Bridge-Enhanced Anterior Cruciate Ligament Repair for Midsubstance Tear

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Background/Purpose

Recently, repair of the injured anterior cruciate ligament (ACL) has been subject to renewed interest as novel arthroscopic techniques have been developed. Specifically, bridge-enhanced ACL repair (BEAR) is a technique that consists of the use of a resorbable protein-based implant in combination with autologous blood to bridge the gap between two torn edges of a midsubstance ACL tear. This implant is believed to facilitate primary suture repair healing and suture cinch and has demonstrated noninferiority to ACL reconstruction with autograft at 2-year follow-up. This video describes a step-by-step surgical technique for midsubstance ACL repair using the BEAR system in a patient undergoing concomitant lateral meniscus radial repair.

Patient Positioning and Anesthesia

The patient is administered general anesthesia and placed in the supine position on a surgical table with the leg of the bed down to allow for circumferential access and hyperflexion of the knee.

Surgical Technique

A high and tight anterolateral portal and a standard anteromedial parapatellar portal were created. Comprehensive diagnostic arthroscopy was performed, assessing cartilage, meniscus, and ligament status. A midsubstance tear of the ACL and a radial tear of the lateral meniscus were confirmed.

Meniscal repair was performed with the use of two high-strength sutures passed via an all-inside self-retrieving device through one transtibial tunnel. Attention was then turned to ACL repair via the BEAR technique. The ACL was confirmed to be of satisfactory tissue quality and length for repair via reduction with the use of a manual grasper. The lateral wall of the femur was débrided, and notchplasty was performed. The location of the anatomic femoral footprint of the ACL was located, and a 2.4-mm guide pin was placed through the footprint in a standard inside-out fashion. This was over-reamed with the use of a 4.5-mm cannulated drill, and a No. 2 nonabsorbable passing suture was passed through the femur using the previously placed beath pin.

A tibial aimer was then used to place a 2.4-mm guide pin just anterior to the tibial attachment of the ACL. The self-retrieving suture passage device was then used to place No. 2 absorbable suture into the stump of the torn ACL, moving from distal to proximal along the ACL stump. The two ends of the ACL stump suture were then brought out through an anteromedial cannula together with the previously placed femoral passing suture. Two nonabsorbable, high-tensile strength No. 2 sutures were then looped through the center holes of a cortical button, and the free ends of the suture from the tibial stump also were passed through the cortical button. Subsequently, the button carrying the two ends of the ACL stump suture and the two nonabsorbable sutures were passed through the femoral tunnel and engaged outside the lateral femoral cortex. The location of the button was confirmed via fluoroscopy.

The cannula was removed, and the anteromedial portal was enlarged to allow for passage of the BEAR graft. The two nonabsorbable sutures from the cortical button were then passed out the enlarged anteromedial portal, and both ends of each nonabsorbable suture were passed through the BEAR graft sequentially with the use of a free needle. A passing suture was shuttled up the previously drilled tibial tunnel in preparation for graft placement and associated suture passage.

The four ends of the two nonabsorbable sutures, which have been passed through, were passed through the tibial tunnel. Previously harvested autologous blood (20 mL) was then used to pre-soak the BEAR graft. The graft was gently introduced through the enlarged medial portal while applying gentle traction to the passing suture. These nonabsorbable sutures were tensioned with the knee in full extension and tied over a cortical button on the anterior tibial cortex. Subsequently, the lateral meniscus repair construct also was fixed with the use of an anchor on the anteromedial tibia.

Available Literature on Outcomes

In 2020, Murray et al sought to investigate the clinical efficacy of BEAR relative to ACL reconstruction in young, active patients. The authors conducted a randomized controlled trial of 100 patients with a median age of 17 years and randomized subjects to the BEAR technique (n = 65) or autograft ACL reconstruction (n = 33 quadruple semitendinosus gracilis; n = 2 bone-patellar tendon-bone). The results demonstrated no considerable differences in International Knee Documentation Committee subjective scores, International Knee Documentation Committee objective outcomes, or AP laxity between the two groups at 2-year follow-up. In addition, the authors observed improved hamstring strength in the BEAR group relative to the reconstruction control group.