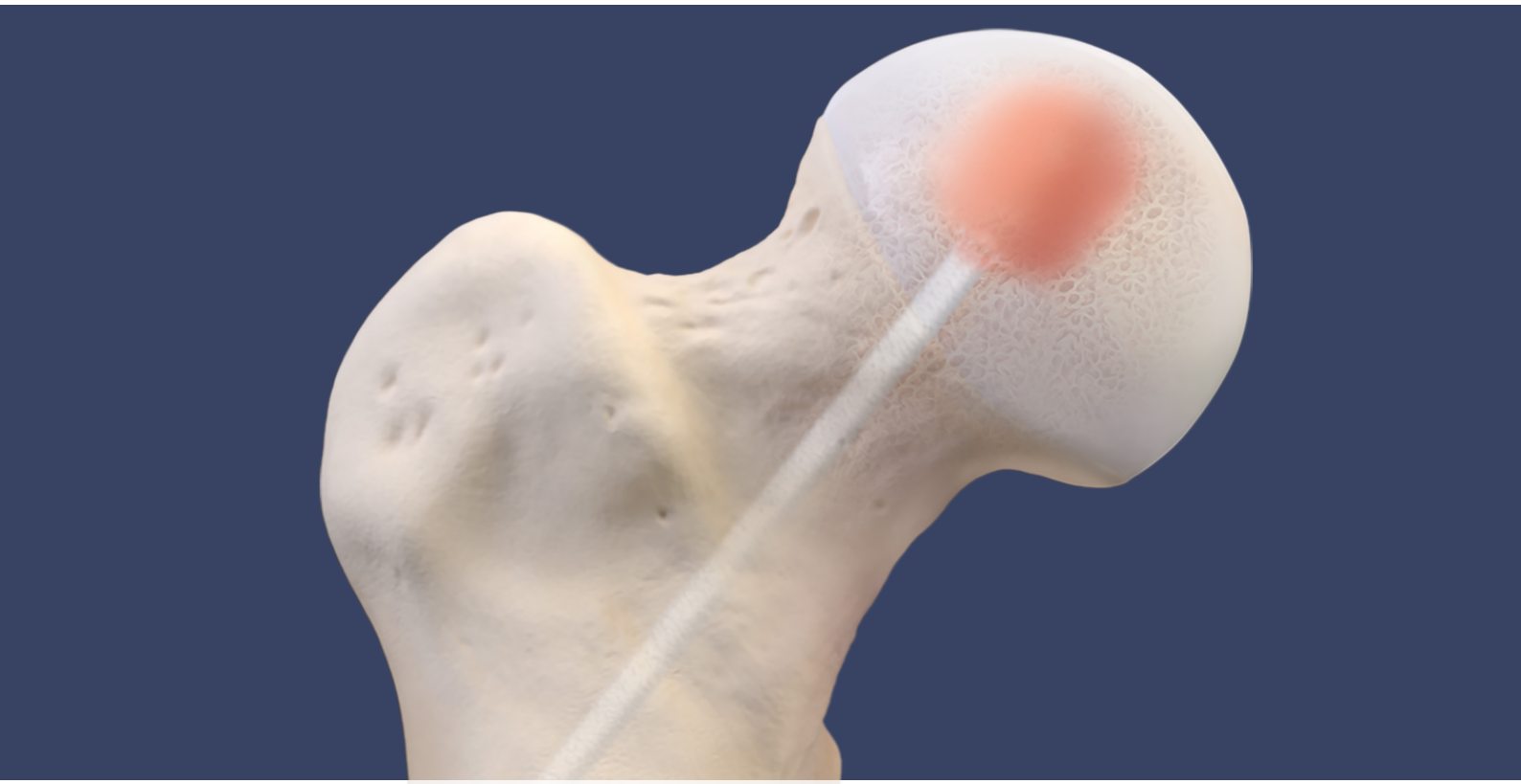
Core Decompression for Avascular Necrosis of the Hip Using an Expandable Reamer

