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Technical Note in Case Series a Novel Recent Technique for the Removal of Broken PFNA-II Blade in Intertrochanteric Fractures is a Technical Challenge

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Learning Point of the Article:

Easy innovative method for removal of PFNA II when conventional methods fail.

With the modification of a new implant for fracture fixation, removal also needs innovation techniques.

Abstract

Introduction: Proximal femoral nail antirotation – II (PFNA- II) is a common treatment for intertrochanteric fractures in the elderly. Removing PFNA is difficult in rare circumstances due to blade head stripping or breaking. In this article, we endeavored to explain an easy methodology that can be utilized to remove stripped, damaged anti-rotation blades for which few had been formulated but other procedures have failed.

Materials and Methods: In four cases, one case is discussed 15 months following the prior fixation; the individual underwent PFNA removal surgery for a broken implant causing pain. We had trouble removing the anti-rotation blade with the standard equipment.

Result: The procedure assisted us in removing the anti-rotation blade and provided a favorable outcome for the patient.

Conclusion: The insertion of a DHS guide wire with a coupling screw for inserting DHS screw in conjunction with a proximal femoral anti-rotation blade may be a cost-effective and simple approach to dealing with extraction failure.

Keywords: PFNA- II, implant removal, helical blade, coupling screw

Introduction

Intertrochanteric femur fractures account for 8–10% of all fractures in recent days. Common geriatric osteoporotic fractures have imposed a huge economic and social burden. Simple falls, and osteoporosis, are the most common causes of intertrochanteric femur fractures in this population [1]. Various studies demonstrate that PFNA-II is a better choice compared to plate-screw fixation because of the biomechanical properties such as load sharing with a short lever arm with anatomical design, sufficient reduction, less short tissue damage, shorter hospital stay, and rigid internal fixation for the treatment of intertrochanteric fractures and unstable peri-trochanteric fractures [2-4].

Complications related to PFNA II (Manufacture Sarma Ltd) are varus collapse, cut out of the helical blade, and lateral migration of screws have been reported in high incidence. In various studies, cut-out of screws reaches to 10% [5].

Implant failure is one of the most disastrous consequences of orthopedic trauma surgery. Delayed union and non-union of pertrochanteric fractures are uncommon, occurring in 1–5% of cases; yet, they are the most common causes of metal fatigue and nail breaking.

There are various types of implant breakage and failure of PFNA-II 1. Nail broken at the entry of PFNA- II blade 2. The nail was broken at the entry of the locking bolt. 3. PFNA- II blade has broken at the entry of the nail site. 4. PFNA- II blade is broken at

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Author's Photo Gallery


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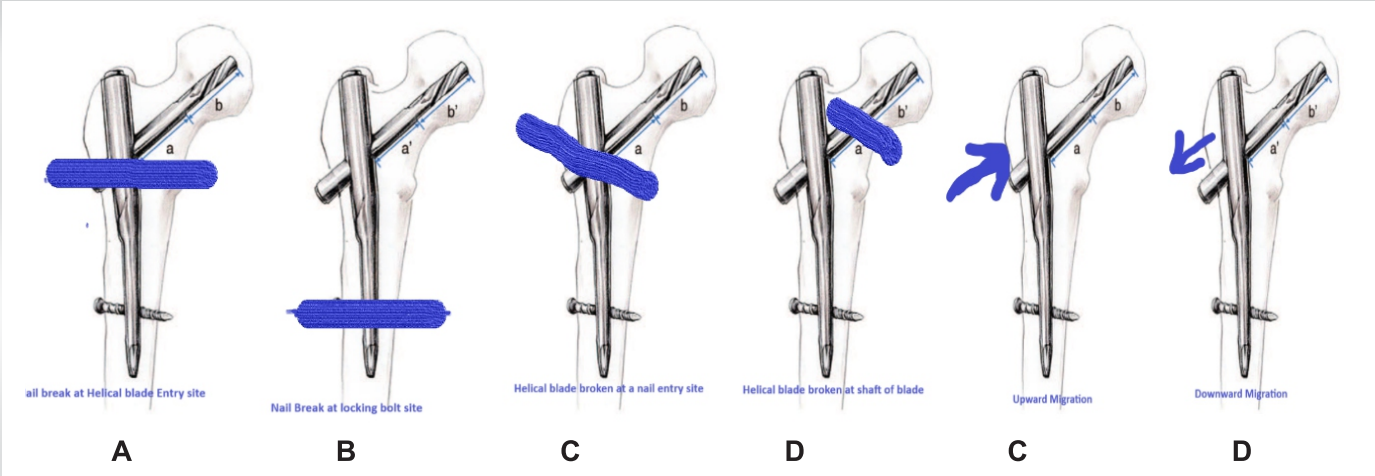

