

Anterior Cruciate Ligament Revision of a Relatively New Implant System

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The Cayenne AperFix system (Cayenne Medical, Inc, Scottsdale, Arizona) is a relatively new implant system used in anterior cruciate ligament reconstruction. This article presents a case of successful revision of the implant and describes the technique used.

Anterior cruciate ligament (ACL) reconstruction is an increasingly common procedure. More than 100,000 ACL reconstructions are performed annually in the United States.¹ With this high number of reconstructions comes a high incidence of surgical failure requiring revision. Re-

search has shown that failure of ACL reconstruction can be classified into graft disruption and functional instability following surgery. Recurrent instability in the early (<6 months) postoperative period typically results from poor surgical technique, failure of graft incorporation, premature return to deceleration and cutting sports, or overly aggressive rehabilitation. Late instability (>1 year postoperatively) is usually attributable to either a single major trauma or repetitive trauma to the ACL graft.² The traumatic force required for rupture of a reconstructed ACL is similar to that of the initial injury and occurs in 5% to 10% of patients who returned to their preinjury level of activity.³ Error in surgical technique is the most common cause of ACL graft failure.¹⁻⁴

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The views expressed herein are those of the authors and should not be construed as official policy of the Department of the Army or Department of Defense.

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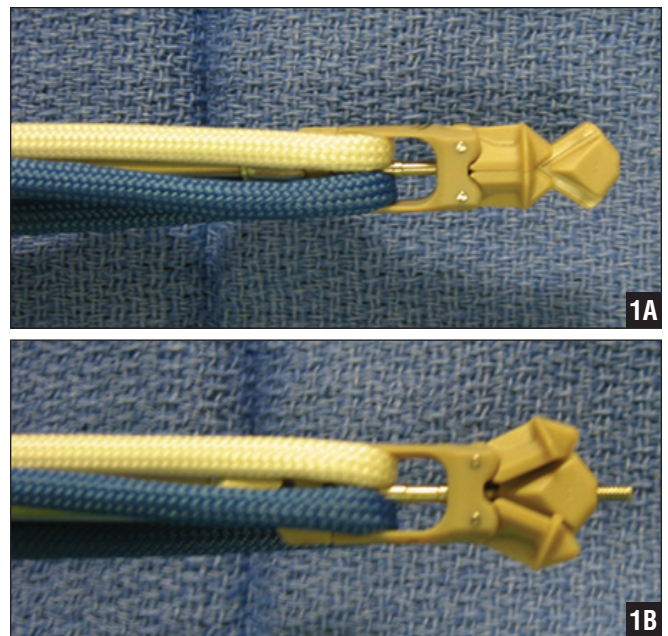


Figure 1: Cayenne AperFix (Cayenne Medical, Inc, Scottsdale, Arizona) with arms undeployed (A) and deployed (B).

Numerous methods of fixation can be used when performing an ACL reconstruction, each with benefits and limitations. The Cayenne AperFix system (Cayenne Medical, Inc, Scottsdale, Arizona) provides strong fixation of soft tissue grafts with circumferential aperture compression. It is an all-inside system, requiring no cross-pins or

additional morbidity to the distal thigh. The device is unique in that arms are deployed anchoring it firmly within the femoral tunnel (Figure 1). The device is made from polyetheretherketone (PEEK), which is a nonabsorbable, radiolucent material that causes no inflammatory response. Polyetheretherketone has the mechanical performance of

metal, but, if necessary, can be drilled through for removal during revision surgery.⁷ A stainless steel center screw provides structural support to the implant and is the focus during the initial stages of removal. To date, >4500 primary ACL reconstructions have been performed using the Cayenne AperFix system. Given the large number of procedures performed and the propensity for ACL surgical failure, there is clearly a need to delineate the technical aspects of revision surgery when this product has been used.

Because the device is uniquely fixed within the femur when the arms are deployed, proper technique in removal is required to prevent morbidity to the femoral tunnel. Without first retracting the arms, a large core reamer would be needed to extract the unit as a whole, resulting in a significantly enlarged femoral tunnel or damage to the back wall. Alternatively, a smaller reamer could be used to fragment the device, requiring piecemeal removal and possible retained loose foreign bodies. But when appropriate instruments are used and proper technique is used, the Cayenne AperFix component can be removed with no associated tunnel morbidity, allowing well-placed tunnels to remain in their correct orientation.