Surgical Technique



Arthrex®

Hip Avascular Necrosis (AVN) Introduction

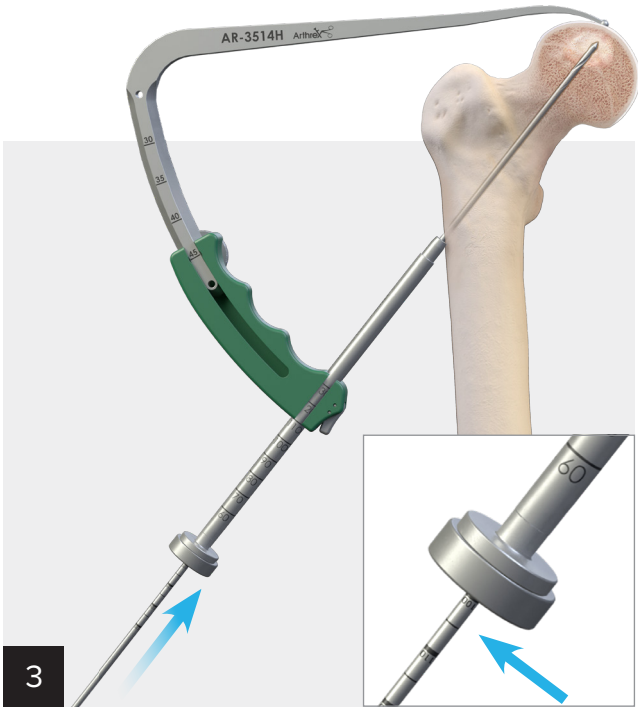
Avascular necrosis in the femoral head occurs when there is a loss of blood supply to the bone that results in the eventual death of the bone. Left untreated, the end result is an eventual collapse of the affected bone. At this stage, total hip arthroplasty is commonly performed.

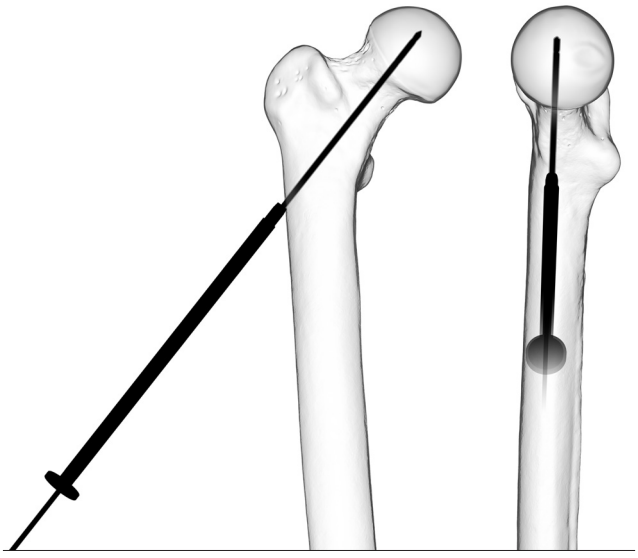
The surface of the femoral head is made up of articular cartilage with subchondral bone found below this surface. Avascular necrosis of the femoral head is located in this subchondral region and results from an interruption of the blood supply to the femoral head. It is typical of AVN of the hip to cause pain in the groin, buttock, and anterior portion of the thigh when weight is placed on the hip joint.

The goal of this technique is to treat the AVN with decompression and removal of the necrotic bone, which is typically found 5 mm-10 mm below the articular cartilage of the femoral head. Using arthroscopic and fluoroscopic guidance as a reference, the instruments allow for treatment of AVN lesions of the femoral head. Once the lesion is decompressed, Arthrex offers multiple biologic options to backfill the socket and cavity.

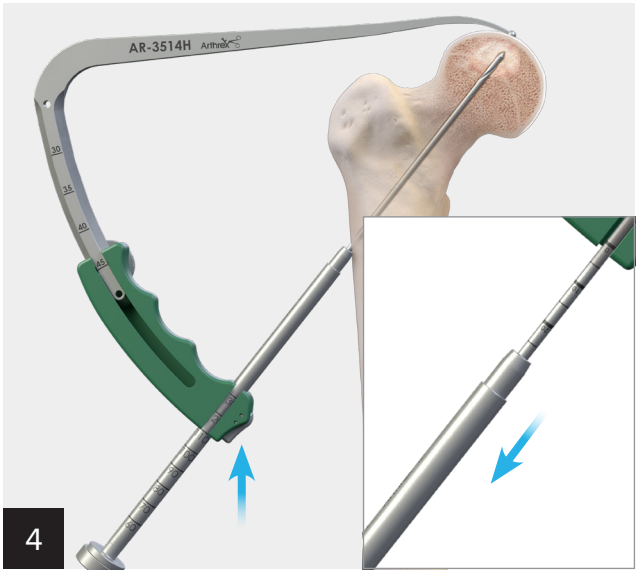
After initial assessment of the hip joint with the arthroscope through the anterolateral portal, switch the scope to the midanterior portal. Place the arthroscopic drill guide through the anterolateral portal, making contact with the anterosuperior femoral head in line with the AVN defect.

