

Re-tensioning Anterior Cruciate Ligament Reconstruction Using an Adjustable Femoral Button

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Background: Despite advancements in surgical techniques for anterior cruciate ligament (ACL) treatment, persistent functional impairment, reduced quality of life, and limited physical activity participation continue to be common after postoperative rehabilitation. We modify the traditional ACL reconstruction method by using hamstring tendons grafts and re-tensioning them.

Indications: This procedure is indicated for patients undergoing ACL reconstruction surgery with soft tissue grafts, utilizing femoral fixation with an adjustable button and tibial fixation with an interference screw.

Technique Description: We employ hamstring grafts for ACL reconstruction and perform femoral fixation using an adjustable button. Initially, we pull the graft approximately 10 mm less than the length of the thickest tunnel drill. This allows for subsequent graft traction after tibial fixation. Following tibial fixation, we pull the graft proximally, inserting it a few millimeters further into the femoral tunnel. This re-tensioning increases tension and enhances physical examination results. In addition, we incorporate the braid graft technique to augment the graft's final thickness.

Results: This technique yields reduced postoperative residual laxity during physical examinations. Our institution's ethics committee is currently reviewing a clinical study comparing functional outcomes with traditional techniques.

Discussion/Conclusion: The ACL re-tensioning technique is easily implemented and involves a subtle modification to the traditional approach, allowing for graft re-tensioning and diminishing the risk of residual laxity post-interference screw fixation. This approach acknowledges that insertion of the interference screw can inadvertently reduce graft tension, counteracting the tension applied during fixation. Consequently, this technique is expected to yield superior clinical outcomes.

Keywords: knee; ACL; ACL reconstruction; hamstrings; femoral fixation

VIDEO TRANSCRIPT

Despite advancements in surgical techniques for anterior cruciate ligament (ACL) treatment, persistent functional

impairment, reduced quality of life, and limited physical activity participation continue to be common after postoperative rehabilitation.³⁻⁵ We modify the traditional ACL reconstruction method by using hamstring tendon grafts and re-tensioning them using an adjustable button.

This procedure is indicated for patients undergoing ACL reconstruction surgery with soft tissue grafts, utilizing femoral fixation with an adjustable button and tibial fixation with an interference screw.

In the video below, a Grade I pivot shift can be observed. We delineate key anatomical landmarks using a dermatographic pen. We adopt an oblique approach to minimize the risk of the infrapatellar branch of the saphenous nerve injury.¹

Careful dissection is conducted to locate the gracilis and semitendinosus tendons. After identification, they are excised using a closed stripper. Following immediate preparation, we measure the tendons' thickness. The braid technique is implemented for tendons measuring less than 8 mm. Gonzalo Samitier and Gustavo Vinagre⁷

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Submitted June 10, 2023; accepted August 28, 2023.

One or more of the authors has declared the following potential conflict of interest or source of funding: J.L.R.D.F. received speaking fees from Síntegra Surgical Sciences. AOSSM checks author disclosures against the Open Payments Database (OPD). AOSSM has not conducted an independent investigation on the OPD and disclaims any liability or responsibility relating thereto.

Video Journal of Sports Medicine (VJSM®), 3(6), 26350254231206137

DOI: 10.1177/26350254231206137

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described this technique in 2019. Employing this method, we can increase the thickness by up to 1 mm in diameter, effectively transforming a 7-mm graft into an 8-mm one.⁷ Prior to initiating the braid, we introduce the Synfix adjustable button (Sínegra Surgical Sciences).

During arthroscopy, we identified the ACL stump while preserving its tibial insertion. Subsequently, we created the femoral tunnel using the technique described by Rocha de Faria et al,² with the knee fixed in hyperflexion using an L-shaped support. Utilizing a femoral guide, we generated a 5-mm-deep hole in the position indicated by the femoral guide, with the knee maintained at 120°. We removed both the guide and the guide wire, then readjusted the knee to 90° to assess the initial hole's placement. If it is not in an anatomically correct position, we repositioned it. In this instance, we repositioned the tunnel using the initial hole as a reference. The knee was then returned to a 120° flexion.

Next, we perforated the path with a 2-mm-thick, needed guide wire. Through this guide wire, we introduced the 4.5-mm cannulated drill from the Synfix button (Sínegra Surgical Sciences) and measured the overall tunnel length. In this case, it was approximately 35-mm deep. Subsequently, we utilized the Synfix button drill to breach the lateral cortex and remove it.

We introduced the graft thickness drill (8 mm) to a depth between 5 and 7 mm less than the total tunnel length, with the goal of preserving the integrity of the lateral cortex.

We then extracted the drill and moved the guide wire proximally while maintaining knee hyperflexion. The shaver was introduced into the femoral tunnel to remove bone debris. Following this cleaning, we reinserted the guide wire and passed a transport wire through its needle outside the arthroscopic portal, leaving it within the femoral tunnel. We observed the femoral tunnel in excellent anatomical positioning.

We created the tibial tunnel while leaving the guide wire in place through the remaining graft portion. Following this, we used basket tweezers to clean the medial cortical outlet of the tibial tunnel, which aids in facilitating screw fixation.

We marked the graft with a circumferential point, similar to the technique utilized in the graft link method located 20 mm from the femoral end of the graft.⁶ Subsequently, we drew a line using a dermatographic pen 30 mm from the femoral end of the graft.

We initiated the ascent of the graft and button by consistently pulling on the green thread and bringing the white threads together toward the proximal end. Under direct visualization, we observed the button completely pass through the 4.5-mm hole. Then, we pulled the button through the white wire at the opposite end, securing it against the lateral cortex to prevent backward movement. Multiple tractions were executed to confirm femoral fixation. By alternating tractions using the central white threads of the button, we encouraged the graft to move proximally. When the graft reached the 20-mm marker,

we halted the proximal traction and performed several flexion extensions with distal traction through the graft's tibial tunnel. This step aims to minimize the laxity effect of the hamstring grafts. We noted all negative tests with distal tibial traction during the physical examination.

We observed that the graft did not shift distally and remained 20 mm within the femoral tunnel. Then, we proceeded to tibial fixation. Distal traction of the grafts was executed using inverted Kelly forceps, and the 9 × 30-mm Synfix interference screw (Sínegra Surgical Sciences) was introduced. We removed the screwdriver using the Synfix screwdriver extractor. Upon retesting the physical examination, slight laxity was noted in the Lachman and anterior drawer tests. We observed a slight distalization of the graft, making it possible to visualize the Vicryl suture. Subsequently, with the knee flexed at 30°, we applied renewed traction to the graft using the traction wires of the femoral button. Doing that, we pull the graft proximally by approximately 5 mm, performing the graft re-tensioning. This resulted in an entirely negative physical examination outcome, confirming excellent stability, finishing the surgery.

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