

Arthroscopic Removal of EndoButton After Anterior Cruciate Ligament Reconstruction: Case Report and Surgical Technique

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ABSTRACT

Multiple methods of anterior cruciate ligament reconstruction are in use, and femoral fixation has been much discussed. The EndoButton Continuous Loop (Smith & Nephew Endoscopy, Andover, Mass) fixation device has been shown to be efficacious and is in widespread use, but few complications have been reported.

In this article, we describe the case of a properly positioned EndoButton that caused symptomatic extensor mechanism irritation necessitating arthroscopic removal.

The multiple anterior cruciate ligament (ACL) reconstruction techniques that are in use share the goal of creating a stable and highly functional knee. Graft fixation in the femur and tibia is the weakest link in the construct and has been the source of much debate and research. The optimal fixation method provides strength without disrupting surrounding soft tissue.

One device used for femoral fixation of ACL grafts is the EndoButton Continuous Loop (Smith & Nephew Endoscopy, Andover, Mass). This device has been well described and has been used with great success by many surgeons.^{1,2} Biomechanical research has shown that fixation is stronger but less stiff with this device than with interference screws.^{3,4} Clinical outcomes of the 2 fixation methods have been similar.^{5,6} One study has shown more graft migration with EndoButtons than with interference screws.²

Complications of EndoButton use are infrequent but primarily involve incorrect placement, as in not passing the device completely through the outer cortex⁷ and flipping it outside the extensor mechanism.⁸

Not described in the literature are soft-tissue irritation caused by a properly positioned EndoButton and the technique of arthroscopic removal. In this article, we describe the case of a properly positioned EndoButton that caused symptomatic extensor mechanism irritation necessitating arthroscopic removal.

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CASE REPORT

A woman in her early 20s was referred for evaluation of her right knee. Five years before presentation, she had undergone bone-tendon-bone ACL reconstruction. She recently noted a return of preoperative symptoms of pain and instability. On physical examination,



Figure 1. Coronal T₁-weighted magnetic resonance imaging shows soft-tissue reaction in (circled) region of EndoButton Continuous Loop (Smith & Nephew Endoscopy, Andover, Mass).

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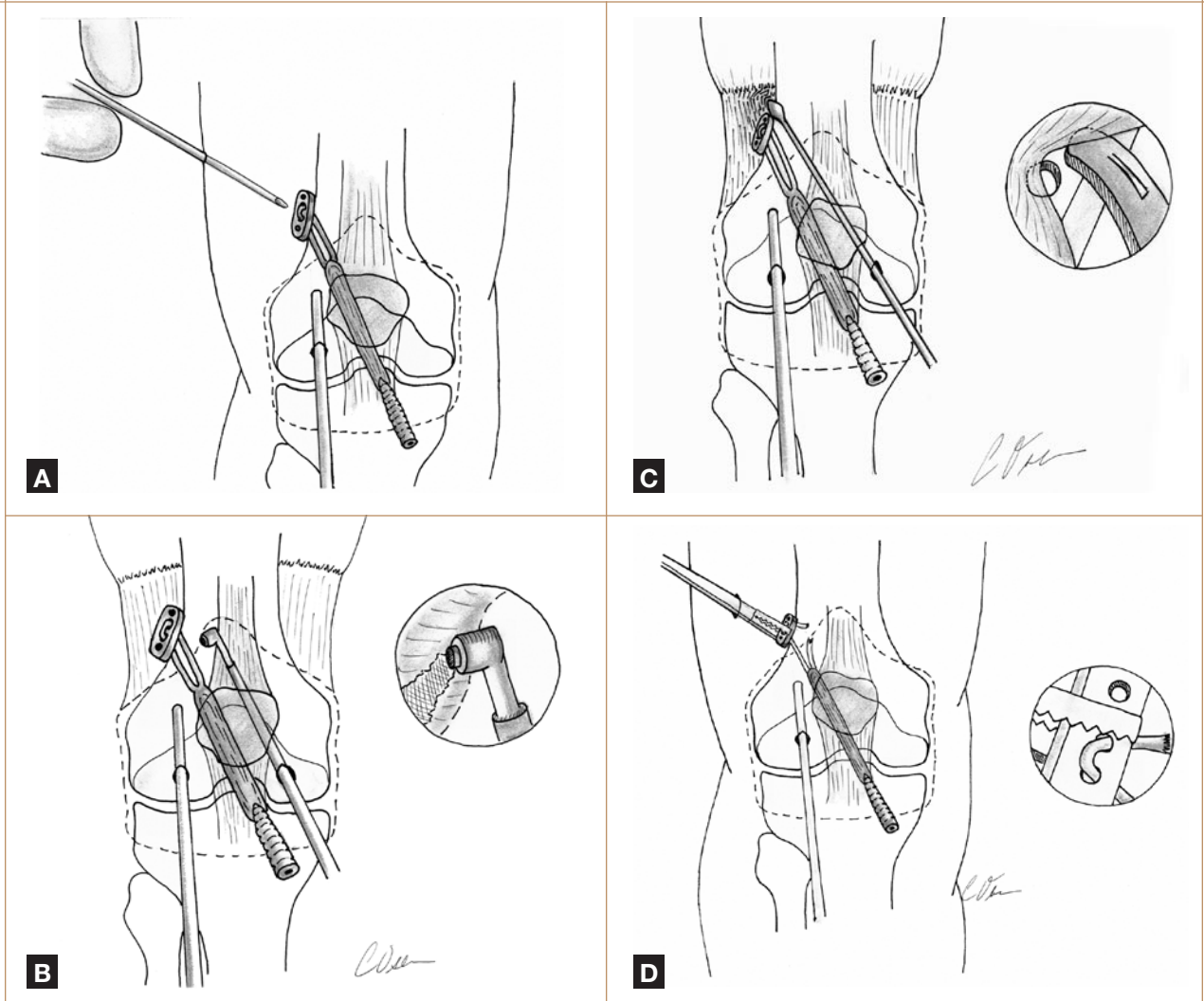