Figure 1: Various types of implant breakage and failure PFNA-II (a) Nail breakage at entry of Helical blade (b). (a) Nail breakage at entry of at entry of distal screw. (c) Helical Blade breakage at the site of entry in nail (d) Nail breakage in mid-length. (e) Implant Failure upward migration of Helical Blade. (f) Implant Failure Downward migration of Helical blade.

mid of the shaft. 5. PFNA- II blade upward Migration. 6. PFNA-II blade downward Migration 7. Others Cut out of PFNA- II blade (Fig. 1).

The PFNA-II blade hole is the most typical site of nail breakage. Because of the lower cross-sectional diameter, it appears that the PFNA- II blade hole is the weakest point of the nail and is more vulnerable to breaking due to improper drilling. Other possible reasons for nail breakage in this area include a longer lever arm due to a shorter lateral end of the PFNA- II blade and early full weight bearing. The second common site for nail breakage is a distal locking screw hole, and it rarely occurs along the nail shaft.

Despite the fact that multiple ways for extracting a broken distal section of the nail have been documented, the procedure can be difficult and regularly used methods may fail to detach the broken component.

Breakage of intramedullary nails, particularly in cases of nonunion, necessitates extraction, which is a tough technique for the surgeon whereas removing the broken helical blade is more difficult. None of the easy and successful approaches for PFNA - II extraction have previously been published. We propose a novel procedure that uses routinely available equipment to remove stripped or broken helical blades when conventional methods have failed.

Materials and Methods

There are four case series but one is discussed. A 66-year-old lady sustained an injury over a hip intertrochanteric femoral fracture on the right side after a fall. The intertrochanteric femoral fracture was fixed with proximal femoral nail anti-rotation (PFNA- II) after closed reduction. There were no post-operative complications, and the patient regained full range of motion with clinical healing. After 15 months again fell and sustained injury over the right hip. On X-ray, distal part of the

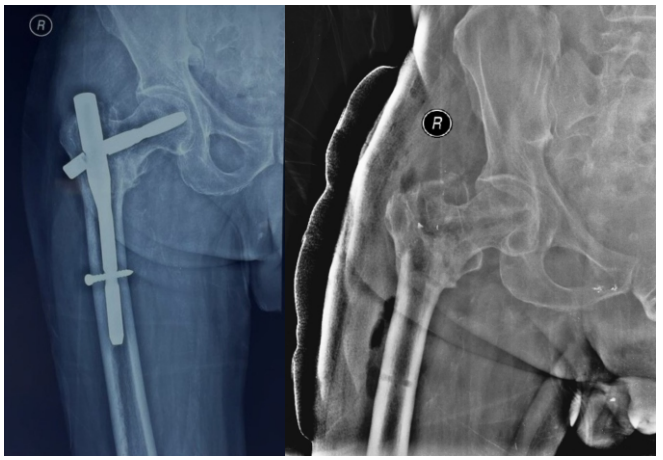

Figure 2: (a) X-ray broken implant. (b) X-ray Removal implant Immediately after surgery.

