Arthrex Angel® cPRP and Bone Marrow Processing System

With Vortex™ Threaded Bone Marrow Recovery Needle

Arthrex®

Arthrex Angel® cPRP and Bone Marrow Processing System

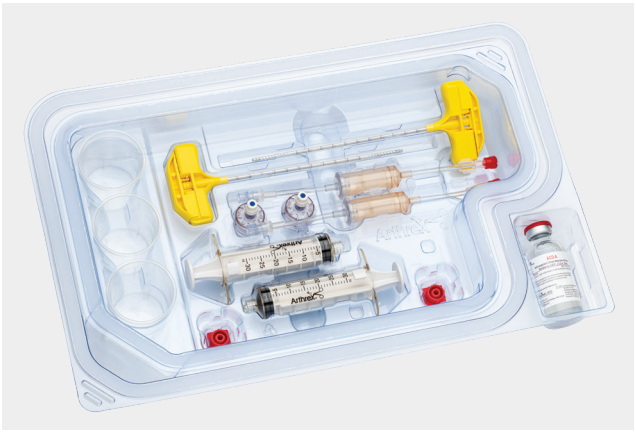
Product Features

Technology is what sets the Angel system apart from the competition. The Angel system uses a proprietary platelet sensor and 1-button automation to prepare customized PRP concentrate (cPRP) from bone marrow aspirate (BMA).

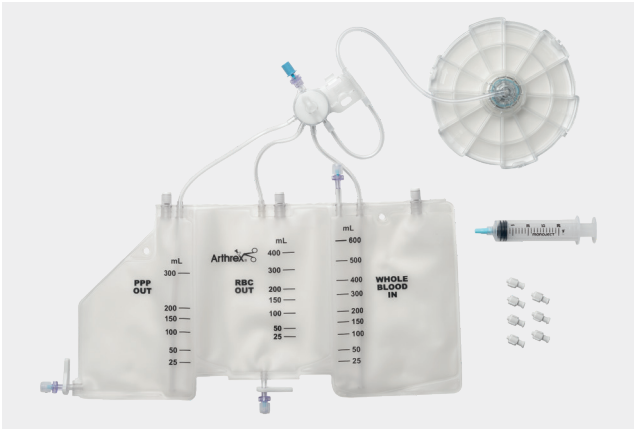
Bone marrow is a rich source of platelets, nucleated cells, and progenitor cells. The Angel device is the only option on the market to provide PRP concentrate from BMA with adjustable cellular levels.

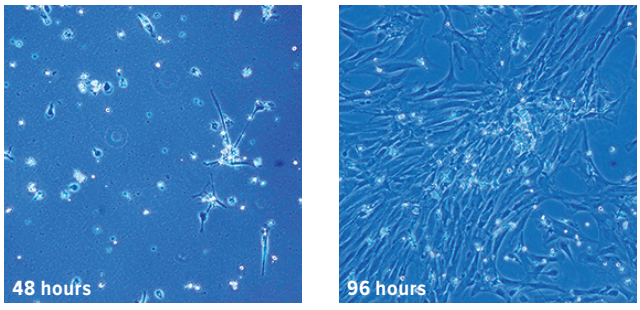
Features and Benefits

- Proprietary platelet sensor system
- Adjustable platelet concentrations
- Adjustable white blood cell (WBC) concentrations
- Flexible processing volume of 40 mL-180 mL
- Each processing kit can process, on the same patient, 3 cycles up to 180 mL
- Programmable; can store up to 30 custom processing protocols
- Closed system delivers PRP, platelet-poor plasma (PPP), and red blood cells (RBCs) into separate, sterile compartments



Angel-powered BMA kit for spine with anticoagulant citrate dextrose solution A (ACD-A)





In vitro culture expansion of progenitor cells over 96 hours

ARTHREX angel™ SYSTEM

Advantages of 3-Sensor Technology (3ST)