Place the 5 mm drill guide sleeve and the blunt obturator flush against the lateral cortex of the femur approximately 30 mm distal to the superior tip of the greater trochanter. Reference the intraosseous distance off of the calibrated 5 mm drill guide sleeve. Once the 5 mm drill guide sleeve is flush against bone, remove the blunt obturator and insert the 2.4 mm drill sleeve.

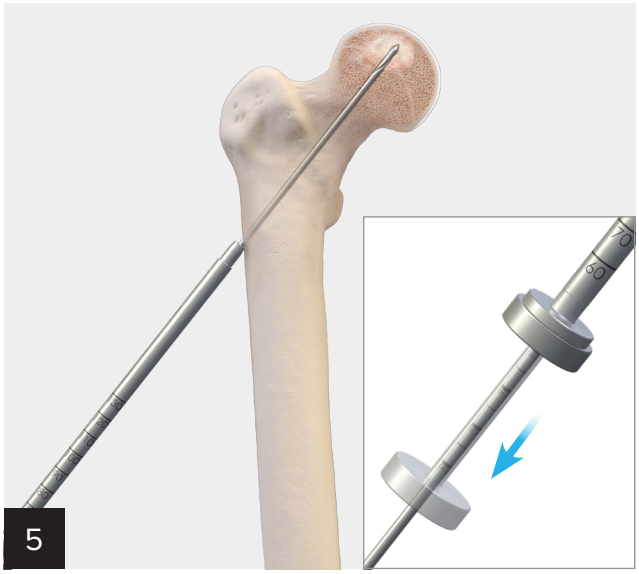




Insert the 2.4 mm calibrated guide pin through the arthroscopic drill guide and, under fluoroscopic view, drill to the desired depth. Reference the drilling depth of the 2.4 mm calibrated guide pin from the back of the 2.4 mm drill sleeve insert.

