

PFNA-II nailing unique complication: central migration and its consequences: A case report

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Abstract

The PFNAII nailing system due to its helical blade has superior rotational stability as well as enhanced sub chondral bone purchase in the treatment of intertrochanteric fractures. However, complications such as screw cut out, loss of reduction, failure of lateralization, medial migration continue to worry treating surgeons. We report an interesting case of post operative medial migration of helical blade perforating the femoral head leading to varus malunion and its management.

Key Words: PFNAII, Medial Migration, Varus Malunion, Intertrochanteric Fracture.

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Introduction

The incidence of adult hip fractures has been showing a rising trend in the recent years owing to increased life expectancy and improved health care facilities[1]. The options available for fixation of unstable per trochanteric fractures are both extramedullary as well as intramedullary implants which have their own benefits and disadvantages. A lot depends on the treating surgeon's expertise and training in choosing the nature of implant to be used for fracture fixation.

The Proximal Femoral Nail Anti rotation (PFNA-II) consists of a helical blade, femoral nail, a locking bolt and an end cap. The helical blade avoids the bone loss that occurs during the drilling and insertion of the standard sliding hip screw. This device allows for improved purchase in the femoral head by radial compaction of the cancellous bone around the blade during insertion[2].

It was specifically designed for Asian patients and has been successfully used in treating unstable fractures of the proximal femur. However, intra and postoperative complications, such as difficulty in insertion, hip and thigh pain, femoral shaft fractures, lateral blade migration and lateral cortex splitting, have been reported since its introduction among Asian patients [3,4]. Post-operative central migration of the helical blade leading to femoral head perforation has been addressed as a unique complication in with PFNA-II [5].

This case report presents a case of perforation of the femoral head with central migration of the helical blade.

Case Study

A male in his mid-thirties, had a trauma to his right hip after fall from bike in a road traffic accident in 2019. Plain radiography of the affected hip showed a stable right AO 31-A1 intertrochanteric fracture. (Fig 1).



Fig 1 – Pre operative radiograph showing right AO 31-A1 intertrochanteric fracture.

After proper pre anesthetic checkup and obtaining informed consent, surgery was planned. Fracture fixation was done with a Proximal

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femoral Nail Anti rotation Asia of size 9mm × 170 mm, 130° and helical blade of 95mm.

The reaming for the helical blade was done over the guide wire inserted up to 60mm. As per protocol the blade was first inserted manually followed by hammering. The calculated tip apex distance (TAD) was 25mm, the cervicodiaphyseal angle was 132 degrees, with the helical blade positioned central in the femoral head in both antero-posterior (AP) and lateral views.

Postoperative period was uneventful; with significant fracture reduction (Fig 2).



Fig 2- Immediate post operative radiograph showing PFNA II nail with anatomical reduction.

The patient was discharged from hospital on 5th post operative day and suture removal was done at 2 weeks. Active quadriceps strengthening, with knee and ankle ROM exercises were advised from 2nd post-operative week. The patient was ambulated by crutch walking from 4th post operative week.

At around 8 weeks following the surgical intervention, the patient presented to us at the follow up clinic with mild hip pain and antalgic gait. On detailed history, he gave an episode of mild fall at home, which was considered to be trivial trauma. Radiograph was done which showed a minimal medial migration of the helical blade (Fig 3).



Fig 3- At 8 weeks follow up showing medial migration of helical blade but not perforating femoral head.

He was advised to continue partial weight bearing and to follow up after 4 weeks.

On his subsequent follow up visit at 12th post operative week, the hip pain was significantly more and radiographically, a perforation of the femoral head by the helical blade abutting the acetabular dome was observed (Fig 4).



Fig 4- At 12th post operative week showing medial migration and femoral head perforation.

The patient was counselled about all possible complications and the need of implant removal surgery. Again, after proper informed consent, the PFNA-II was extracted using the previous approach at around 14 weeks after the index surgery. There was varus malunion of the fracture with up riding of the Greater trochanter (Fig 5A, 5B).



Fig 5A- Post operative radiograph showing implant removed and varus malunion of Intertrochanteric fracture. Fig 5B- 6 Months follow up post implant removal. Fig 5C- 12 Months follow up post implant removal.

Further follow ups showed no significant hip movement restriction except a short limb gait. The patient was able to perform active SLR, bear weight and do normal activities of daily living (Fig 6A,6B,6C).

