

Case Report

An unusual case of femoral head perforation following fixation with proximal femoral nail antirotation (PFNA-II) for an unstable intertrochanteric fracture: Case report and literature review

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ABSTRACT

The proximal femoral nail antirotation (PFNA-II) is designed for fixation of unstable proximal femoral fractures in Asian patients due to its superior biomechanical properties. The helical blade achieves purchase through bone compaction and requires less removal of bone than a screw. Medial migration of the helical blade with perforation into the hip joint without loss of reduction is a rare problem noted with PFNA. Past literature reporting the migration of the helical blade medially, perforating the femoral head has been addressed as a characteristic complication of the PFNA. A review of literature suggests various reasons for the same such as fresh trauma, fracture settlement and failure of lateralization of the blade. We report a case of postoperative medial migration of the helical blade perforating the femoral head due to loosening of the locking bolt of the helical blade without any signs of rotational or varus displacement of the fracture.

Introduction

With an increase in life expectancy and better health care facilities, there has been a rise in the incidence of hip fractures [1]. Intertrochanteric fractures that are commonly encountered in geriatric population are usually treated with surgical fixation; while dynamic hip screws (DHS) have proven to be a reliable method of fixation for stable fracture patterns (AO-31-A1), unstable fracture patterns (AO-31-A2, A3) often require intramedullary devices such as “proximal femoral nail (PFN)” and “gamma nail”. The latter have now become the standard implants for fixation of such fractures due to their superior biological and mechanical advantages [2]. The proximal femoral nail antirotation (PFNA-II) is an intramedullary implant that consists of a femoral nail, helical blade, a locking bolt and an end cap. It was specifically designed for Asian patients and has been successfully used in treating unstable fractures of proximal femur [3]. However, it is associated with a number of complications, most common being femur fracture at the distal tip and cut out of the helical blade [2,3]. Post-operative femoral head perforation with helical blade has been addressed as a unique complication in with PFNA [4,5]. The present case reports an unusual case of loosening of the locking bolt of the helical blade following treatment of an unstable intertrochanteric fracture with PFNA-II causing perforation of the femoral head.

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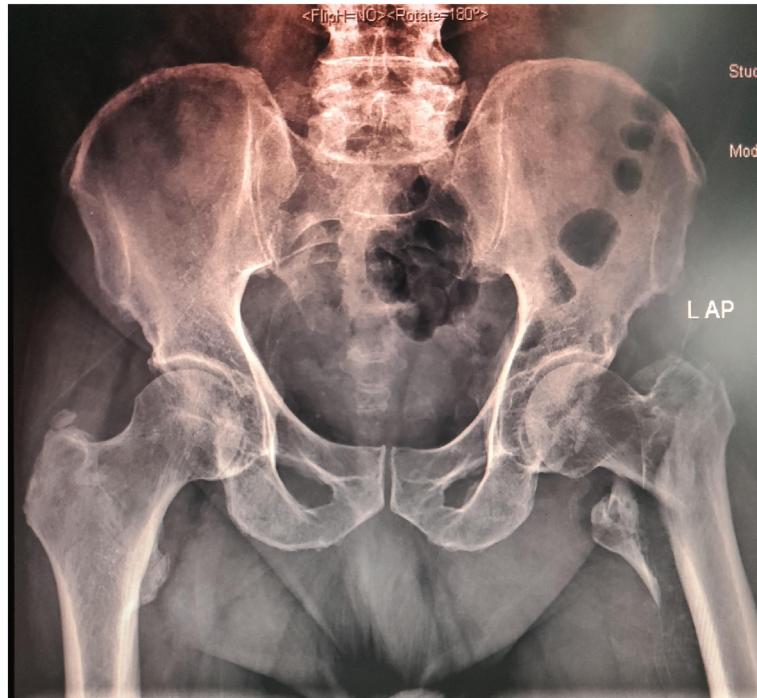


Fig. 1. X-ray showing an intertrochanteric fracture of the left hip (OTA-31-A2.2).

Case report

A 65 year old male patient presented to the emergency department at our hospital with severe left hip pain following a fall in the bathroom. Plain radiography showed an unstable left intertrochanteric fracture of the left hip (OTA-31-A2.2) (Fig. 1) and a closed reduction and internal fixation with PFNA-II was planned. After obtaining a written informed consent, the patient was undertaken for surgery under spinal anesthesia. A nail sized 11×230 cm was placed as guided by intra-operative measurement with the scale. The guide wire was centred in the femoral head in both the AP and the lateral views. A 95 mm helical blade was chosen after measuring the size on the guide wire and the reaming was done till 40 mm. Thereafter the blade was first inserted manually followed by gentle blows applied via hammer. The tip apex distance (TAD) was measured to be 20mm, the neck shaft angle was 128 degrees and the helical blade was positioned central in the femoral head in both antero-posterior(AP) and lateral views (Fig. 2). The surgical procedure and postoperative recovery were uneventful and the patient was mobilized under full weight bearing on the second post-