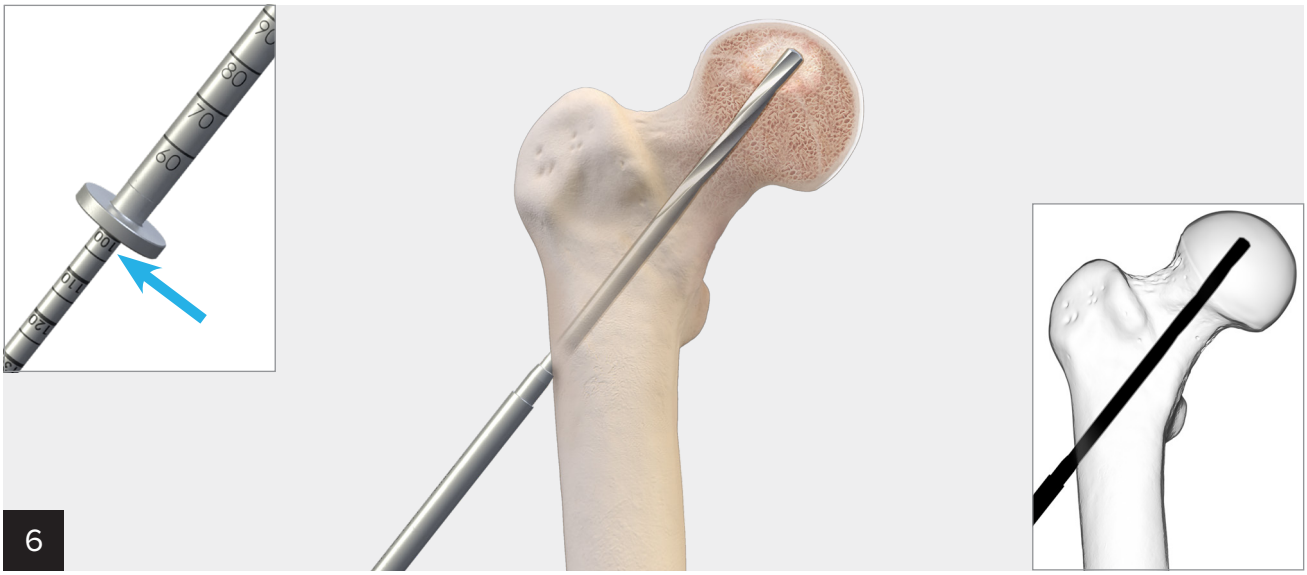


Once the desired 2.4 mm pin placement is achieved, press the release button on the drill guide handle and slide the 2.4 mm and 5 mm drill sleeves backwards enough to remove the drill guide handle and marking hook.



Slide the 2.4 mm drill sleeve insert and 5 mm drill sleeve over top of the 2.4 mm drill pin back up to bone.

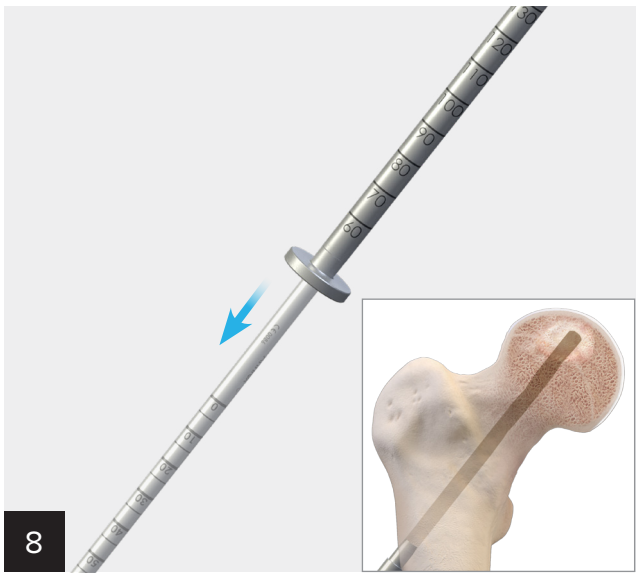
Note: The drill guide handle and targeting piece are now removed.



Advance the 5 mm reamer under fluoroscopic guidance to the same depth as the previously placed 2.4 mm drill pin.

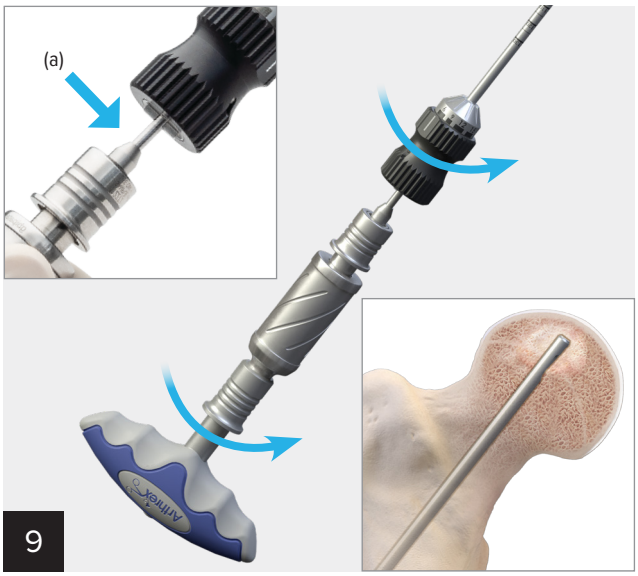
Note: Be mindful the 2.4 mm drill pin is not advancing proximally during overdrilling.

Mallet the drill sleeve 10 mm into the lateral cortex and ensure it maintains the same trajectory as the cannulated reamer.