Figure 3: DHS Richard screw guide wire removing the broken PFNA- II blade.

Figure 4: DHS Richard screw guide wire removed the broken PFNA- II blade.

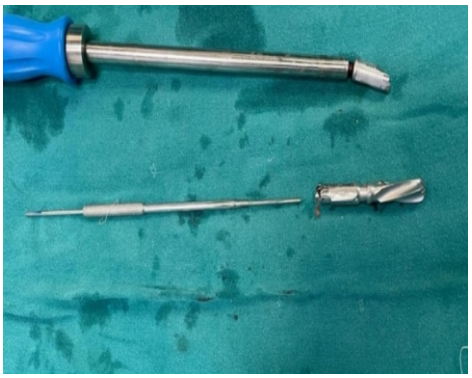

Figure 5: Screwdriver removed the broken piece of the PFNA- II blade.

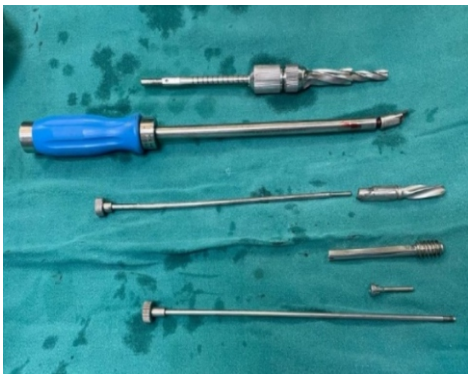

Figure 6: All instruments required to remove broken PFNA- II Blade (Manufacture Sarma Ltd).

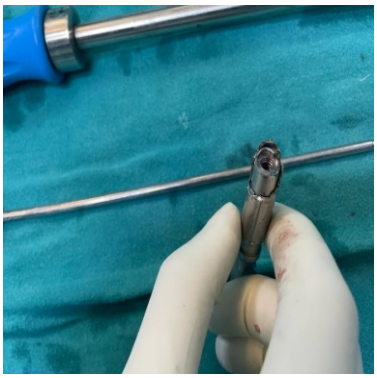

Figure 7: Pitch in Blade to tighten DHS Richard screw guide wire (Manufacture Sarma Ltd).

PFNA – II (Manufacture Sarma Ltd) blade was broken at the insertion site patient presented with severe pain over the hip.

The surgery was done under spinal anesthesia, utilizing the original lateral approach. The end cap and distal locking bolt were successfully removed in the initial step of surgery. To remove the helical blade hexagonal socket was locked up with the extraction screw. The broken distal part of the PFNA- II blade was taken out. However, now technical demand was removing the proximal long part of the PFNA- II blade which was buried in bone. The technical problem was how to hold the broken proximal PFNA- II blade buried inside the bone and nail shaft. We used the coupling screw for inserting DHS Screw/Long Coupling Screw for DHS Screw Removal is fixed to the broken proximal part of the PFNA- II blade on the guide wire. Then, it is pulled out under c arm guidance. DHS dynamic hip set is an easily available and cheap instrument to remove (Fig. 2a and b, 3-7) Mandrel devices, osteotomes, hook rods, Steinman pins, broken screw carbon drill bit, Kuntcher groovers, cerclage wire, and laparoscopic forceps should also be kept for this procedure.

Discussion

A broken PFNA- II blade of the cephalomedullary nail has been documented in a few articles. The frequency of hip fractures in the elderly continues to rise dramatically, and proximal femoral nail antirotation is frequently utilized to treat intertrochanteric fractures, with a high number of cases of performed PFNA-II. Considering operation necessity and safety, PFNA-II removal is not a regular surgical treatment for the majority of patients; however, problems such as nonunion and intractable regional pain in the greater trochanter area are not uncommon and are nevertheless grounds for removal.

