Harvest and Application of Bone Marrow Aspirate Concentrate to Address Acetabular Chondral Damage During Hip Arthroscopy

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Background

This video presents a safe and technically feasible approach for harvesting bone marrow aspirate from the body of the ilium, followed by centrifugation and application during hip arthroscopy. This versatile and updated technique for bone marrow aspirate concentrate (BMAC) harvesting, processing, and application avoids donor-site morbidity, attains a substantial concentration of connective tissue progenitor cells, minimizes additional surgical time, and limits hip arthroscopy and aspiration to a single procedure. Because recent literature has shown preliminary evidence supporting the use of BMAC in patients with moderate cartilage damage and full-thickness chondral flaps who are undergoing acetabular labral repair, this video details an evidence-based approach for the management of chondral injury in patients undergoing acetabular labral repair.

Description

After induction of anesthesia and appropriate patient positioning, a quadrilateral arrangement of arthroscopic portals is established to perform puncture capsulotomy. On arthroscopic visualization of the cartilage/chondrolabral junction injury, 52 mL of whole venous blood is promptly obtained from an intravenous access site and combined with 8 mL of anticoagulant citrate dextrose solution A (ACD-A). The mixture is centrifuged to yield approximately 2 to 3 mL of platelet-rich plasma and 17 to 18 mL of platelet-poor plasma. Then, approaching along the coronal plane and aiming toward the anterior superior iliac spine under fluoroscopic guidance, a heparin-rinsed Jamshidi bone marrow biopsy needle is driven through the lateral cortex of the ilium just proximal to the sourcil. Under a relatively negative-pressure vacuum, bone marrow is aspirated into three separate heparin-rinsed 50-mL syringes, each containing 5 mL of ACD-A. Slow and steady negative pressure should be used to pull back on the syringe plunger to aspirate a total volume of 40 mL into each syringe. To avoid pelvic cavity compromise and minimize the risk of mobilizing marrow-space contents, care should be taken to ensure that no forward force or positive pressure is applied during the aspiration process. A total combined bone marrow aspirate/ACD-A mixture of approximately 120 mL is consistently harvested and subsequently centrifuged to yield approximately 4 to 6 mL of BMAC. The final mixture containing BMAC, platelet-rich plasma, and platelet-poor plasma is combined with thrombin to generate a megaclot, which is then applied to the central compartment of the hip.

Expected Outcomes

Patients with moderate cartilage damage treated via BMAC during labral repair experienced substantially greater improvements in functional outcomes at 12 and 24 months postoperatively compared with patients who did not undergo BMAC augmentation. In addition, patients with a full-thickness chondral flap who were treated via BMAC during arthroscopic labral repair had substantially greater improvements in functional outcomes at 12 months postoperatively compared patients treated via microfracture. In addition, 77.6% of the patients in the BMAC cohort reached the minimal clinically important difference threshold for the International Hip Outcome Tool-33 compared with 50% of the patients in the microfracture group.

Important Tips

1. Use the previously established Dienst arthroscopic portal for bone marrow aspiration to avoid secondary donor site morbidity.
2. Under fluoroscopic guidance, approach the ilium along the coronal plane, aiming toward the anterior superior iliac spine.
3. With a heparin-rinsed Jamshidi bone marrow biopsy needle, penetrate the lateral cortex of the ilium just proximal to the sourcil to consistently harvest a total combined bone marrow aspirate/ACD-A volume of approximately 120 mL.
4. Simultaneously perform bone marrow aspirate and whole venous blood centrifugation during hip arthroscopy to minimize additional surgical time.
5. Bone marrow aspiration should be performed without applied traction to minimize the risk of neurovascular complications associated with extended traction time.