<ul scxp32496542="" bcx0="" role="list"><li data-aria-posinset="1" role="listitem" data-aria-level="1" ltr="" scxp32496542="" bcx0="">Merging the Modern and the Classic: Anterior Cruciate Ligament Reconstruction With Bone Marrow Aspirate Concentrate Augmentation of Bone-Tendon-Bone Allograft

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This video shows a technique for augmentation of bone-tendon-bone allograft anterior cruciate ligament reconstruction with the use of bone marrow aspirate concentrate.

Anterior cruciate ligament reconstruction is a common surgical procedure in sports medicine geared toward restoring knee kinematics and stability during anterior cruciate ligament–dependent activities, such as side-to-side movements, cutting, and jumping. Much research has been performed on graft options; however, in terms of graft integration and ligamentization, allograft currently tends to lag behind available allograft options, with a mean time of 2 years necessary for full biologic incorporation of the donor ligament.

Bone marrow aspirate concentrate is a biologic adjuvant that has garnered increased interest in orthopaedics because of the high concentration of growth factors and mesenchymal stromal cells that can be harvested and used to promote bone and soft-tissue healing. In the setting of anterior cruciate ligament reconstruction in prior animal studies, the addition of mesenchymal stem cells accelerated bone graft incorporation.

To aid in acceleration of bone graft healing, bone marrow aspirate concentrate augmentation may be considered in older patients undergoing anterior cruciate ligament reconstruction with the use of allograft. Potential contraindications or factors that may deter bone marrow aspirate concentrate use include bleeding or clotting disorders or anticoagulant use that may increase the risk of bleeding from the harvesting procedure. In addition, bone marrow aspirate concentrate may be contraindicated in patients with active malignancy and patients who currently are pregnant or breast feeding.

This video reviews the case presentation of a 33-year-old woman who has experienced right knee instability for 1 month after a ski-related injury. At baseline, the patient was fairly active and engaged in high-intensity interval classes three times per week. At the time of presentation, the patient reported 2 to 5 out of 10 anterior knee pain and a Single Assessment Numeric Evaluation score of 50%.

On physical examination, the patient had active range of motion from 0° to 90°, a positive anterior drawer test, and grade IIB Lachman test. The patient was tender to palpation about the medial joint line, with 1+ valgus laxity and a positive McMurray test.

AP, lateral, and centralized radiographs of the right knee were obtained and were otherwise unremarkable. MRIs of the right knee revealed an anterior cruciate ligament rupture, with the classic bone bruising pattern to the posterior tibia and the lateral femoral condyle associated with an anterior cruciate ligament injury; a grade 1 medial collateral ligament sprain; and a lateral meniscus tear.

The patient was taken to the operating room, the patient was placed in the supine position, and the iliac crest was prepared and draped in a sterile fashion. The borders of the anterior iliac crest were palpated and marked.

Using a No. 11 blade, a stab incision was made through the skin in the middle of the anterior iliac crest. A fenestrated bone marrow aspiration trocar with a sharp tip was inserted through the cortex and directed between the inner and outer tables of the iliac crest. The trocar was gently advanced using a twisting motion through the cortex and was then malleted further to a depth of 3 to 4 cm. After the determined depth was attained, the inner sharp trocar was removed, and a 30 cc syringe previously rinsed with heparin and preloaded with 3 cc of an anticoagulant citrate dextrose solution was screwed to the trocar. Bone marrow was slowly aspirated until 25 to 30 cc were obtained. This process was repeated with a second syringe prepared in the same fashion. Both syringes were passed off the surgical field for additional preparation, and the wound was closed in a standard fashion with the use of 3-0 nylon suture.

Off the surgical field, the two syringes with a total of 60 cc of harvested aspirate were connected, and the contents were inserted into the Angel Bone Marrow Processing System (Arthrex). Aspirate contents were spun using a machine to reduce to a concentrated solution of bone marrow aspirate over a course of 15 minutes. While the bone marrow aspirate was being processed, preparation of the bone-tendon-bone allograft was performed.

On completion of graft preparation, the harvested and processed bone marrow aspirate concentrate was injected into multiple locations along the length of the soft-tissue portion of the graft. The graft was then suspended to allow for increased absorption of the bone marrow aspirate concentrate into the graft to remove any creep. The remainder of the surgical procedure was then performed, starting with an examination under anesthesia confirming restoration of full knee range of motion after a course of pre-rehabilitation, a grade IIB Lachman test, and a 2+ pivot-shift test.