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Case Reports

Late tibial interference screw extrusion following anterior cruciate ligament reconstruction: A case report

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Introduction

Interference screws are used as back-up fixation in anterior cruciate ligament reconstructions. Historically these were composed of metal, but recently surgeons have switched to using bioabsorbable screws as they cause less symptoms and are biomedically advantageous. Usually these screws are absorbed by the body within one to two years after surgery.

Case Presentation

A 32-year-old male presented with aseptic extrusion of his intact tibial bioabsorbable interference screw eight years following successful anterior cruciate ligament reconstruction.

Management and Outcomes

Patient underwent laboratory evaluation and magnetic resonance imaging to rule out infection as an underlying cause. He went on to heal the wound without complication.

Conclusion

Late aseptic extrusion of tibial interference screw can occur; however, infectious etiologies should be carefully ruled out.

INTRO

The interference screw is a commonly used implant to achieve fixation of anterior cruciate ligament (ACL) graft. The screw provides primary graft-bone fixation and helps distribute the stress in the initial period of recovery until the body incorporates the graft. Bioabsorbable screws have advantageous properties compared to metallic screws, such as being less symptomatic thus reducing the need for removal, and gradual load transfer as the screw absorbs.[1] They also produce fewer artifacts with advanced imaging for evaluation of the knee after reconstruction. The disadvantages include an increased cost and variable biomechanical strength dependent upon host biologic response. Additionally, an immunologic reaction may occur with bioabsorbable screws regardless of material, company, or implant site and often develops in the late stages of implant absorption but can be asymptomatic.[2] Multiple systematic reviews and meta-analyses have shown no difference in outcomes such as graft failure rates, knee stability, or between metallic and bioabsorbable screws. Given the apparent equivalence in clinical outcomes, the other relative advantages have led more surgeons to adopt bioabsorbable implants.[3,4] While complications associated with bioabsorbable interference screws are uncommon, inflammatory reactions, drainage, and bone resorption are reported.[5–7] We report on a rare complication, aseptic interference extrusion, which occurred 8 years following the index procedure.

CASE PRESENTATION

The patient is a 32 year-old male who initially underwent ACL reconstruction 8 years prior to presentation at our facility. The surgery was performed using a hamstring autograft with a PLA-bTCP bioabsorbable (Bio-INTRAFIX; DePuy Mitek, Raynham, MA) interference screw fixation of the tibial side, without backup suspensory fixation. Follow-

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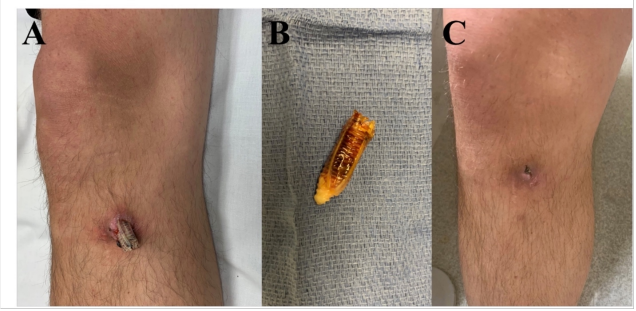

Figure 1. A) Clinical presentation of patient knee in the emergency department B) Retrieved screw C) Clinical exam of knee at follow-up appointment.

ing surgery, his postoperative course was uncomplicated and he recovered to full duty.

Eight years later the patient sustained a low-energy direct blow to his anterior proximal tibia and developed an area of swelling. Over the following 2 weeks, he developed a fluid collection; which drained, and ultimately formed a dark eschar. Finally, on the day of presentation he picked off the eschar and noticed the interference screw at the edge of the wound and came to the emergency department for evaluation. Clinical image of his knee on presentation is shown in Figure 1A.

He denied any knee pain prior to presentation. There was no knee effusion and he had full, active, painless range of motion of his knee. The knee was stable to anterior drawer, Lachman's and had a negative pivot shift. Laboratory values were unremarkable with a white count of 5, sediment rate of 10, and C-reactive protein of 0.4. Radiographs showed the patient had underwent ACL reconstruction with an intact femoral button and a soft tissue shadow outlining the extruded interference screw.

MANAGEMENT AND OUTCOME

As the screw was almost completely extruded from the wound, the mostly-intact screw was removed in the emergency department with forceps without need for local anesthetic as seen in Figure 1B. The skin tract was probed and it did not penetrate bone. Cultures were deemed unnecessary as he lacked clinical signs of infection and had normal inflammatory markers.