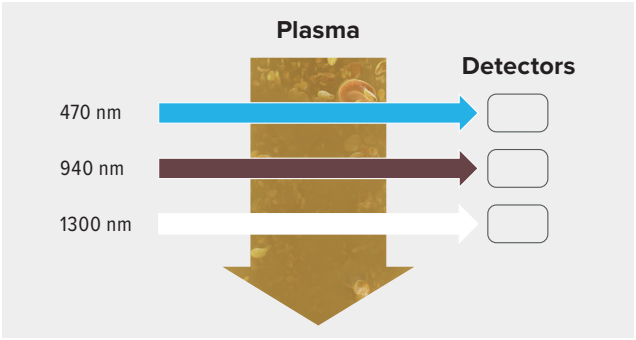
- No syringe switching
- No manual steps to prepare PRP
- Delivers PRP, PPP, and RBCs into separate, sterile compartments
- Ability to modulate platelet, leukocyte and RBC content
- Consistent PRP output

High-specificity 3ST light sensor technology and automated valve actuation are the foundation of the Arthrex Angel® cPRP system. The results of these features are the production of a high yield of PRP and PPP from whole blood.

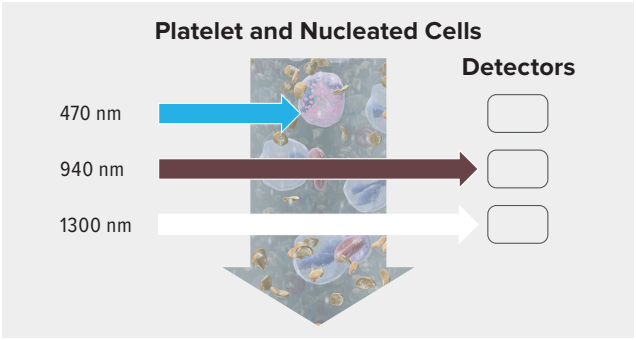
High-specificity 3ST light sensor technology

Three-Sensor Technology

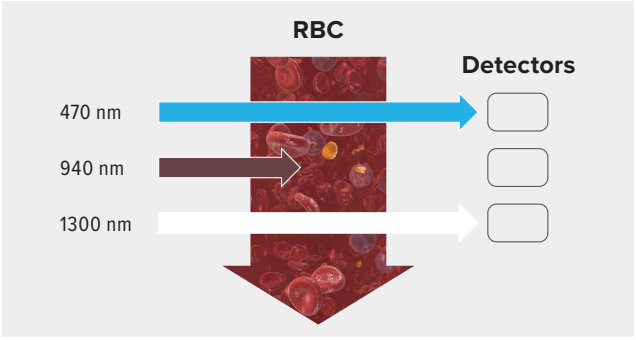
The Angel system incorporates three sensors to accurately separate blood components using cell-specific wavelengths of light to increase cellular yields. Absorption of 470 nm light detects platelets and leukocytes; 940 nm detects erythrocytes; and the 1300 nm wavelength corrects for ambient light and the presence of air bubbles.



When plasma is present, all 3 light beams pass through and contact the detector. The Angel device recognizes the presence of plasma and turns the valve to collect PPP. The PPP is deposited in the PPP collection reservoir.



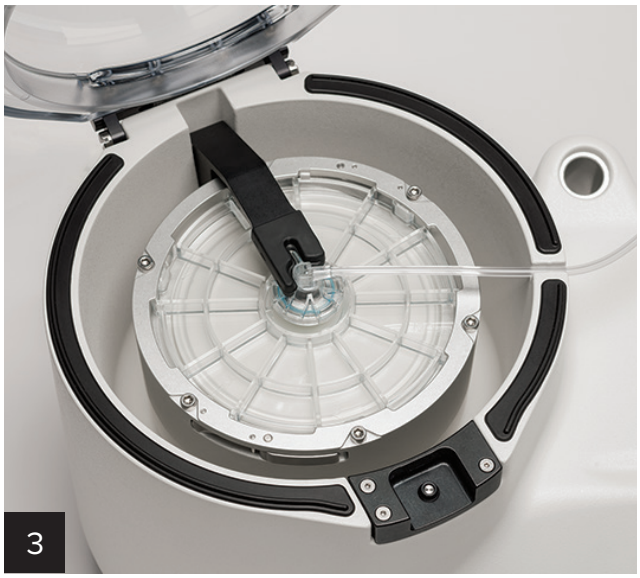
When platelets and nucleated cells are present, the 470 nm wavelength of light is absorbed. The absence of the 470 nm beam on the detector alerts the Angel system to stop collecting PPP; it will then actuate the valve to collect PRP. The PRP is directed into the collection syringe on top of the unit.



