

## Original Research Article

# Clinical evaluation of the proximal femur intramedullary nail antirotation system-II for treatment of unstable pertrochanteric fractures

Ram Avtar, Rajat Gupta\*

Department of Orthopaedics, ESI PGIMS, Basaidarapur, New Delhi, India

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**\*Correspondence:**

Dr. Rajat Gupta,

E-mail: [dr Rajatgupta@gmail.com](mailto:dr Rajatgupta@gmail.com)

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### ABSTRACT

**Background:** Pertrochanteric fractures are relatively common among the elderly. Common techniques for fixation of these fractures are sliding hip screw and plate or intramedullary nailing. The objective of the present study was designed to evaluate and analyze the role of proximal femoral nail antirotation II (PFNA II) in the treatment of unstable pertrochanteric fractures.

**Methods:** It was a prospective study on 50 cases of unstable pertrochanteric fractures. Harris hip score was used for functional assessment.

**Results:** In this study at 6 months follow up, Union was achieved in 48 cases, technical and mechanical complications were noted in 6% cases (3 cases). Reoperation rate was 4% (2 cases). According to Harris Hip scoring system Excellent results were noted in 26 cases, good in 14 cases, fair in 8 cases and poor result in 2 cases.

**Conclusions:** It is concluded from our study that PFNA II is an attractive and suitable implant for unstable pertrochanteric fractures.

**Keywords:** Proximal femoral nail antirotation II, Intertrochanteric fractures, Pertrochanteric fractures, Proximal femur fracture

### INTRODUCTION

Petrochanteric femoral fractures are common fractures amongst geriatric age group.<sup>1</sup> Treatment of intertrochanteric fractures in elderly patients is a huge challenge for many trauma surgeons, mainly because many such patients have severe osteoporosis and medical disorders.<sup>2</sup> From a biomechanical point of view the use of an intramedullary nail combined with a sliding neck screw appears to be the more appropriate technique.<sup>3</sup>

In 2003, the proximal femoral nail antirotation (PFNA) system was introduced by the Association for Osteosynthesis/Association for the study of Internal

Fixation (AO/ASIF).<sup>4</sup> This study was undertaken to evaluate the functional outcome of PFNA II system in treatment of unstable pertrochanteric fractures.

### METHODS

This was a prospective study on cases of unstable pertrochanteric fractures treated between July 2016 to July 2018, who were admitted in Department of Orthopaedics, ESIC Hospital, Basaidarapur, New Delhi.

Unstable pertrochanteric fractures according to AO/ASIF classification were included in the study (AO, 31.A2 and 31.A3).<sup>5</sup> 50 cases were followed at regular intervals and

final assessment was done at 6 months. The Harris hip score (HHS) of hip function was used for clinical evaluation.<sup>6</sup>

### Operative technique and follow-up

Patients were positioned supine on the fracture table under spinal or general anesthesia according to the condition of the patient. Fracture was reduced by longitudinal traction and the limb was placed in slight adduction to facilitate nail insertion through the greater trochanter. Nailing was performed in all of them according to standard protocol for the PFNA. All patients received prophylactic antibiotic therapy as per the standard protocol. Weight bearing as tolerated was allowed immediately post-operatively using walking aids. Patients were followed at regular intervals and final assessment was done at 6 months.

Statistical analysis was done with the help of computer using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, version 22.0 for Windows).

## RESULTS

A total of 50 patients were enrolled for the study. There were 21 males and 29 females, with an average age of 64 years (range: 42 to 93 years). 35 patients (70%) had AO 31.A2 fractures and fifteen patients (30%) had AO 31.A3 fractures. The average time from injury to surgery was 8 days (range: 1 to 13 days). Average duration of surgery was 68 min (range 45 to 136 min). Mean intraoperative blood loss was 126 ml. In our study, most commonly we used 10 mm diameter nail and 11 mm diameter nail was used in 12 cases.

In our study we encountered certain complications intra-operatively. There was an iatrogenic fracture of the lateral cortex of proximal fragment (shattering) in one case. In two cases, there was guide wire breakage while drilling over guide wire. In our series no other complications like deep vein thrombosis, systemic infection, acute respiratory distress syndrome and fat embolism was seen.

