Case report

Complete traumatic backout of the blade of proximal femoral nail antirotation: A case report


Department of Orthopaedic Surgery, Kobe University Graduate School of Medicine, 7-5-1, Kusunoki-cho, Chuo-ku, 650-0017 Kobe, Japan

1. Introduction

As life expectancy continues to increase, the incidence of hip fracture rises drastically [1]. Intertrochanteric fractures are common in elderly patients with osteoporosis [2]. Their treatment with intramedullary fixation devices is a well-established method because of the biological and biomechanical advantages of these procedures [3]. The proximal femoral nail antirotation (PFNA; Synthes, Oberdorf, Switzerland) is an intramedullary device with a helical blade that was developed by AO/ASIF (Davos, Switzerland) in 2004 [4,5]. In 2007, the AO/ASIF developed the PFNA-II (also known as PFNA-Asia) with sizes and geometry adapted to the femoral geometric proportions of Asians [6]. The helical blade has been claimed to compact the cancellous bone to provide increased stability, and has been biomechanically proven to retard rotation and varus collapse [7]. Since its introduction, several studies have shown good clinical results [4–6]. This article describes a rare case involving traumatic complete backout of the helical blade of the PFNA-II in a healed intertrochanteric fracture.

2. Case report

A 94-year-old woman sustained an intertrochanteric fracture (AO/OTA classification: 31-A1) of her left femur after a fall (Fig. 1). Internal fixation was performed without difficulty using the PFNA-II (Synthes) (nail diameter: 10, length: 170 mm) (Fig. 2A). The helical blade was 85 mm long. Postoperative radiographs showed satisfactory alignment with a tip-apex distance (TAD) [8] of 20.0 mm. The blade was placed at the center and slightly posterior of the femoral head on the anteroposterior and lateral views, respectively. Postoperatively, the patient was mobilized under full weight-bearing. Three months after surgery, although lateral sliding (13 mm) of the helical blade due to impaction of the fracture was noted (Fig. 2B), she was able to walk with a walker without pain. The bone mineral density (BMD) of her right femoral neck was 0.36 g/cm², 42% of the mean in young adults.

At 6 months, a protrusion at the proximal lateral left thigh was noted after a fall (Fig. 3). Radiographs (Fig. 4A) and CT scan (Fig. 4B) revealed a complete backout of the helical blade with a healed intertrochanteric fracture. Magnetic resonance imaging (MRI) showed several low-intensity bands in the left femoral head on multiple slices (Fig. 5), indicating the presence of a fracture in the femoral head. Therefore, we decided to perform a revision surgery. The patient underwent removal of the PFNA-II and a cemented bipolar hemiarthroplasty. Bone union of the intertrochanteric fracture was confirmed during operation. At 5 month follow-up, the patient was able to walk with a walker without pain. There was no loosening of the prosthesis.
3. Discussion

The use of PFNA/PFNA-II allows a minimally invasive approach that provides stable fixation and allows for early full weight-bearing mobilization. Most of the complications documented in the literature involved cutout and perforation of the femoral head by the blade [4–6,9]. Lateral sliding (migration) of the helical blade caused by secondary dynamization (impaction of the fracture) is also another common complication [9–12]. Such sliding sometimes causes irritation of the iliotibial band due to friction [9]. In most

Fig. 1. Initial post-traumatic anteroposterior and lateral radiograph of the left hip.

Fig. 2. Anteroposterior and lateral radiograph of the left hip taken (A) immediate postoperatively and (B) 3 months postoperatively.

Fig. 3. Photograph showing a protrusion in the proximal lateral left thigh.

Fig. 4. (A) Anteroposterior and lateral radiograph and (B) a CT image taken 6 months after surgery showing complete blade backout from the femoral head with a healed intertrochanteric fracture.
The complete backout of the helical blade is rare. A literature review showed only six descriptions of excessive blade backout in six earlier reports [13–18]. In two cases, the cause of the complete backout was imperfect blade locking [13,14]. In two other cases, the causes included inadequate fracture reduction before PFNA insertion [15,16]. In these earlier cases, insufficient stability of the fracture site led to an excessive backout, resulting in non-union or loss of reduction. In contrast, in the present case, neither nonunion nor loss of reduction were seen. To the best of our knowledge, this is the first report of a traumatic complete backout of the helical blade of a PFNA/PFNA-II in a healed intertrochanteric fracture.

The present case showed proper postoperative reduction and blade position [5]. The TAD of 20.0 mm appeared to be within the appropriate distance [19,20]. Nikoloski et al. [19] concluded that the TAD for PFNA/PFNA-II should be 20–30 mm. Zhou and Chang [20] recommended a TAD of 20–25 mm, based on their experiences and an analysis of the literature. Three months after the initial surgery, the intertrochanteric fracture had healed, and the patient was able to walk using a walker without pain. Therefore, it is unlikely that the cause of the complete backout was a surgical error.

Biomechanically, the PFNA/PFNA-II is constructed so that the helical blade slides in a lateral direction. Radiographs 3 months after surgery revealed 13-mm lateral sliding of the helical blade (telescope effect) (Fig. 2). We consider this to be caused by impact of the fracture, because the anchorage of the helical blade in the femoral head was similar before and after sliding. Although this excessive sliding resulted in femoral neck shortening, the intertrochanteric fracture eventually healed. This excessive sliding might be caused by bone fragility due to osteoporosis or comminution of the fracture. The patient had severe osteoporosis as was evident with the BMD of the right femoral neck being 0.36 g/cm², 42% of the mean value in young adults. One possible reason for the complete blade backout after a fall in the present case is direct blow to the blade end that had been laterally protruded by the excessive sliding. In other types of intramedullary nail devices containing a lag screw such as the Gamma3 nail (Stryker, Mahwah, NJ, USA) [12], a set screw is designed to fit into one of the grooves of the shaft of the lag screw. This allows the lag screw to slide laterally while preventing complete backout of the lag screw even in the presence of loosening, because the grooves end at the center of the lag screw shaft. Since PFNA/PFNA-II has no such preventive structures, once the blade slides in a lateral direction after loosening because of a direct blow, complete blade backout could occur. We speculate that this phenomenon can occur after a direct blow to the hip in cases in which excessive sliding (>10 mm) of the helical blade exists. This case report identifies a new type of postoperative complication associated with intertrochanteric fractures treated with PFNA/PFNA-II.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References