Figure 2. EndoButton removal: (A) Device is localized with spinal needle superior and lateral to joint capsule; (B) electrocautery is used to dissect through capsule and vastus lateralis; (C) periosteal elevator is used to expose device; (D) superior lateral portal is created, and device is removed with grasper. Artwork copyright 2008, Christeen Osborn, MD.

she had full range of motion (ROM), a grade 2 of 3 Lachman test, and a grossly positive pivot shift. There was no joint-line tenderness and no sign of infection. Radiographs showed widening of the tibial and femoral tunnels. Magnetic resonance imaging (MRI) showed an intact graft with a vertical orientation. No other abnormalities were noted.

The patient underwent revision ACL reconstruction with a tibialis anterior allograft, which involved removal of tibial and femoral interference screws. The graft was fixed proximally with an EndoButton fixed to the graft with a 15-mm continuous loop of polyester tape placed in the standard fashion⁹ and distally with an Intrafix screw (DePuy Mitek, Norwood, Mass). During surgery, the knee was found to be stable.

The patient was partial weight-bearing for 2 weeks after surgery and then progressed to full weight-bearing. She recovered full ROM rapidly and returned to work without restriction 10 weeks after surgery.

At 6-month follow-up, she was doing well with her usual activities but complained of feeling a knot at the

superior lateral aspect of the knee. This knot was progressively enlarging with activity. Physical examination revealed a stable knee but also a raised, tender region that was freely mobile and painful with knee extension. MRI showed reactive soft tissue in the region of the EndoButton but no discrete mass (Figure 1). We then realized that the device was probably causing the patient's discomfort and that removing it would probably relieve this symptom.

Seven months after the revision ACL reconstruction, the EndoButton was arthroscopically removed. An inferolateral portal was created, and a diagnostic arthroscopy was performed. The ACL graft was partially torn, but the majority of fibers appeared intact and showed good tension when probed. The arthroscope was then placed in the suprapatellar pouch. There was no evidence of the hardware within the joint. The EndoButton was then localized with a spinal needle placed from the superolateral direction (Figure 2A). A capsulotomy was performed, with elevation of the vastus lateralis muscle, and the device was visual-

ized (Figures 2B, 2C). It was well seated to bone, and there was no soft-tissue entrapment. An accessory working portal in the superior lateral thigh was created, and radiofrequency and sharp dissection were used to free the EndoButton from the polyester tape. The device was then removed through the superior lateral portal (Figure 2D). The surrounding soft tissues were then débrided.