The 940 nm wavelength is absorbed by RBCs. When the detector no longer detects the 940 nm beam, the Angel system will allow a percentage of RBCs to pass through into the PRP collection syringe. The percentage of RBCs collected in the PRP syringe is determined by the hematocrit (HCT) setting selected by the operator.

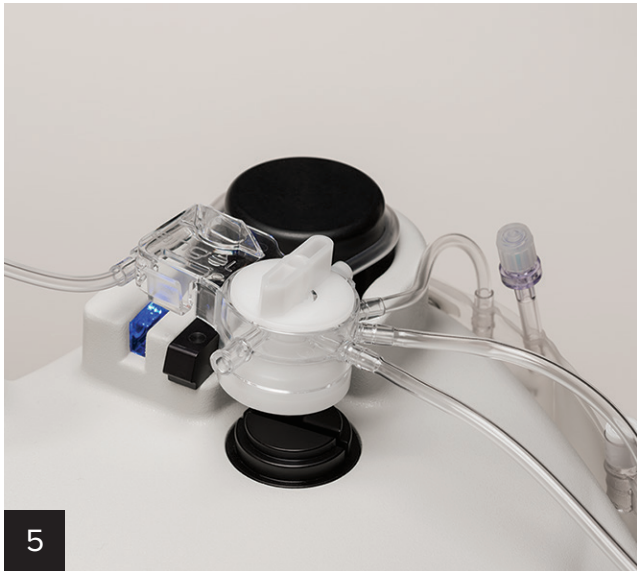
Remove the Angel® cPRP processing set from the tray and place it on top of the machine.

Insert the variable volume separation chamber into the centrifuge adapter by aligning the notches.



Once aligned, press down and turn clockwise until the position indicators snap into place. Place the tube leading from the separation chamber through the centrifuge well slot.

Lower the centrifuge stator arm and align it with the raised tab on top of the separation chamber. Close the centrifuge lid.



5

Place the pump loop tubing over the pump rotor. The pump loop will automatically load when the processing cycle is initiated.

6

Press down firmly on the back side of the platelet cuvette until the assembly is snapped in place.

Note: It is essential that the platelet cuvette/valve assembly seats fully on the machine to obtain proper sensing of blood components.

7

Hang the 3-compartment reservoir bag on the 2 support pins located on the side of the Angel system.

8

Prepare the heparin flush. Dilute 5000 units of heparin (1000 units/mL) with 5 mL of sterile saline to achieve a final concentration of 500 units per mL. Transfer heparin flush to sterile field. Transfer ACD-A to the sterile field. Each 60-mL syringe will contain 8 mL ACD-A, 30-mL syringes will contain 4 mL of ACD-A, and 20-mL syringes will contain 3 mL of ACD-A.

9

At the sterile field, draw up the heparin flush in the first 30-cc collection syringe. Flush the bone marrow harvest needle. Return the remaining heparin flush solution to the medicine cup. Draw up 4 mL of ACD-A into the first 30-cc collection syringe and cap.

