



CLINICAL OUTCOMES OF PFNA II INTERNAL FIXATION IN PERTROCHANTERIC FRACTURE PATIENTS IN INDIA: AN OBSERVATIONAL STUDY

Orthopaedics

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ABSTRACT

Purpose: The goal of this study is to evaluate the efficacy of PFNA II internal fixation in reducing morbidity and mortality, and improving the overall quality of life in elderly Indian patients with pertrochanteric fractures. **Materials And Methods:** 62 patients who underwent PFNA-II internal fixation between March 2019 and February 2022 were evaluated for a period of 12 months. Their morbidity and mortality were assessed at the end of one year. **Result:** 44 (70.9%) of the 62 patients survived till the end of the evaluation period. Among the survivors, 40.9% became mobile without any walking aid; 31.8% required a walker; 15.9% required a stick; and 11.36% required a wheelchair. Most of the surviving patients could successfully return to their pre-injury activities (47.7%) or had slight restrictions (31.8%), while only 20.5% could not return to their earlier activities. Furthermore, after one year, the majority of the surviving patients had mild (31.8%) or no pain (54.5%), whereas only 6.8% had moderate to severe pain. Revision surgery was not required for any of the patients. **Conclusion:** PFNA-II internal fixation is very successful in reducing morbidity and mortality of elderly Indian patients with pertrochanteric fractures. This method improves the overall quality of life of such patients.

KEYWORDS

Pertrochanteric fracture, PFNA, PFNA II

INTRODUCTION:

Among all forms of hip fractures in elderly patients, pertrochanteric femoral fractures are very common and result in significant morbidity and mortality.^{1,2} Such injuries include both intertrochanteric and subtrochanteric fractures. Intertrochanteric fractures are extracapsular fractures of the femur that take place in the region of the greater and the lesser trochanter.³ On the other hand, proximal femur fractures occurring within 5 cm of the lesser trochanter are called subtrochanteric fractures.⁴ Almost half the hip fractures among the elderly consist of intertrochanteric fractures.⁵ Such fractures are commonly associated with osteoporosis and are directly caused by falls or indirectly by torsion.⁶ The treatment of such patients also becomes challenging due to the simultaneous presence of maladies such as diabetes and hypertension. In many cases, the prognosis remains poor and the quality of life (QOL) gets severely affected.^{7,8}

In the last few decades, pertrochanteric fracture treatment has shifted from predominantly conservative treatment to surgical methods. For elderly patients with hip fractures, non-operative treatment has been associated with higher mortality.⁹ Patients undergoing conservative treatment often develop urinary tract infections, bed sore, pneumonia, and thromboembolic events.¹⁰ Other complications associated with conservative treatment of trochanteric fracture include muscle atrophy, disuse osteoporosis, external rotation deformity, varus, and shortening. Hence, other than non-ambulatory patients and those with a high risk of perioperative mortality, surgical intervention remains the preferred mode of treatment.¹¹

The treatment goal for pertrochanteric fractures in elderly people is to perform a minimally invasive and short procedure to stabilize the fracture and allow early mobilization. Hence, internal fixation is currently the preferred surgical treatment. It decreases the recovery time, thereby reducing the possibility of complications related to prolonged bed rest and improving patient prognosis.^{12,13} Internal fixation procedures employed in such cases include dynamic hip screw (DHS), percutaneous compression plating (PCCP), dynamic condylar screw (DCS), and proximal femoral nail antirotation (PFNA).^{14,15,16} A recent comparative study demonstrated a better curative effect of PFNA compared to DHS in treating intertrochanteric fractures.¹⁶ This study further showed that internal fixation by PFNA required less

operation time, and also resulted in less intraoperative blood loss and postoperative complications than that by DHS.¹⁶ Another comparative study revealed that internal fixation by PFNA was more effective than DHS and proximal femoral locking compression plate (PFLCP) in the treatment of unstable intertrochanteric femoral fractures. Internal fixation by PFNA also had significantly lower complications than the other two methods.¹⁷

The PFNA procedure also has some complications due to existing geometric discrepancies between the PFNA system and the proximal femur. Such a geometric discrepancy is linked to lateral cortical impingement, resulting in lateral cortical fracture and intraoperative loss of reduction during insertion of the PFNA.¹⁸ To overcome this drawback of PFNA, the PFNA II system was introduced.^{19,20} The flat lateral shape of PFNA II devices could reduce the probability of lateral impingement during nail insertion, thereby lowering the possibility of intraoperative lateral wall fracture and intraoperative loss of reduction.^{21,22} PFNA-II has also been successful in treating subtrochanteric fractures.²³

Despite the improvement in internal fixation achieved by PFNA II in treating pertrochanteric fractures, the concern is still there regarding its efficacy among Korean patients due to the average femoral length of the Korean population.²⁴ This concern also raises the question of whether the PFNA II system requires further modification tailored to the ethnicity of the patient. Indeed, a morphologic mismatch between the greater trochanter and the proximal segment of PFNA II has been reported in Asian patients.²⁵ Moreover, the efficacy of PFNA II internal fixation in treating pertrochanteric fractures has not been well documented in the Indian scenario. Hence, we intended to evaluate the efficacy and complications (if any) of the PFNA II procedure for pertrochanteric fracture treatment in the Indian elderly population. In this observational study, we report the clinical outcome of PFNA II implantation in elderly patients with intertrochanteric and subtrochanteric fractures in our center.