Given his open tibial wound, the patient was prescribed a 10-day course of cephalexin for infection prophylaxis and simple dry dressing was placed over the anterior tibial wound. The patient underwent magnetic resonance imaging as an outpatient which demonstrated no inflammatory changes in the tibial tunnel to suggest infection. The patient was followed clinically and went on to heal his wound without complication or sign of infection as seen in Figure 1C.

ETHICAL CONSIDERATIONS

The patient provided written consent for his case presentation.

DISCUSSION

There are few cases in the literature reporting on the phenomenon of bioabsorbable, interference screw extrusion to guide management in these patients. A systematic review performed by *Pereira et al*[8] found 10 studies reporting migration of bioabsorbable screws, of which only one study - *Sassmahausen et al.* - reported a case of tibial transcutaneous migration. Across the ten cases, intra-articular migration was more common, and migration occurred prior to two years post-operatively.[8] The *Sassmahausen et al*[9] study was the first report of extrusion of a tibial interference screw. The case report detailed the spontaneous development of erythema, swelling, and subsequent wound dehiscence over the tibial incision in a 28 year-old at 12 months after initial ACL reconstruction. The authors posited extrusion was caused by an aseptic local inflammatory reaction.[9] Another report not included in the review performed by *Anakwenze et al* reported the case of a 34 year-old dancer who presented with pain and drainage from the tibial incision 15 months after an uncomplicated ACL reconstruction.[10] Like our patient, the screw was visible at the open wound and was removed in the clinic. In all of these cases, extrusion occurred in a subacute timeline, different from our patient who experienced extrusion 8 years following his surgery. The prior case reports also differed in that the extrusions were spontaneous and thought to be due to an inflammatory response to the screw, whereas our patient had a minor trauma that resulted in the extrusion and the screw demonstrated no sign of breakdown by the body.

The only reports of late extrusion were linked with infectious process. A case series by *Dumlao et al*[11] presented two patients who presented with screw extrusion at 2 and 4 years. Both patients presented with signs of infection prompting screw removal in the operating room followed by a course of intravenous antibiotics.[11] Our patient had no clinical findings concerning for infection; however, an MRI was obtained to rule out occult infection given the chronicity of extrusion. There was no sign of inflammation within the proximal tibia to suggest infection and the patient was treated with a short course of oral antibiotic therapy only for prophylaxis while the open wound healed. To our knowledge this is the first described case of late tibial interference screw extrusion not associated with infection.

Other case reports have detailed a retrograde, or intra-articular, migration of bioabsorbable screws in the first two years following reconstruction. These often resulted in locking and catching symptoms from the loose body and required arthroscopic removal.[12,13] Some of these cases reported residual instability and suboptimal clinical outcomes.[14]

The overall complication rate associated with bioabsorbable interference screw fixation for ACL reconstruction is low. A large retrospective analysis of 858 pediatric and

adolescent athletes with 925 ACL injuries reported complications following bioabsorbable interference screw use in ACL reconstruction and found an overall rate of 10%.[15] Complications included pain over the site, screw breakage, screw loosening and migration, and extrusion of the screw, either intact or in part. Less than half of those with complications required some form of surgery a median 2 years after the index procedure. No difference was found in rates of complications between the types of screws reported in this study. The screws that were surgically removed were often partially absorbed and not intact. Bioabsorbable screws have also been shown to have increased bacterial adherence than metallic screws that may contribute to the inflammatory response in some cases.[16] The screw removed from our patient was seen to be almost entirely intact with minimal signs of resorption after 8 years. This is well outside the reported average resorption window for these types of implants. Barber et al reported interference screw resorption and osteoconductivity in a case series using the DePuy Mitek bTCP-PLA bioscrew and found a 100% absorption at 3 years after insertion.[3]

Tibial interference screw extrusion is a rare complication that can occur following recovery from ACL reconstruction. In the few prior reported cases, graft incorporation led to maintained integrity of the ACL reconstruction despite loss of interference screw fixation. We recommend surgeons consider infection as a potential cause or effect of late interference screw extrusion.

AUTHOR CONTRIBUTIONS

CW and RM examined the patient initially. BM saw a patient for follow-up evaluation. RM took part in the conceptualization, writing of the original draft, and review and editing. ND took part in conceptualization, supervision, writing of the original draft, and review and editing. CW took part in the supervision and review and editing of the final draft. DK took part in supervision and review and editing. BM took part in the conceptualization, supervision, and review and editing of the final manuscript. All authors read, edited, and approved the final manuscript.

COMPETING INTERESTS

The authors declare that they have no competing interests. Disclaimer: The views expressed are those of the author(s) and do not reflect the official policy of the Department of the Army, the Department of Defense or the U.S. Government. The investigators have adhered to the policies for protection of human subjects as prescribed in 45 CFR 46.

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