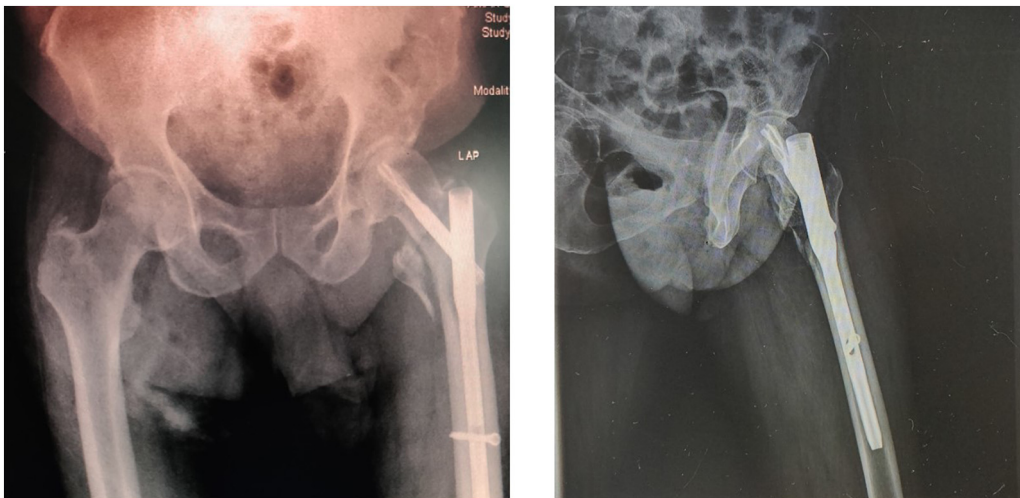


Fig. 2. Post-operative AP and lateral x-ray of the left hip showing the fracture treated with PFNA II. The TAD was 20mm and the helical blade was in the centre position, The neck shaft angle was 128 degrees.

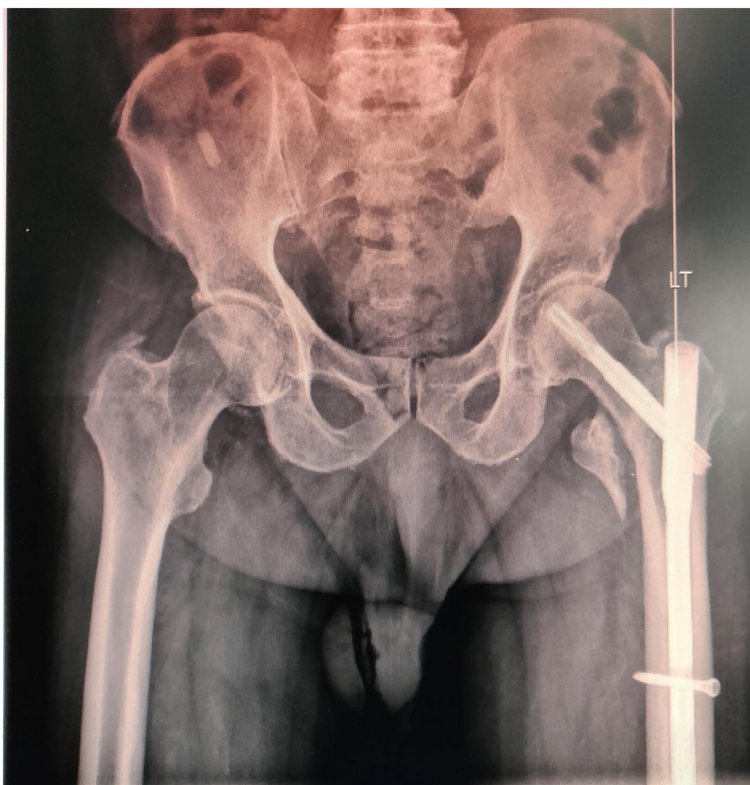


Fig. 3. Antero-posterior X-ray showing medial migration of the helical blade at 6 weeks.

operative day. However, 6 weeks following the surgery we noticed a slight medial migration of the helical blade on routine post-operative imaging, but considering that the patient was asymptomatic and attributing the migration to fracture settlement, we decided to follow a “wait and watch” approach. (Fig. 3).

Three months following surgery, the patient presented to the hospital with pain in the left hip while walking with limitation of daily activities such as sitting and squatting. A repeat radiograph showed perforation of the helical blade through the femoral head without any loss of reduction (Fig. 4). More interestingly there was loosening at the blade and sleeve junction. The patient did not have any fever or swelling at the left hip. A complete blood count revealed a TLC of 4000/mm³, ESR 18 mm/h, and CRP of 0.8 mg/L.