METHODS:

Patient Selection

This is a retrospective analysis of patients who underwent PFNA II internal fixation in our hospital from March 2019 to February 2022. All

the patients were above 60 years of age and had intertrochanteric or subtrochanteric fractures due to traumatic causes. The patients were taken up for surgery only after physician, endocrinology, critical care, and anesthetist clearance. Appropriate informed consent was taken from each patient.

Surgery

The standard PFNA II internal fixation procedure was followed in all the cases. A single surgeon performed all the surgeries with the patient in a supine position on the fracture table. Anatomical measurements of the proximal femur were pre-established by a true plain anteroposterior (AP) radiograph before surgery. We also used true plain AP radiographs to measure the proximal femoral length (PFL), the femoral neck-shaft angle, and the AP bending angle (APBA). Finally, the PFNA II nail guide system was used for the fixation.

Before the surgery, spinal anesthesia was performed with bupivacaine (0.5%). Then the fracture was reduced using a fracture table under a C-arm and image intensifier. Using a lateral incision, an entry point was made in the greater trochanter of the femur. Reamed nails with a helical blade of appropriate size were used to fix the fracture. Subtrochanteric fractures were reduced using a mini-open incision and were held using a cerclage wire. After surgery, patients were made to sit with legs dangling from the postoperative day (POD) 1, and non-weight bearing (NWB) mobilization started from POD 2. Deep vein thrombosis (DVT) prophylaxis with low-molecular-weight heparin (LMWH) was started after 24 hours of surgery. The patients were discharged on oral anticoagulants that were continued for 21 days. All the patients received subcutaneous injections of teriparatide (25 mcg), which was continued till fracture reunion.

Post-Surgery Follow-up

The patients included in this study were followed up monthly for the first 3 months. Toe-touch weight-bearing mobilization with a walker was started 1 month after surgery. Then onwards, gradual weight bearing with walking aids was encouraged. A questionnaire-based visual analogue scale (VAS) was used to estimate the pain status of the patients during the study period. A VAS score of 0 indicated no pain; 1–3 indicated mild pain; 4–5 indicated moderate pain; and 6–10 indicated severe pain.

RESULTS:

Patient Demographics

The characteristics of the patients who participated in this study are presented in Table 1. All our patients were older than 60 years, with 6 (9.6%) in the age group of 60–69 years; 24 (38.7%) in the age group of 70–79 years; 28 (45.1%) in the age group of 80–89 years; and 4 (6.4%) in the age group of 90–99 years. Among the patients, 22 (35.48%) were male and 40 (64.5%) were female. Most of the patients suffered from left intertrochanteric (30; 48.38%) and right intertrochanteric (24; 38.7%) fractures, whereas, there were some cases of left subtrochanteric (4; 6.4%) and right subtrochanteric (4; 6.4%) fractures as well.

Patient Survival

Among the 62 patients, 44 (70.9%) survived till the end of this study. Only one of the 18 patients who died before the completion of this study passed away due to post-operative complications. The rest of the patients died due to various other age-related ailments. Moreover, two of the patients succumbed to COVID-19 infection.

Mobility And Activity Of The Patients After Surgery

We assessed the mobility of the surviving patients 1 year after the PFNA-II surgery. As shown in Table 2, among 44 patients, 18 (40.9%) were able to move unaided; 14 (31.8%) required a walker; 7 (15.9%) required a stick; and 5 (11.36%) required a wheelchair. We also checked whether the patients could return to their pre-injury activities. As presented in Table 3, 21 (47.7%) patients could resume all of their pre-injury activities; 10 (22.7%) had slight restriction; 4 (9%) had restricted activities; and 9 (20.4%) could not return to pre-injury activities.

Pain Assessment After 1 Year

We used a questionnaire-based visual analogue scale (VAS) to assess the pain status of our patients one year after the PFNA-II surgery. As presented in Table 4, 24 patients (54.54%) had no pain (VAS score 0); 14 (31.8%) had mild pain (VAS score 1–3); 4 (9%) had moderate pain (VAS score 4–5); and 2 (4.5%) had severe pain (VAS score 6–10).

Hospital Stay Duration And Patient Outcome

We also analyzed the average duration of hospitalization of the patients. We observed that the longer the duration of the hospital stay during the surgery, the worse the outcome of the surgery in patients. As presented in Table 5A, the average hospital stay duration in patients who are able to move unaided or have no restriction in returning to pre-injury activities was 3.2 days; that for patients who became dependent on a wheelchair or had some restriction in returning to pre-injury activities was 5.6 days; and that for patients who died at some point of time after the surgery was 6.6 days. Moreover, among the patients who died, the ones with comparatively shorter hospital stays survived longer than the others. Patients who survived one year or longer after the surgery had an average hospital stay of 3.7 days, whereas, those who survived less than 1 year had an average hospital stay of 8.54 days (Table 5B).

