IntraOsseous BioPlasty™
Surgical Technique
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The IntraOsseous BioPlasty (IOBP) procedure is a biologic treatment for bone pathologies resulting from acute or chronic injury, including bone marrow lesions associated with insufficiency fracture, osteoarthritis, persistent bone bruises, avascular necrosis, and osteonecrosis. Arthrex offers multiple options for the biologic treatment of these pathologies, including decompressing the lesion and the delivery of a concentrated dose of platelet-rich plasma concentrate from bone marrow aspirate (cPRP_BMA) using the Arthrex Angel® cPRP and Bone Marrow Processing System. The IOBP™ technique is intended to encourage physiologic bone remodeling and repair to achieve normal bone anatomy and function.

Viscous Delivery System

Use the viscous low-velocity ratio applicator for the homologous mixture of 2 fluids. The individual pieces delivered in each package are easy to assemble and disassemble quickly. When the 2 fluids are within their respective syringes, they will be dispensed through the mixing chamber with simultaneous ease. The Viscous-Spray™ low-viscosity applicator has a shorter 3 cm mixing tip.

Recipe for Formation of Gelling Agent Solution

The ingredients for formation of the gelling agent solution are:

- A gelling agent powder containing 4800-5000 IUs (international units)
- A gelling agent liquid containing 5 mL of 10% calcium chloride solution

For every 1000 IUs of gelling agent powder, mix with 1 mL of gelling agent liquid (1000 IUs/mL ratio of powder to liquid).

- If a bottle has 5000 IUs of gelling agent powder, mix with 5 mL of gelling agent liquid
- If a bottle has 10,000 IUs of gelling agent powder, mix with 10 mL of gelling agent liquid, and so on...
- This process creates the gelling agent solution

For every 1 mL of autologous fluid administered with the ratio applicator, 0.1 mL of gelling agent solution will be dispensed.

- 10:1 ratio of autologous fluid to gelling agent solution
Prepare the cPRP<sub>BMA</sub> in standard fashion using the Arthrex Angel® cPRP and Bone Marrow Processing System. The cPRP<sub>BMA</sub> and gelling agent solution should be drawn from a sterile basin within the sterile field.

Transfer the cPRP<sub>BMA</sub> into the larger syringe in the mixing kit. Transfer the gelling agent solution into the 1 cc syringe. The ratio of cPRP<sub>BMA</sub> to gelling agent solution is 10:1.

Attach the low viscosity tip (Viscous-Spray™ applicator) to the end of the syringes. Place the snap-on piece over the syringe plungers.

Depress the plungers to mix the cPRP<sub>BMA</sub> and gelling agent solution via the mixing elements within the applicator tips; the cPRP<sub>BMA</sub> is delivered in an activated state.
Process for Mixing DBM With Autologous Fluid

1. Transfer the cPRP<sub>BMA</sub> into a separate sterile basin and draw into a syringe.

2. Fill the mixing and delivery syringe with AlloSync™ Pure demineralized bone matrix (DBM). Use a female-to-female luer adaptor to connect to the cPRP<sub>BMA</sub> syringe. Add the autologous fluid to the mixing and delivery syringe in a 5:3 ratio of DBM to fluid.

3. Unsnap the pushrod from the mixing element by pressing on the tip of the mixing element with counter pressure on the tip of the pushrod. Push and pull the mixing element back and forth until thoroughly mixed.

4. Pull back on the mixing element and snap the pushrod back onto the mixing element.

5. To reduce the amount of force required to deliver the biologic material, reattach the female-to-female luer connector and transfer the material into 1 cc or 3 cc syringes.

6. Following transfer into smaller volume syringes, the AlloSync Pure and autologous fluid mixture is ready to deliver.
Direct Delivery IntraOsseous BioPlasty™ Procedure

To perform a direct IOBP™ procedure, assemble the delivery cannula onto a pin driver and approximate the location of the bone marrow lesion using the preoperative MRI and intraoperative fluoroscopy.

Insert the delivery cannula through the bone marrow lesion, taking care to avoid penetrating the opposite cortex.

Remove the inner stylet of the delivery cannula to complete the core decompression.

Assemble the mixing and delivery syringe onto the delivery cannula. Optionally, to reduce the amount of force required to deliver the IOBP mixture, transfer from the 14 cc syringe to several 1 cc syringes, and deliver the material sequentially.

Use the material delivered to fill the decompression site and pathologic bone marrow lesion. Arthroscopic visualization may be preferred to ensure the material is delivered into the bone marrow lesion. A radiopaque dye may be used to improve visualization under intraoperative fluoroscopy.
Guided Delivery IntraOsseous BioPlasty™ Procedure

Advancing a 2.4 mm guide pin through the lesion. Take care not to violate the subchondral bone or create a full tunnel. It is also recommended to visualize the entire procedure arthroscopically. Note: Use fluoroscopy throughout the procedure to confirm position.

Use the side-release RetroConstruction™ handle with the femoral ACL marking hook and 2.4 mm guide pin sleeve to triangulate the approximate location of the lesion according to the MRI.

Remove the handle by unlocking the side-release mechanism. Remove the 2.4 mm guide pin sleeve then confirm position of the 2.4 mm guide pin.

Position the 7 mm low-profile reamer over the 2.4 mm guide pin.

Advance the reamer to tip of the guide pin then remove it to complete core decompression. Confirm arthroscopically that the pin or reamer does not advance into the joint. Ensure the 2.4 mm guide pin remains in place.