Screw cut out was observed in one case and femoral head perforation was seen in one case. Revision surgery was done in two cases (reinsertion of screw in one case and hemiarthroplasty in other). The average duration of hospital stay following surgery was days ranging from 5-20 days.

All patients were followed up in the out patients department up to 6 months. At each follow up radiographs of upper femur and hip were taken to assess the fracture union, implant failure and screw cut out.

Results were assessed by HHS system and excellent results were noted in 26 cases, good in 14 cases, fair in 8 cases and poor result in 2 cases.

**Table 1: Demographic data.**

Sex	Number	%
Male	21	42
Female	29	58

**Table 2: Intraoperative details.**

Intraoperative details	
Mean duration of surgery	68 min
Mean blood loss	126 ml

**Table 3: Intraoperative complications of PFN.**

Intraoperative complications	Number	%
Fracture of lateral cortex (shattering)	1	2
Failure to lock distally	0	0
Jamming of nail	0	0
Guide wire breakage	2	4

PFN: proximal femoral nail.

**Table 4: Delayed complications.**

Delayed complications	Number	%
Screw cut out	1	2
Femoral head perforation	1	2

**Table 5: Functional results (HHS).**

Functional result	Number	%
Excellent	26	52
Good	14	28
Fair	8	16
Poor	2	4

## DISCUSSION

Unstable fractures of the proximal femur represent a significant challenge to the trauma surgeon. Surgical fixation is often technically difficult and poor surgical technique may lead to failure of primary fixation.<sup>7,8</sup> The best treatment for these fractures remains controversial. DHS fixation is widely preferred but failure of fixation still occurs in up to 20% of cases.<sup>9</sup> Common causes of fixation failure include fracture instability, osteoporosis, lack of anatomic reduction, implant failure, and incorrect placement of the lag screw in the femoral head (leading to cutting out of the screw).<sup>10</sup> Cephalomedullary femoral reconstruction nails with a trochanteric entry point are biomechanically stronger than extramedullary implants.<sup>11</sup> In unstable proximal femoral fractures, control of axial telescoping and rotational stability are essential. The PFNA device is a reliable internal fixator, it can share a large axial load, its helical blade achieves an excellent fit through bone compaction with less bone removal. The inserted blade prevents rotation by locking with the nail and accordingly, it may be a more suitable implant for

unstable trochanteric fractures especially in the presence of osteoporosis. Biomechanical studies have shown that the blade has a higher resistance to head collapse than commonly used screw design.<sup>12,13</sup>

According to Klinger et al in 2005 the mean age was 74 years ranging from (27 to 98 years) in patients who were treated either with DHS or proximal femoral nail.<sup>14</sup> Alyassari et al studied seventy patients and the average age was 84 years showing trochanteric fracture are more common in higher age group.<sup>15</sup> In our study The mean age of unstable intertrochanteric fractures was 64 years with range from 42 years to 93 years which is slightly towards the older age group, mainly due to Osteoporosis.

In a study by Aguado-Maestro et al, there were 200 patients of pertrochanteric fractures treated with PFNA, they reported the incidence of cut out was 1%.<sup>16</sup> Takigami et al reported cut out rate of 2%, Zhang et al reported 7.9%.<sup>17,18</sup> In our study incidence of blade cut-out was 2%. The rates of femoral head perforation were found to be 1.4% in a study by Karapinar et al and 1.2% in a study by Simmermacher et al.<sup>19,20</sup> In our study it was 2%.

Zhang et al reported varus collapse in 5.8% of cases in their series.<sup>18</sup> In this study varus collapse occurred in 8% cases.

In our study mean HHS at final follow-up was 78.2. Zhang et al reported 139 mean HHS of 72.4±7.20 in their study.<sup>18</sup> Maheras et al reported mean HHS of 82.<sup>21</sup>

In our study excellent results were noted in 26 cases, good in 14 cases, fair in 8 cases and poor result in 2 cases.

## CONCLUSION

It is concluded from our study that PFNA II is an attractive and suitable implant for use in unstable pertrochanteric fractures. This study has also shown that this device can be safely used by the average surgeon to treat common but sometimes difficult fractures.

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