DISCUSSION:

In this study, we evaluated the effectiveness of PFNA-II surgical procedure in improving the quality of life (QOL) of elderly Indian patients suffering from intertrochanteric and subtrochanteric fractures. Such fractures are debilitating injuries that greatly reduce the mobility and QOL of patients and thus result in huge liabilities for the families of such patients. This is a major burden in India and other countries, where elderly people constitute a significant portion of the population. Hence, restoration of mobility and the patient's ability to resume pre-injury activities are major goals of the treatment.

In recent times, the PFNA II system of internal fixation has emerged as an effective method of treating intertrochanteric and subtrochanteric fractures in patients. It is an improved variety of the earlier PFNA method and is supposed to further reduce post-operative complications. However, some studies have also shown that the PFNA II procedure may result in some complications in Asian patients due to morphologic mismatch between the greater trochanter and the proximal segment of PFNA II.²⁴ Moreover, this method is not well documented among Indian elderly patients. Hence, our study looks into the efficacy PFNA II procedure in Indian elderly patients suffering from pertrochanteric fractures.

Our study shows that PFNA II is very successful in restoring mobility among elderly patients with pertrochanteric fractures. After a year of surgery, the majority of our patients were able to move without any aid, while most of the others could move with the help of sticks and walkers. Only a small fraction of the patients was restricted to wheelchairs. We also evaluated the ability of the patients to resume their pre-injury activities. The majority of our patients were able to return to their earlier activities, while some had slight restrictions. However, depending on the age and general physical conditions, some patients had mild to moderate or total restrictions on the resumption of earlier activities. The patients who were unable to resume pre-injury activities consisted of all those who required wheelchairs and some who required walkers. Furthermore, our questionnaire-based VAS analysis for pain assessment revealed that the majority of our patients did not have any pain one year after surgery. Most of the patients who experienced pain after one year had only mild to moderate pain, and only two patients had severe pain. But, none of the patients had pain beyond a VAS score of 6 on a scale of 0–10. Pain due to protrusion of PFNA II nails has been reported as a complication of this procedure in Korean patients.²⁵ Therefore, the absence of pain in most of our patients indicates that nail protrusion is probably not a major complication of PFNA II in Indian patients.

Pertrochanteric fractures often result in mortality in elderly patients due to various complications. Reduction of mortality is one of the major reasons for opting for surgery in such cases. However, post-operative complications may also result in patient mortality. As the PFNA II procedure is supposed to reduce post-operative complications, the mortality rate should also be reduced in this process. In our study, only one patient died due to post-operative complications. However, over the course of the study, seventeen other patients succumbed to various age-related ailments, and two patients succumbed to COVID-19. Given the age of our patients, such complications are unavoidable. In general, the patients who died at different post-surgery time points in the course of our study had a longer average duration of hospital stay than those with good outcomes. Moreover, those who survived longer among the patients who died had relatively shorter hospital stays. Also, the patients who died due to COVID-19 after 2 and 3 years of the surgery had short

hospital stays. All our patients were above 60 years of age, with the majority between seventy and ninety years. Importantly, none of the surviving patients required any revision surgery. Overall, our findings indicate that the PFNA II method is a reliable and effective mode of treatment for elderly Indian patients with intertrochanteric fractures.

CONCLUSION:

PFNA II is effective in improving the quality of life of elderly Indian patients suffering from peritrochanteric fractures. This procedure results in pain reduction and restoration of mobility among patients, and thereby enables them to return to their pre-injury activities.

Table 1.

Characteristic	Number of patients
Age group	
(60–69)	6 (9.6%)
(70–79)	24 (38.7%)
(80–89)	28 (45.1%)
(90–99)	4 (6.4%)
Sex	
Male	22 (35.48%)
Female	40 (64.5%)
Type of fracture	
Left Intertrochanteric	30 (48.38%)
Right Intertrochanteric	24 (38.7%)
Left Subtrochanteric	4 (6.4%)
Right Subtrochanteric	4 (6.4%)

Table 2.

Mobility after 1 year	Number of patients
Unaided	18 (40.9%)
With Walker	14 (31.8%)
With Stick	7 (15.9%)
With Wheelchair	5 (11.36%)

Table 3.

Return to pre-injury activities	Number of patients
Yes	21 (47.7%)
Slight Restriction	14 (31.8%)
No	9 (20.5%)

Table 4.

VAS Score	Pain level	Number of patients
0	No pain	24 (54.54%)
1–3	Mild	14 (31.8%)
4–5	Moderate	4 (9%)
6–10	Severe	2 (4.5%)

Table 5A.

Patient Outcome	Average hospital stay during surgery (days)
Resumption of normal mobility and activity	3.2
Restricted movement and activity	5.6
Mortality	6.6

Table 5B.

Survival for dead patients	Average hospital stay during surgery (days)
1 year or more	3.7
Less than 1 year	8.54

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