Remove the stylet from the delivery cannula and advance over the guide pin.
Remove the 2.4 mm guide pin while holding the cannula in place.

Alternatively, using the mixing and delivery syringe, use a mixture of AlloSync™ Pure and cPRP in a 5:3 ratio to fill the void. Arthrex specifically recommends against filling the void with bone cement, which has not been shown to promote physiologic bone remodeling and repair in conjunction with natural healing.

While injecting the Angel® cPRP autograft, slowly remove the delivery cannula to ensure complete fill of the core decompression. There are several recommendations to deliver the cPRP. Optionally, clot the autologous fluid by using the viscous delivery applicator.
Direct Delivery Ankle Arthroscopic Procedure

The Direct Approach may be used if an articular cartilage lesion is present. If the articular surface remains intact, the Guided Approach may be preferred.

Under tourniquet control, apply 4 mm of distraction to the tibiotalar joint. Debride the articular cartilage defect to create stable margins using a ring curette. Use arthroscopic and fluoroscopic guidance throughout the procedure to aid visualization.

Advance the 11 gauge cannula through the articular defect and into the bone marrow lesion. Remove the inner trocar from the delivery cannula to complete the core decompression.

Following positioning of the delivery cannula, mix AlloSync™ Pure with the Arthrex Angel® cPRP BMA (5:3 ratio) within the mixing syringe, then transfer to 1 cc syringes. Deliver the DBM gel and cPRP BMA mixture to the bone marrow lesion to treat the subchondral edema or fracture. The trocar may be used to empty the delivery cannula, and the cannula may be removed.
Aspirate all arthroscopic fluid and dry the cartilage defect with the cannulated swabs from the BioCartilage® mixing and delivery kit. After mixing the BioCartilage extracellular matrix with an autologous blood solution (1:0.8 ratio) within the mixing syringe, apply the mixture into the defect using the ArthroPaddle™ delivery needle.

Use the elevator component on the ArthroPaddle to smooth the BioCartilage extracellular matrix into the defect. Ensure the BioCartilage extracellular matrix remains flush or slightly recessed to the surrounding articular cartilage. Use a dual-lumen applicator to apply fibrin glue over the BioCartilage implant. Do not apply too much fibrin and do not manipulate the joint for 5 minutes after application.

Gently flex and rotate the ankle before closure to assure adherence of the BioCartilage implant. At the completion of surgery, immobilize the ankle in neutral position. The patient should be non-weightbearing. Thereafter, standard rehabilitation protocols following marrow stimulation are implemented.
Guided Delivery Ankle Arthroscopic Procedure

The Guided Approach may be used with or without an articular cartilage lesion present. The IOBP™ ankle techniques were developed in collaboration with Christopher D. Kreulen, MD.

1. Remove the inner trocar from the delivery needle and advance the 11 gauge cannula into the bone marrow lesion. Remove the 2.4 mm guide pin to complete the core decompression.

2. Following positioning of the delivery cannula, mix AlloSync™ Pure with the Arthrex Angel® cPRP BMA (5:3 ratio) within the mixing syringe, then transfer to 1 cc syringes. Deliver the DBM gel and cPRP BMA mixture to the bone marrow lesion to treat the subchondral edema or fracture. Use the trocar to empty the delivery cannula, and then remove the cannula.

3. Under tourniquet control, apply 4 mm of distraction to the tibiotalar joint. Debride the articular cartilage defect to create stable margins using a ring curette. Use arthroscopic and fluoroscopic guidance throughout the procedure to aid visualization.

4. Using the GPS targeting guide with 2.0 mm insert, deliver a 2.4 mm guide pin to the bone marrow lesion. The GPS targeting guide is point-to-point, so care should be taken to avoid penetrating the articular surface. Remove the guide, leaving the 2.4 mm guide pin in position.

The Guided Approach may be used with or without an articular cartilage lesion present. The IOBP™ ankle techniques were developed in collaboration with Christopher D. Kreulen, MD.
Aspirate all arthroscopic fluid and dry the cartilage defect with the cannulated swabs from the BioCartilage® mixing and delivery kit. After mixing the BioCartilage extracellular matrix with an autologous blood solution (1:0.8 ratio) within the mixing syringe, deliver and smooth the mixture into the defect using the ArthroPaddle™ delivery needle. Use a dual-lumen applicator tip to apply fibrin glue over the BioCartilage implant.

Following approximately 5 minutes after fibrin glue application, gently flex and rotate ankle before closure to assure adherence of the BioCartilage implant. At the completion of surgery, immobilize the ankle in neutral position. The patient should be non-weightbearing. Thereafter, implement standard rehabilitation protocols following marrow stimulation.

**Note:** Gelling agent powder and liquid are not provided within the mixing kits. The powder and liquid must be provided by the facility where the surgery is being performed.

**Note:** AlloSync™ Pure, provided separately, may be used to mix with the autologous blood solution.

Products may not be available in all markets because product availability is subject to the regulatory approvals and medical practices in individual markets. Please contact Arthrex if you have questions about the availability of products in your area.
This description of technique is provided as an educational tool and clinical aid to assist properly licensed medical professionals in the usage of specific Arthrex products. As part of this professional usage, the medical professional must use their professional judgment in making any final determinations in product usage and technique. In doing so, the medical professional should rely on their own training and experience and should conduct a thorough review of pertinent medical literature and the product’s directions for use. Postoperative management is patient-specific and dependent on the treating professional’s assessment. Individual results will vary and not all patients will experience the same postoperative activity level or outcomes.

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