After surgery, the patient was allowed to be weight-bearing as tolerated and resumed her physical therapy. At 2-week follow-up, she reported that the pain at the EndoButton site had resolved completely and that she had only mild residual soreness from the surgery. On examination, she had no pain with ROM or palpation at the removal site. She then resumed normal activities without further complication.

We have obtained the patient's written, informed consent to publish her case report.

In the case of our patient, the EndoButton was properly seated on the lateral femoral cortex, and there was no soft-tissue entrapment. The soft-tissue irritation surrounding the hardware may have been a mild foreign-body reaction to the device or mechanical irritation. Given the high incidence of EndoButton use in ACL reconstruction, this is likely not the first or last instance of extensor mechanism irritation caused by this device. We hope that this case report increases awareness of this possible complication and provides useful advice regarding management.

AUTHORS' DISCLOSURE STATEMENT AND ACKNOWLEDGMENT

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DISCUSSION

Correct positioning of the EndoButton is immediately adjacent to the vastus lateralis on the lateral femoral cortex. It is therefore intuitive that any soft-tissue reaction to the device may irritate the extensor mechanism and lead to disabling symptoms. A malpositioned device—one that sits proud off of bone or entraps soft tissue—will exacerbate this effect. The present report is the first of a properly positioned EndoButton causing extensor mechanism irritation.

For this complication, we considered three options: conservative management, open removal, and arthroscopic removal of hardware. We chose arthroscopic removal, which offers diagnostic evaluation of the joint and less morbidity. Although technically more difficult than open removal, arthroscopic removal allowed us to minimize disruption of soft tissue and permitted almost immediate return to function. Were arthroscopic removal to fail, open removal was always an intraoperative backup option.

REFERENCES

1. Prodromos CC, Joyce BT, Shi K, Keller BL. A meta-analysis of stability after anterior cruciate ligament reconstruction as a function of hamstring versus patellar tendon graft and fixation type. *Arthroscopy*. 2005;21(10):1202.
2. Tsuda E, Fukuda Y, Loh JC, Debski RE, Fu FH, Woo SL. The effect of soft-tissue graft fixation in anterior cruciate ligament reconstruction on graft-tunnel motion under anterior tibial loading. *Arthroscopy*. 2002;18(9):960-967.
3. Au AG, Raso VJ, Liggins AB, Otto DD, Amirfazli A. A three-dimensional finite element stress analysis for tunnel placement and buttons in anterior cruciate ligament reconstructions. *J Biomech*. 2005;38(4):827-832.
4. Brown CH Jr, Wilson DR, Hecker AT, Ferragamo M. Graft-bone motion and tensile properties of hamstring and patellar tendon anterior cruciate ligament femoral graft fixation under cyclic loading. *Arthroscopy*. 2004;20(9):922-935.
5. Amendola A, Menon M, Clatworthy M, Fowler PJ. The effect of fixation technique on graft position in anterior cruciate ligament reconstruction. *Iowa Orthop J*. 2003;23:29-35.
6. Ma CB, Francis K, Towers J, Irrgang J, Fu FH, Harner CH. Hamstring anterior cruciate ligament reconstruction: a comparison of bioabsorbable interference screw and EndoButton-post fixation. *Arthroscopy*. 2004;20(2):122-128.
7. Karaoglu S, Halici M, Baktir A. An unidentified pitfall of EndoButton use: case report. *Knee Surg Sports Traumatol Arthrosc*. 2002;10(4):247-249.
8. Simonian PT, Behr CT, Stechschulte DJ Jr, Wickiewicz TL, Warren RF. Potential pitfall of the EndoButton. *Arthroscopy*. 1998;14(1):66-69.
9. Chen L, Cooley V, Rosenberg T. ACL reconstruction with hamstring tendon. *Orthop Clin North Am*. 2003;34(1):9-18.

This paper will be judged for the Resident Writer's Award.