Flipping Method of a RetroButton During ACL Reconstruction With Outside-in Femoral Drilling Using a FlipCutter

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Abstract: Little information exists on the intraoperative difficulties and complications of using a RetroButton (Arthrex, Inc, Naples, Florida), which is a new suspensory device. However, some difficulties are encountered, such as incomplete sitting, pulling at the outside portion of the iliotibial band, or slipping during distal pulling due to incomplete transverse flipping. These problems can be avoided if the mechanism can be understood and some technical tips are practiced. The goal of this study was to determine the difficulties encountered during RetroButton femoral fixation and prevent iatrogenic complications with the RetroButton devices by offering some technical tips.

Surgical Technique

A hamstring autograft was used for the anteromedial bundle, and tendinous portion of the Achilles allograft was used for the posterolateral bundle. The graft’s free ends were sutured with #5 Ethibond (Ethicon, Inc, Somerville, New Jersey) approximately 3 cm in length. The smallest 15-mm RetroButton loop was used routinely to maximize the tendon-to-bone contact. The grafts are normally adjusted to 7 mm for the anteromedial tunnel and 6 mm for the posterolateral tunnel.

The anteromedial and posterolateral tunnels of the femur were each created at 90° of knee flexion. The arthroscope was inserted via the anteromedial portal, and the femoral guide set (RetroConstruction Drill Guide Set; Arthrex, Inc) was inserted via an anterolateral portal at a 90° angle using a FlipCutter drill guide system. The tip of the guide hook was pointed at the central portion of the footprint of each bundle (Figure 1A). If the footprint

Materials and Methods

Without the technique described herein, more than 100 EndoButton loops (Smith & Nephew, London, United Kingdom) and 25 RetroButtons were used for femur fixation in ACL reconstruction. This technique was used in 12 recent double-bundle ACL reconstructions (24 RetroButtons) using an outside-in technique.
was not easily seen, the lateral intercondylar ridge and lateral bifurcate ridge were used for the landmark.\(^5,6\)

Once the FlipCutter tip was in the joint, the drill sleeve was pushed back and the femoral guide was removed (Figure 1B). The blue hub was turned counterclockwise until it contacted the crosspin. Using an arthroscopic probe, the blade of the FlipCutter was folded until it was perpendicular to the shaft, and the blue hub was turned clockwise until it was tight (Figure 1C). The drill sleeve was pushed down to the bone and then pushed in approximately 7 mm.

Retro reaming was then performed until the FlipCutter bottomed out on the drill sleeve. The reaming length was also double-checked using a rubber ring. After removing the FlipCutter by pushing it back into the joint and straightening the blade tip, the looped wire or #5 Ethibond was inserted with a beath pin through the drill sleeve and used for graft passage (Figure 1D). The looped portion was pulled through the anteromedial portal and then re-pulled through the tibial tunnel (Figure 1E).

Viewing from the superolateral portal, 2 free ends of the #5 Ethibond could be seen at each tunnel (Figure 2A); the arthroscopic shaver was inserted via a skin incision for the FlipCutter, and shaving was performed along the guiding suture material (Figure 2B). A StarVac 90 ICW ArthroWand (ArthroCare Corporation, Austin, Texas) was also used to expose the periosteum around the tunnel hole for the complete sitting without the impingement of soft tissue (Figure 2C). The grafts were passed from the tibial tunnel to the femoral tunnel, and the probe was inserted through a minimal skin incision (Figure 2D).

The probe or knot pusher was used for flipping and compressing the RetroButton to the bony surface while maintaining complete flipping (Figures 2E, F). Mild tensioning of the guiding suture material was additive because the guiding hole was located near the central loop, which could aid transverse flipping. After complete flipping, distal pulling was performed for tensioning (Figure 3).

**PRELIMINARY RESULTS**

In the authors’ previous series without this technique, it was difficult to confirm complete sitting of the device, and they experienced incomplete sitting of the RetroButton (unpublished data) (Figure 4A). In some cases, the authors tried several times for complete sitting because the toggling was not done perfectly. This was more prominent with the RetroButton (complete sitting in 1 try in 16 patients, complete sitting in several tries in 5 patients, incomplete sitting in 3 patients, and pulling at the outside of the iliotibial band in 1

Figure 1: The tip of the guide hook was pointed at the central portion of the footprint of each bundle (A). The FlipCutter (Arthrex, Inc, Naples, Florida) tip was advanced in the joint (B), and the blade of the FlipCutter was folded until it was perpendicular to the shaft (C). #5 Ethibond (Ethicon, Inc, Somerville, New Jersey) was inserted with a beath pin through the drill sleeve and used for graft passage (D), and the looped portion is pulled through the anteromedial portal and then re-pulled through the tibial tunnel (E).
patient) because toggling was more difficult. At second-look arthroscopy 1 year after index surgery, the fixation device was positioned with incomplete sitting (Figure 4B) (unpublished data). However, using the current technique, the authors confirmed complete sitting and no wrong fixation in all 12 cases.

**DISCUSSION**

In femoral fixation, 3 fixation mechanisms are used: compression, expansion, and suspension. The latter is further divided into the cortical, cancellous, and corticocancellous suspension mechanisms.2,7 Suspensory fixation has been reported to result in a higher incidence of tunnel widening.8 However, it is being used increasingly with outside-in femoral drilling for better replication of the anatomy of the native ACL.3,4,9

The RetroButton is included with cortical suspension devices and has acceptable biomechanical properties.2,7,8 This device is commonly used with a FlipCutter, which was devised for outside-in femoral drilling and provides the least invasive, bone-sparing reconstructive procedures. This device allows surgeons to place the femoral socket without anatomic restrictions or femoral soft tissue dissections. Once in the joint, the FlipCutter is used as a retrograde reamer to create the femoral socket from inside-out.

Compared with the EndoButton loop, some difficulties exist during flipping of the RetroButton, despite its small design being beneficial (eg, incomplete sitting, pulling at the outside portion of iliotibial band, or slipping during distal pulling due to incomplete transverse flipping). These difficulties might be caused by the hole being positioned near the central loop, as well as the difficulty in feeling the sense of flipping because toggling is impossible. In addition, a narrow tunnel diameter near the far cortex using a FlipCutter creates some additional difficulties, although it has some benefit in bone sparing.

A marker line was also used to make an indirect assessment of the position of the RetroButton. However, in a tight tunnel configuration, some elongation of the graft can occur, and this measurement is not correct in this situation. The authors observed the RetroButton directly through the anterolateral portal with full extended position and managed the RetroButton directly through the superolateral portal.
In the authors’ experience with another fixation device, the fixational problems could be avoided by observing the fixation directly. Therefore, it is believed that direct viewing and control are the best ways of performing complete and safe fixation. Only the routine superolateral portal was used, and the arthroscope was inserted through this portal. Therefore, another skin incision was not required.

The RetroButton is controlled by a probe or knot pusher. This area is around the lateral epicondyle, and no risky neurovascular structure exists. Viewing from this portal, this area appears similar to the bursal space in the shoulder arthroscope. Therefore, the RetroButton is not easily noticed initially. In this situation, suture material is used as a guide, and easy access to the RetroButton along the guiding suture material can be gained.

This technique has 2 important advantages. First, the complete sitting of the fixation device can be confirmed using arthroscopic visualization. Second, control of sitting can be achieved using accessory devices, such as a probe or knot pusher. However, the lateral side of the suprapatellar pouch is opened and more time is required. Therefore, in cases of infection, it can be spread to the outside of the lateral capsule. In addition, some extravasation of fluid is inevitable.

**REFERENCES**