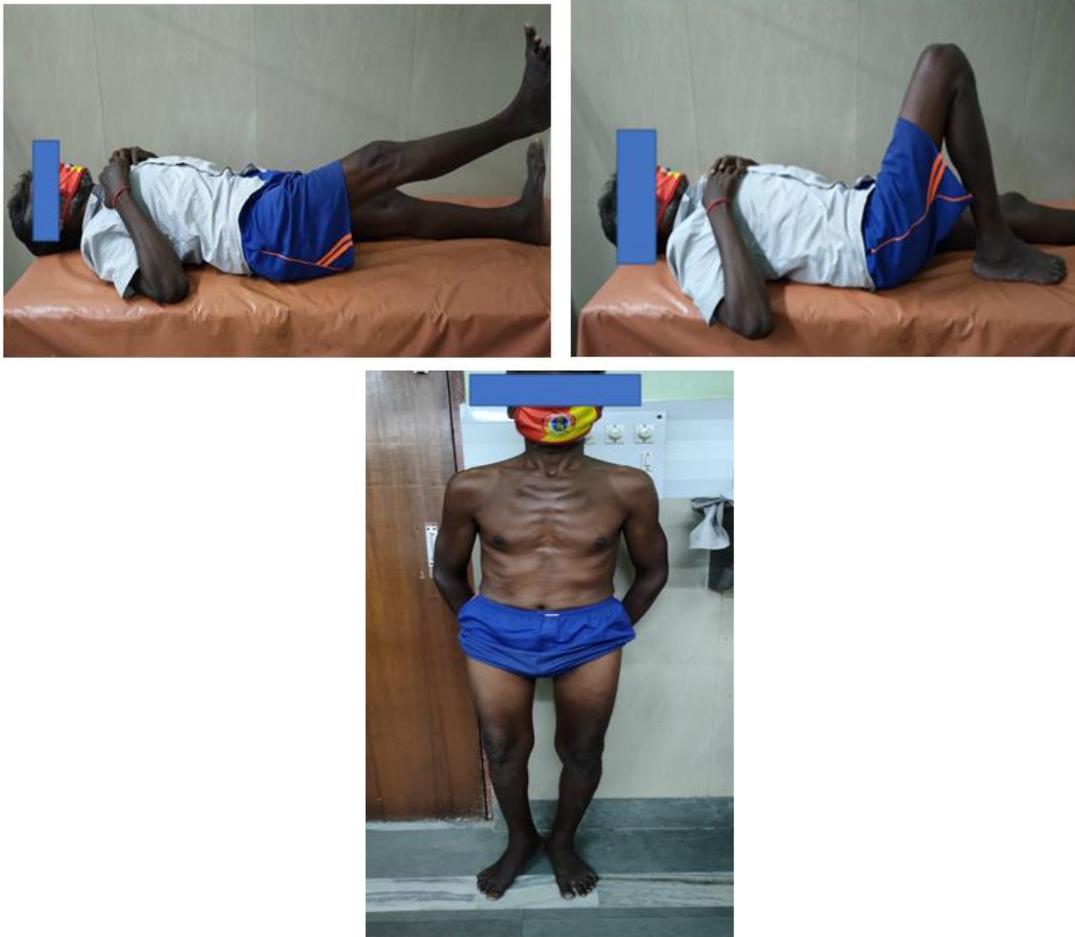


Fig 6A, 6B, 6C- Clinical photos of patient showing straight leg raising, hip flexion and weight bearing.

Discussion

The PFNA-II has been lately attributed for providing more rotational stability than the previous generation proximal femur nails. The benefit of helical screw is that it impacts the cancellous subchondral bone beneath the femoral articular surface leading to better compaction and purchase[6]. Several biomechanical studies have demonstrated the advantages of spiral blades when compared with conventional screws[7].

In this case, the post operative radiograph showed a satisfactory anatomical reduction with central positioning of the helical blade confirmed peri operatively by fluoroscopy. The TAD was 25mm which was in the higher range of acceptable criteria of 20-25mm[8]. The cervico-diaphyseal angle was 132 degrees.

Failure of lateralisation of the helical blade, decreased bone density due to osteoporosis and recent trauma are some of the factors that lead to this unusual presentation of central migration. Brunner et al.[9] and Simmermacher et al.[6] respectively, attributed the perforation of the femoral head to recent trauma. Frei et al.[10] reported 7 cases of implant failure with a "Cut Through," defined as a postoperative central perforation of the spiral blade into the hip joint, without any displacement of the neck-head fragment. Review of literature suggests that a study conducted by Nikoloski et al.[11] concluded that the TAD rule of <25 mm should not apply for the PFNA. They suggested avoiding a TAD <20 mm due to possible axial cut-out (medial migration) and avoiding a TAD >30 mm to avoid cephalad cut-out. Senile osteoporosis has a role to play in implant failure. Studies have shown that bone mineral density of less than 0.6 g/cm³ has led to failure of helical blade to slide laterally as the fracture collapses and

the entire construct fails leading to central perforation of femoral head[12].

Secondary surgical interventions have options to retain the nail, remove it or do a total hip arthroplasty. As in this case scenario, the patient belongs to a younger age group, has no signs of severe osteoporosis, nail removal was considered to be the best possible treatment modality that could be offered.

Conclusion

We believe that in this case, the secondary trauma might have led to this complication. The central perforation of the femoral head by the helical blade is a unique complication. To clarify the exact mechanism of central migration more extensive biomechanical research is required.

Clinical Message

PFNAII being an advanced nailing system for per trochanteric fractures has its own demerits and complications. Rare complications such as medial migration of helical blade due to secondary trauma or osteoporosis lead to hip pain and varus malunion of fracture that warrants removal of the implant.

Ethical approval

Ethical clearance was obtained from the institutional ethical committee of SSKM and IPGMER prior to the commencement of the study.

Patient consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author's contribution

PD documented the patient's data during the course of his treatment. KM, STAR, KD, DB were major contributor in writing the manuscript. All authors read and approved the final manuscript.

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