Breakage of cephalomedullary nails is uncommon, with incidences ranging from 2.9 to 5.7 %, In a multicenter study, the failure rate of PFN secondary to poor reduction, malrotation or wrong choice of screw was reported to be 5%, whereas the screw cut out rate was reported to be 0.6% 9 according to the literature [6-8]. The primary cause of nail breakage or helical blade lag screw breakage is nonunion at the fracture site. There are four case series but one is discussed. In our case, PFNA- II blade breakage developed 15 months after fixing; however, fracture site union was still present.

The various techniques for the removal of broken nails and PFNA-II blade are discussed.

The PFNA- II blade, distal locking screw, and shattered nail fragment were all removed. A 4-mm k-wire was implanted from the lateral side of the femur immediately distal to the fragment under C-arm control to prevent further distal migration. To evaluate the pin's hold in the nail canal, a 4.5-mm Schanz pin was put in a similar undamaged nail. At the distal end of the cephalomedullary nail channel, it was totally fixed. As a result, under C-arm control, a 4.5 mm Schanz pin was inserted from the prior nail entry in the canal of the fragment. The distal part of the damaged nail was then retrieved proximally using a T-handle bar [9].

Small-sized burr used in reaming after extraction of the proximal part of the broken nail. Guidewire retrogradely delivered through distal end broken part of the nail. The proximal part is reamed with a large-sized burr. Schanz screw inserted through the widened hole. Extraction of broken distal nail tip [10] developed a new technique (hook trapped in the medulla by flexible nail injected through the locking hole) that is useful in circumstances of tiny diameter nails when previous ways are ineffective due to the narrow canal of the nail [11].

A technique for the extraction of the proximal femoral nail anti-rotation (PFNA) after conventional method failure. The single

cortical hole at the end of the PFNA- II blade was drilled through a 5-mm tungsten carbide burr. The PFNA- II blade hole was threaded with double-strand steel wire, and the distal end was fashioned into a circle that could be tied to the extraction screw. The PFNA- II blade was softly knocked out following the anatomical path of the femoral neck using a Slide Hammer [12].

The PFNA- II blade was successfully removed using a high-speed burr with a 2-mm burr tip to create new matched slots for reinserting the original Zimmer lag screw inserter and retaining the shaft into the lag screw. It was critical to choose the tip burr size and the burring spot while creating new matching slots. After removing the lag screw, no serious issues were discovered during nail removal [13].

Screw extractors or vice grip-style pliers could not be used to remove the head of the PFNA- II blade because it was broken. Using a 6.0 mm carbide drill, we excised the outer cortical bone and trimmed the perimeter of the nail around the PFNA- II blade insertion section. The PFNA-II blade could still not be rotated or removed. Finally, using a 6.0 mm carbide drill, cut the PFNA- II blade in the nail. We removed the nail after cutting the PFNA- II blade. Two carbide drills were used to cut the PFNA-II blade [14].

To remove a PFNA- II blade, a customized removal tool was made by altering a 12 × 400 mm Arbeitsgemeinschaft für Osteosynthesefragen femoral interlocking nail [15,16].

We developed a new technique for the removal of a broken PFNA- II blade with a very easily available DHS Dynamic Hip Screw set -Screw/Long Coupling Screw for DHS Screw removal which is fixed to the broken proximal part of the PFNA-II blade on the guide wire. Then, proximal part of the PFNA- II blade is pulled out under c-arm guidance.

Conclusion

Removing the distal piece of a broken PFNA – II nail and the PFNA- -II blade is a challenging problem, and many surgeons have endeavored to come up with a straightforward method of extracting the fragment. Even though various methods for extracting a broken distal piece of the nail have been reported, few publications for the removal of a broken PFNA-II blade the procedure can still be challenging, and commonly used methods and instruments may fail to detach the broken component.

Clinical Message

A novel technique for removal of broken helical blade PFNA – II with easily accessible instruments which is a very challenging procedure with a high failure rate.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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