher proportion of high energy injury causing proximal femur fractures in our study than theirs could be due to the relatively younger

population (mean age 65) than their study (mean age 78years) and unique mechanism of injury causing high impact injury in hilly and rural areas in our setting; fall from height, including that from trees. Associated significant injury requiring treatment was seen in 3 cases (4.22%); head injury, distal radius fracture and spine injury. This result highlights the role of osteoporosis for fracture of hip, along with spine and distal radius. Traumatic hip fractures could be associated uncommonly with head injury as well. Mean blood loss was 132.6±21 ml and surgery time measured from skin incision to closure was 56±8 minutes. Both of these findings are comparable to findings of Zou et al who have reported mean blood loss of 156±24ml and surgery time of 52±10 mins with PFNA fixation.[21] Mean VAS score at 2 weeks, 6 weeks and 12 weeks were 7, 3 and 1 respectively with a clear downward trend with increasing number of weeks after surgery, indicating significant reduction in pain severity in these patients with time. Fracture united at 12 weeks in most patients with a mean fracture union time of 13±3 weeks for 69 fractures out of 71. Two fractures did not unite until last follow-up, of which one case developed helical blade backout seen in x-ray taken at 12th week and the other case showed fixation in distraction when reviewed retrospectively. Mean Harris Hip Score (HHS) at 6 months was 80±10 points with a range of 47 to 99, comparable to study by Liu et al who reported mean HHS of 84 points (range, 46-100 points). Return to preinjury ambulatory status at 6 months was seen in 49 (69%) patients in our study, slightly lower that Liu et al who reported restoration of preoperative mobility in 74% cases at final follow-up (mean duration 21 months). 5 of 71 cases (7%) developed complications, with two cases of superficial infection, one case of deep infection, one non-union and one helical blade backout with non-union. The overall complication rate of 5 out of 71 cases (7%) was comparable to outcome study by Liu et al who reported an overall complication rate of 8%.[28] However, there was no case with screw cut out or screw cut through with penetration into the femoral head. All the cases were operated with short PFNA2 (with available lengths of 200mm and 240mm), but there was no case of fracture at the tip of the nail, neither had any issue of size mismatch of implant intraoperatively.

Being retrospective study, level of evidence provided is low. The follow-up duration is short (6 months), so that outcome of management of the complications like non-union could not be included. This study does not include the trend of improvement in Harris Hip Score over time. Likewise, data did not include the most accepted classification system for these fractures, ie AO classification. However, this retrospective review has opened opportunity for prospective comparative studies of longer duration.

CONCLUSIONS

PFNA-II fixation of the peritrochanteric fractures has a short operative time and limited blood loss. The implant is biomechanically strong to allow early ambulation of patients. The functional and radiological outcome is good with low complication rates compared to other implant designs. Hence, it is recommended as an implant of choice, especially for unstable fracture configurations of the osteoporotic proximal femur in elderly.

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CONFLICT OF INTEREST

None

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