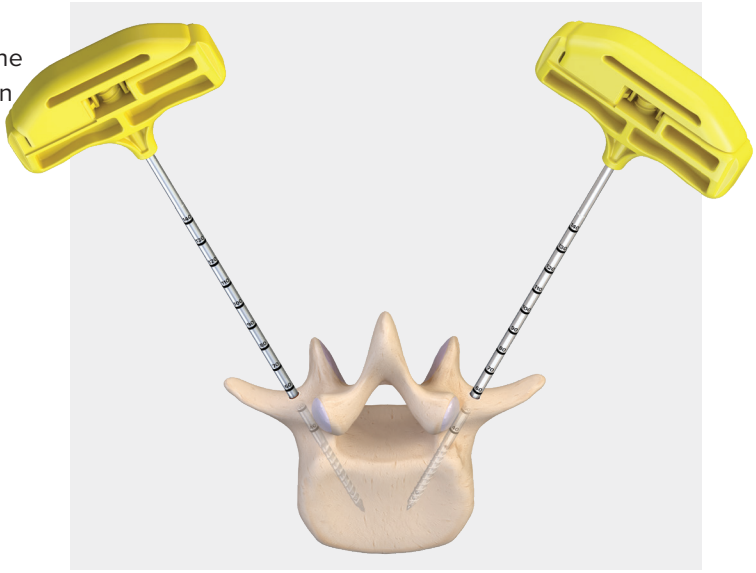
10

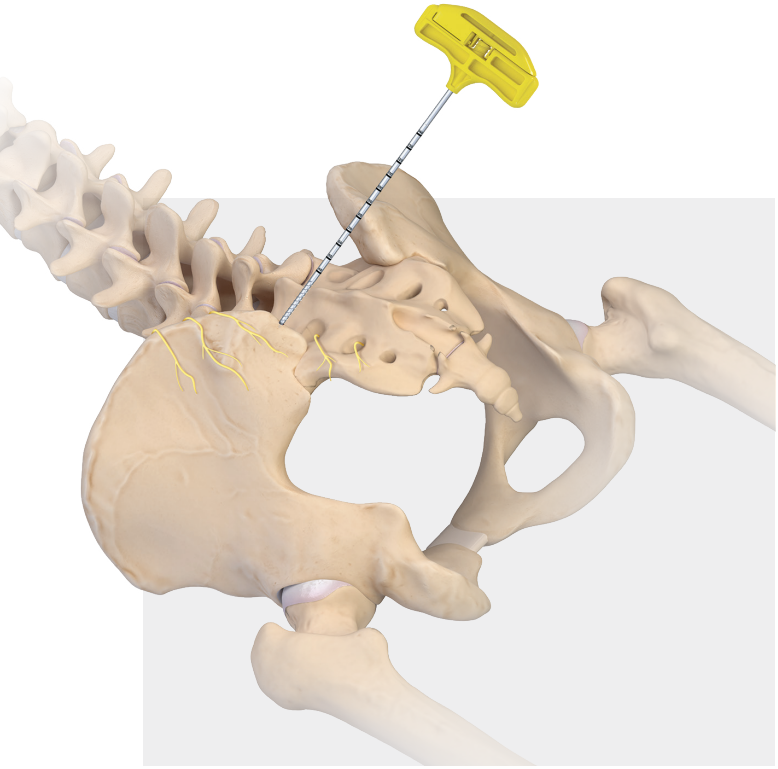
At the sterile field, use the second 30-cc collection syringe to draw up the remaining heparin solution. Flush the bone marrow processing filter. Disconnect the processing filter from the 30-cc collection syringe and discharge the remaining heparin solution. Draw up 4 mL of ACD-A into the second 30-cc collection syringe and cap.

Vortex™ Threaded Bone Marrow Recovery Needle

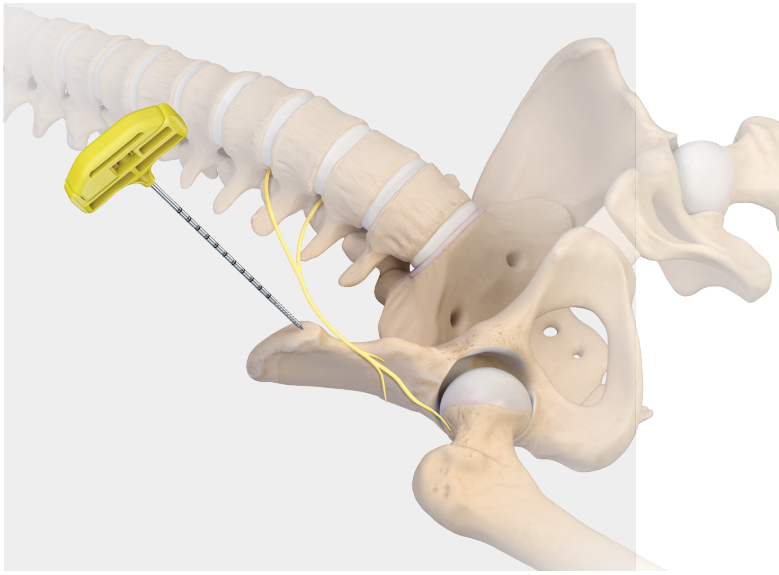
Vertebral Body Harvest Site
With either an open or percutaneous approach, use the Vortex needle to cannulate the pedicles in preparation for pedicle screw insertion. Bipedicular aspiration is recommended to maximize the concentration of osteoprogenitor cell aspiration.[1]

Note: When using a percutaneous approach, it is recommended that you use the open tip Vortex needle so that a guide wire can be placed into the pedicle prior to removal of the needle.