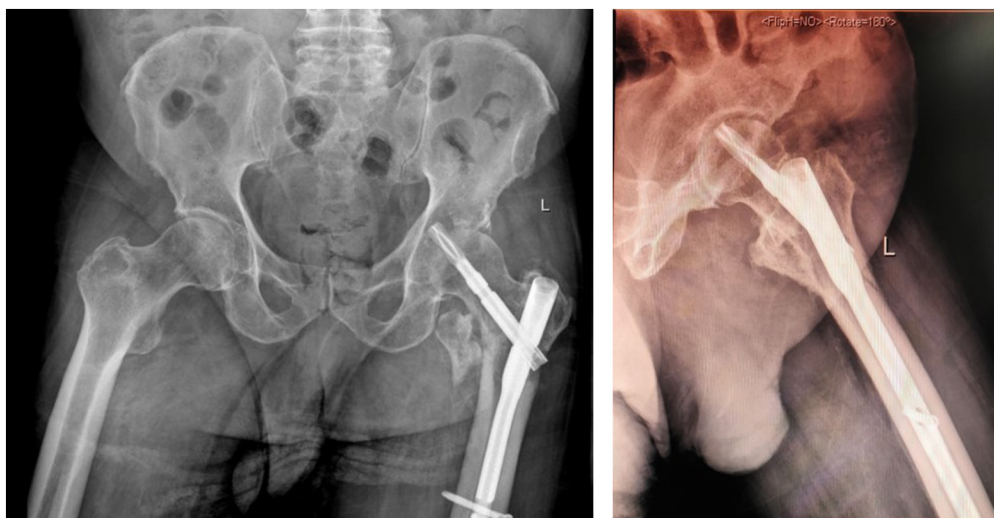


Fig. 4. Antero-posterior and lateral X-ray showing perforation of the helical blade through the femoral head at 3 months with loosening of the locking mechanism.



Fig. 5. Antero-posterior X-ray of the left hip showing the union of the fracture following removal of PFNA-II.

DEXA scan was done which showed a T score of -1.2 and a bone mineral density of 0.886 g/cm^3 . A repeat surgery to remove the nail was planned and undertaken and intra-operatively the fracture was found to be united (Fig. 5). Postoperatively the patient was mobilized under full weight bearing and he was able to walk, squat and sit pain free.

Discussion

Peritrochanteric fractures of the femur pose as one of the most serious health hazards to the older population and the best line of treatment for this fracture still remains controversial. Earlier intramedullary implants such as the gamma nail did not show promising results as it failed to provide rotational stability [6]. Later, the PFN was introduced that had an additional antirotational screw and fluting at the distal tip to prevent stress fractures of the femoral diaphysis [7]. However, this implant was also associated with perforation of the femoral head with the antirotation screw (z effect) representative of lateral migration of the lag screw along with a varus collapse of the head [8]. Later the PFNA and PFNA-II was introduced producing better results as it had a helical blade, worked by bone compaction, demonstrated a greater resistance to varus collapse and provided additional rotational stability [2].

The present case showed a satisfactory postoperative reduction and the blade position following surgery with PFNA-II. This is substantiated by a tip-apex distance (TAD) of 20 mm in our case, which is within the recommended range of 20 to 25 mm for optimal blade positioning [9]. Also, a neck shaft angle (CCD) lesser than 125 degrees has been noted to be associated with a varus collapse of the femoral head [8] and the same was 128° in our case. Furthermore, the bone density in our patient was 0.886 g/cm^3 that is also well above the cut-off of 0.6 g/cm^3 for predicting implant cut out [10].

In the present case we found out that the helical blade had migrated medially perforating the femoral head and although there was no loss of reduction of the fracture, there was loosening of the locking mechanism of the blade. Medial migration of the helical blade with perforation into the hip joint without loss of reduction is a rare problem noted with PFNA. A review of literature reveals six such papers; two of them by Brunner et al. [11] and Simmermacher et al. [2] respectively, who attributed the perforation of the femoral head to recent trauma. Wanjun Li et al. [12] conducted a retrospective analysis of 233 patients and observed that 3.6% of the

patients had medial migration of the blade without loss of reduction. Similar mechanism of failure of implant was termed as “cut through” by Frei et al. [13] in seven patients and the cause was attributed to the failure of the lateralization of the blade. Takigami et al. [4] and Gomes et al. [5] also reported medial migration of the blade causing acetabular perforation but did not comment about any specific cause for the same. Imperfect blade locking has been described with back out of the helical blade [14] but none with medial migration of the blade. To the best of our knowledge, this is the first case reporting loosening of locking mechanism with a medial migration of the blade as a cause for femoral head perforation. In our opinion the loosening of the blade occurred due to cyclical loading destroying the threads of the locking bolt in the postoperative period, although failure to slide the blade laterally could also have been an additional contributing factor. Further studies are required to investigate the risk factors and understand the patho-mechanism for femoral head perforation.

Conclusion

Femoral head perforation post fixation with PFNA-II without loss of fracture reduction is as such an uncommon complication. Loosening of the blade is an unreported cause for the same and should be considered in such cases.

Disclosure of potential conflict of interests

The authors have nothing to disclose.

Informed consent

Informed consent was obtained from the patient.

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