We present a case of a failed primary ACL reconstruction with the Cayenne AperFix system in a US Army active duty soldier who underwent revision ACL reconstruction.

A 23-year-old man underwent primary ACL reconstruc-

tion using hamstring autograft in September 2007. He progressed through the postoperative rehabilitation with good results and reported no instability during any follow-up appointments. Nine months postoperatively, while riding a bike, his foot slipped off the pedal leading to a hyperextension and twisting mechanism at the knee. He had immediate pain and effusion, and subsequently began experiencing instability of the knee. Physical examination demonstrated a 2B lachman and KT-2000 findings of 14/16 mm of translation on the affected side and 8/9 mm translation on the contralateral knee. Preoperative radiographs demonstrated the implant to be in acceptable position and alignment (Figure 2), and magnetic resonance imaging demonstrated an attenuated but intact ACL. He underwent removal of the implanted Cayenne AperFix system and revision ACL reconstruction using an achilles tendon allograft.

This article discusses the technical challenges presented by the Cayenne AperFix system and describes our technique for its removal for revision reconstruction.

SURGICAL TECHNIQUE

The patient was placed in the supine position with the operative leg in an arthroscopic leg holder. Preoperative examination under anesthesia demonstrated a 3B lachman and a positive pivot shift test. The knee was otherwise stable. Diagnostic arthroscopy yielded no abnormal findings other than a loosened, attenu-



Figure 2: Preoperative radiograph showing the Cayenne AperFix implant (Cayenne Medical, Inc, Scottsdale, Arizona).

ated ACL graft. The tibial and femoral components remained well fixed in the tunnels.

We initially proceeded with debridement of the ACL to better expose the tunnels. An incision was made at the site of the tibial tunnel for screw extraction. The Cayenne tibial removal tool was used to remove the screw and a standard grasper was used to extract the tibial sheath. If the Cayenne tibial removal tool is unavailable, a 2.7- to 3.0-mm hex driver may also be used. We then placed a guide pin through the tibial tunnel and used a 10-mm straight reamer to debride the remnant ACL from the tunnel. The tunnel was dilated to 11 mm and the edges were chamfered with a 5.5-mm full radius shaver. For removal of the femoral implant, the AperFix femoral implant removal tool was inserted into the knee through the tibial tunnel and the reverse threads

were engaged into the implant (Figures 3, 4).

Counterclockwise rotation of the tool returns the arms of the implant to their predeployment formation, and pulling axially will remove the central screw completely from the implant. The next step involves inserting the Cayenne alignment guide wire up through the center of the AperFix femoral implant until the drill stop is positioned at the femoral aperture (Figure 5). We then used the 10-mm AperFix coring reamer over the guide wire to a depth of 30 mm (Figure 6). The reamer bottoms out at the drill stop to prevent overreaming. The coring reamer, which contains the encased AperFix femoral implant, is backed out (Figure 7), leaving an intact femoral tunnel (Figure 8). If residual PEEK material was left in the tunnel, standard graspers could be used for removal.⁸ Following removal of the Cayenne AperFix and prep-