Posterior Superior Iliac Spine (PSIS)
Insert the trochar 3 cm superior to the PSIS to avoid damaging the cluneal nerves. Palpate to find the medial and lateral edges of the iliac crest and insert the trochar in the middle of the superficial cortex, aiming toward the ASIS.



Anterior Superior Iliac Spine (ASIS)
Insert the trocar 4 cm posterior to the ASIS to avoid damaging the lateral femoral cutaneous nerve; aim medially.

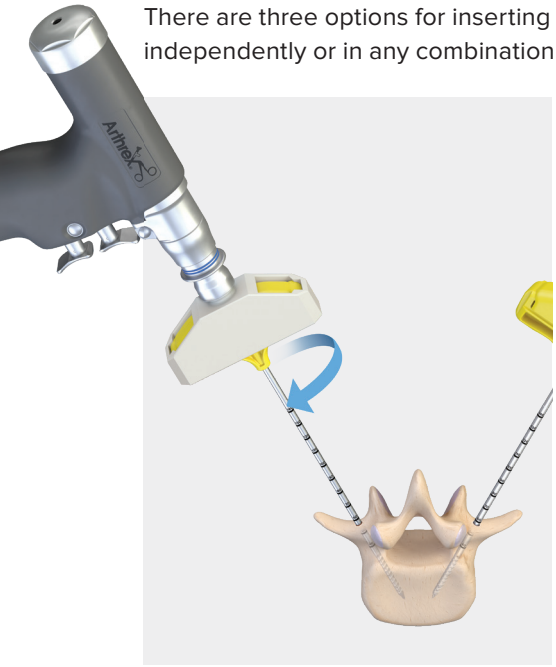
Potential BMA Harvest Site Guidelines

Harvest Site	Approximate BMA Harvest Volume
Iliac Crest	60 mL-100 mL
Vertebral Body	20 mL-40 mL per vertebral body

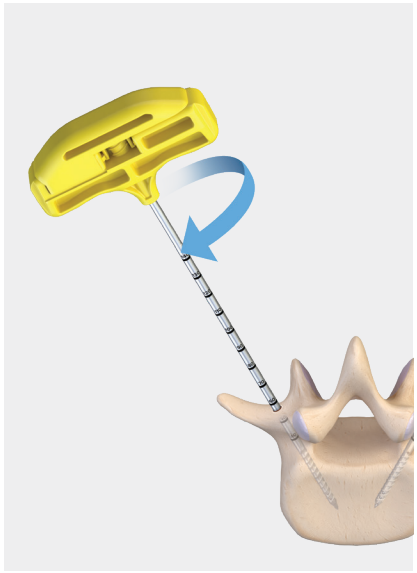
Guidelines only. Actual results may vary.

Vortex™ Threaded Bone Marrow Recovery Needle Insertion Methods

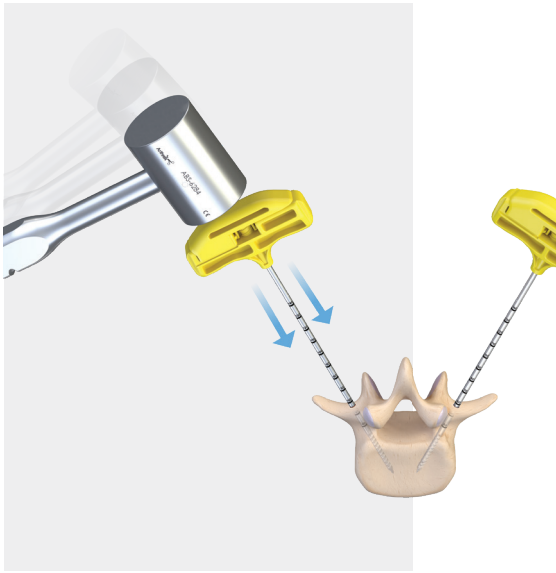
There are three options for inserting the Vortex bone marrow recovery needle. These methods can be used independently or in any combination.