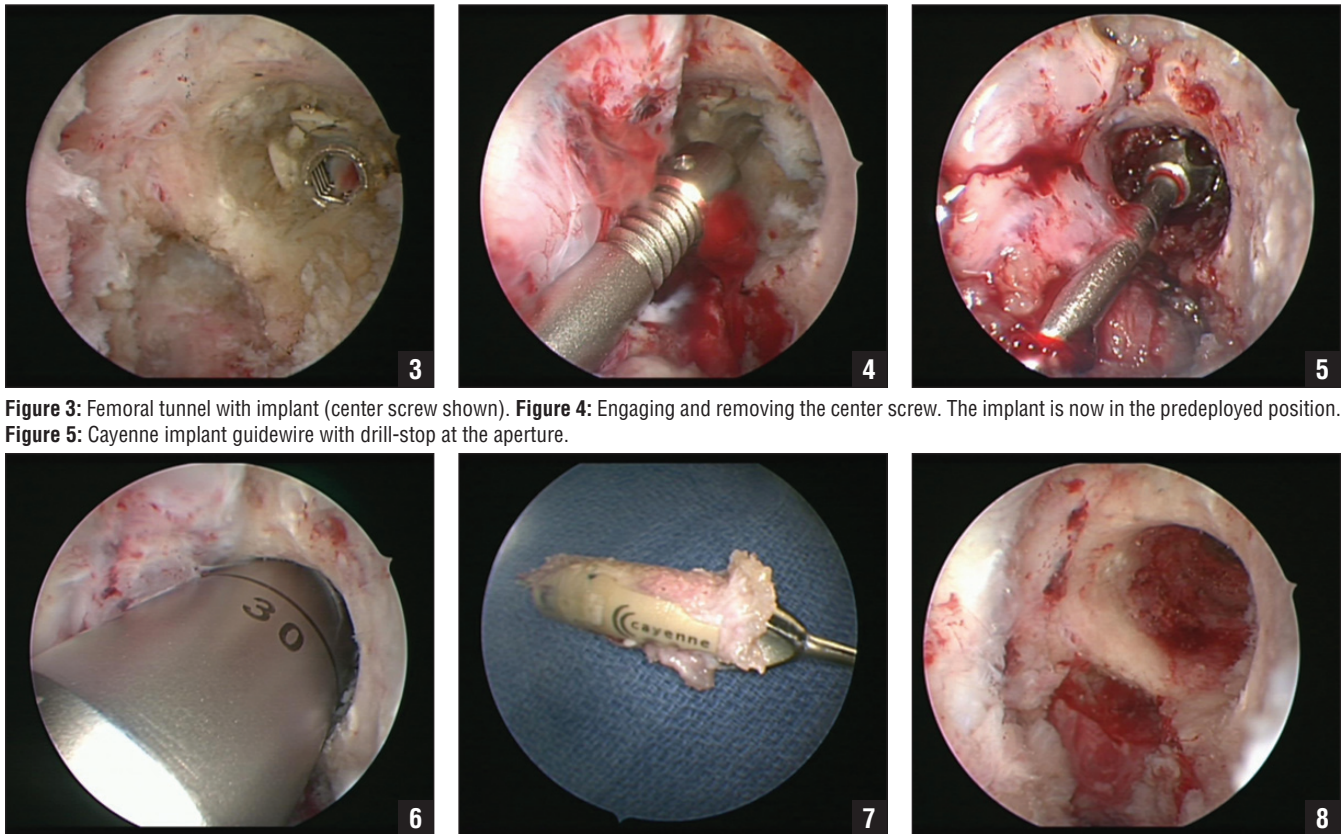


Figure 3: Femoral tunnel with implant (center screw shown). **Figure 4:** Engaging and removing the center screw. The implant is now in the predeployed position. **Figure 5:** Cayenne implant guidewire with drill-stop at the aperture.


Figure 6: Drilling with a 10-mm core reamer around the implant. **Figure 7:** Removal of guidewire shows extracted bone plug with implant. **Figure 8:** 10-mm femoral tunnel with intact back wall and no associated morbidity.

aration of the tunnels, we used an achilles tendon allograft with a metal interference screw for fixation in the femoral tunnel and a biointerference screw for tibial fixation.

DISCUSSION

The Cayenne AperFix system is a relatively new implant system used in ACL reconstruction. Because of the uniqueness of the femoral anchor, concern exists among surgeons regarding the feasibility of implant removal for revision surgery. Revision ACL reconstruction always

represents a technical challenge for surgeons, especially when an unfamiliar or new implant is involved. We present a case of successful revision of this system and describe the technique employed. We were able to completely remove the device following the manufacturers guide and using the necessary tools without any associated morbidity to either the femoral or tibial tunnels. As the number of primary ACL reconstructions performed with Cayenne AperFix system continues to increase, there will undoubtedly

be occasions where removal of the implant and revision surgery will be undertaken. Given that there is no prior published literature regarding removal of this unique implant during revision surgery, we have shown that the procedure can be successfully performed when warranted. 

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