Method 1
Connect the specially designed power adapter to the needle to aid insertion.



Method 2
Twist the needle manually into the bone.

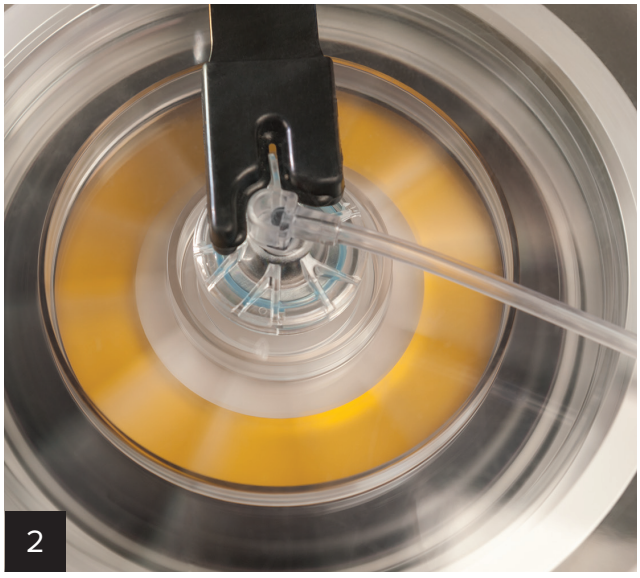


Method 3
Gently tap the needle into place using a mallet.

Arthrex Angel® cPRP Processing System

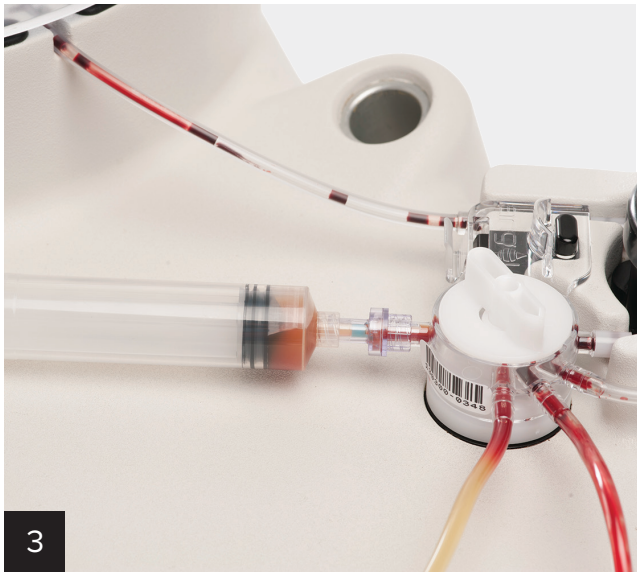
1

After the Angel system has been assembled and the operator has connected the heparin-flushed bone marrow filter to the “whole blood in“ compartment, introduce the citrated BMA. The ratio of citrate anticoagulant to whole blood, BMA, or a mixture of both is 1:7.



2

The Angel system can process 40 mL to 180 mL of whole blood, BMA, or a mixture of both in a single cycle. The approximate spin time for a 40-mL sample is 15 minutes. The approximate spin time for a 180-mL sample is 26 minutes.



3

PRP collection is automated. No manual steps are required for preparation and there are no syringes to change, buffy coats to resuspend, or plasma to decant. The automated process is driven by the 3-sensor technology employed by the Angel® system centrifuge.

4

The Angel system first collects PPP. Collection will stop when the 470 nm wavelength of light is absorbed by platelets. The Angel system will adjust the valve position to collect PRP until red blood cells are detected by the absorption of the 940 nm wavelength of light.

5

The PRP will be dispensed into the PRP collection syringe after the PPP is collected. To increase the volume of the PRP syringe by expanding with PPP, simply pull back on the plunger of the syringe. If PPP is desired, it may be withdrawn from the port on the PPP compartment.

6

The Angel system can process up to 180 mL in 1 cycle or a total of 3 cycles for the same patient with the same disposable.

Note: If BMA and peripheral blood will be processed separately, it is recommended that peripheral blood is processed first.

Allograft demineralized bone matrix (DBM) is optimal for combination with autologous, biologically active products. DBM putty, sponges and cortical fibers provide a grafting material with excellent handling characteristics when hydrated with a fluid such as PRP concentrate from BMA. Hydrated DBM provides a scaffold that is rich in growth factors, natural architecture, and interconnected porosity.

The Arthrex Angel cPRP and BMA processing kit is a convenient and rapid means of concentrating the cellular contents and growth factors contained in BMA.

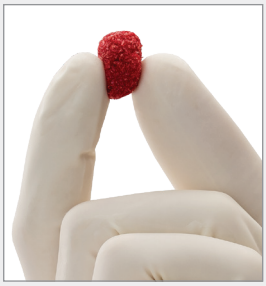
BoneSync™ Putty and Strips

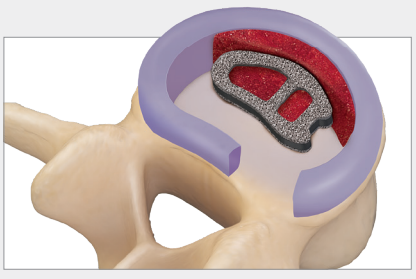
BoneSync DBM strip

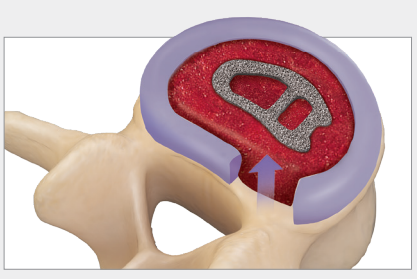
BoneSync DBM putty

AlloSync™ Expand Demineralized Cortical Fibers

Allosync Pure DBM







Additional Non-BMA Bone Repair Solutions

ArthroCell™ Cellular Bone Graft

AlloSync™ Putty, Gel, and Paste

Ordering Information

Product Description	Item Number
Angel® BMA Processing Kit, 8 ga closed tip, w/o ACD-A	ABS-**10062-TH8CT**
Angel BMA Processing Kit, 8 ga open tip, w/o ACD-A	ABS-**10062-TH8OT**
Angel BMA Processing Kit, 13 ga closed tip, w/o ACD-A	ABS-**10062-TH13CT**
Angel BMA Processing Kit, 13 ga open tip, w/o ACD-A	ABS-**10062-TH13OT**
Angel BMA Processing Kit with Vortex™ Threaded Recovery Needle, 8 ga closed tip, w/ ACD-A	ABS-**10062K-TH8CTA**
Angel BMA Processing Kit with Vortex Threaded Recovery Needle, 8 ga open tip, w/ ACD-A	ABS-**10062K-TH8OTA**
Angel BMA Processing Kit with Vortex Threaded Recovery Needle, 13 ga closed tip, w/ ACD-A	ABS-**10062K-TH13CTA**
Angel BMA Processing Kit with Vortex Threaded Recovery Needle, 13 ga open tip, w/ ACD-A	ABS-**10062K-TH13OTA**
Angel BMA Processing Kit with Vortex Threaded Recovery Needle, 8 ga closed tip, w/o ACD-A	ABS-**10062K-TH8CT**
Angel BMA Processing Kit with Vortex Threaded Recovery Needle, 8 ga open tip, w/o ACD-A	ABS-**10062K-TH8OT**
Angel BMA Processing Kit with Vortex Threaded Recovery Needle, 13 ga closed tip, w/o ACD-A	ABS-**10062K-TH13CT**
Angel BMA Processing Kit with Vortex Threaded Recovery Needle, 13 ga open tip, w/o ACD-A	ABS-**10062K-TH13OT**
Angel System Centrifuge	ABS-**10060**
Angel System Centrifuge, refurbished	ABS-**1006OR**
Arthrex Biologics Cart	ABS-**10100**

To order, please call Arthrex, Inc. at **(800) 933-7001**. Contact your local Arthrex representative for additional information.

Reference

1. McLain RF, Boehm CA, Rufo-Smith C, Muschler GF. Transpedicular aspiration of osteoprogenitor cells from vertebral body: progenitor cell concentrations affected by serial aspiration. *Spine J*. 2009;9(12):995-1002.

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 and/or outcomes.

View U.S. patent information at www.arthrex.com/corporate/virtual-patent-marking

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