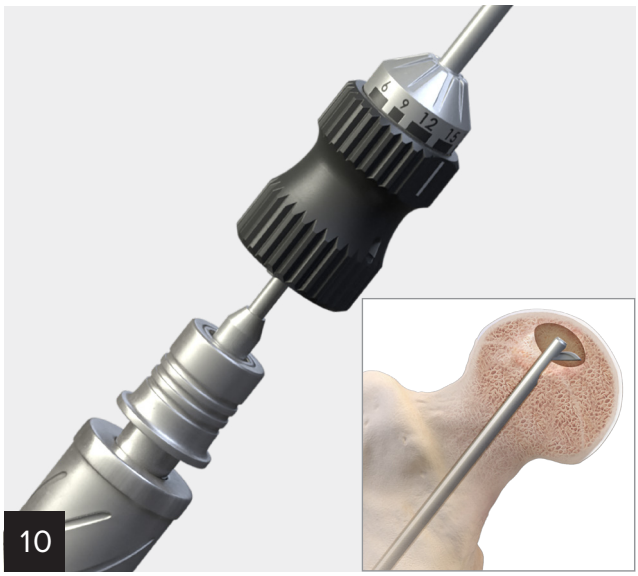
Remove the 5 mm cannulated reamer on power so that only the 5 mm drill sleeve is left in place.

Note: If the 2.4 mm drill pin does not withdraw with the reamer, remove the pin.



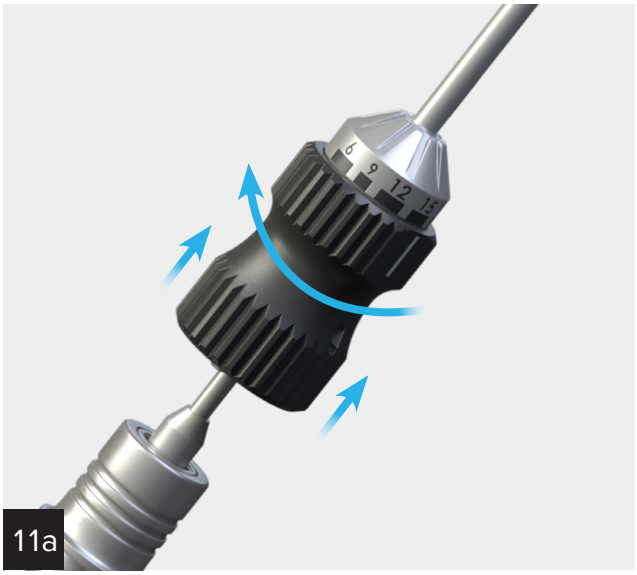
Hold the expandable reamer just below the black knob **(a)**. Insert the reamer through the 5 mm drill sleeve and advance to the proximal end of the socket. With one hand, grip the T-handle and open the blade with the other by twisting clockwise until a click is felt. Rotate the expandable reamer clockwise and counterclockwise until there is no resistance.

Note: The expandable reamer should only be expanded one or two clicks at a time by turning the knurled knob clockwise.



Incrementally adjust the expandable reamer one click at a time until the desired socket diameter is achieved to remove all of the necrotic bone. If the expandable blade is opened too far initially, then the blade may experience too much torque and may not cut effectively.

Note: Check the blade under fluoroscopy to ensure the cartilage is not violated.



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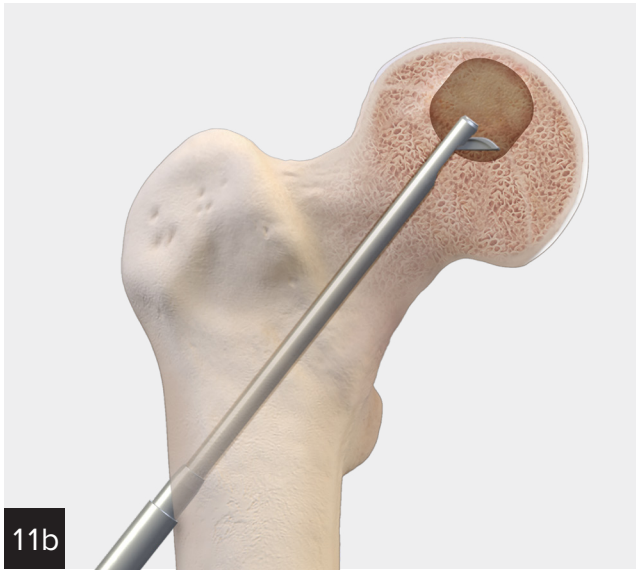
If too much torque is encountered in the bone, the torque limiter will engage and not allow the blade to spin inside the socket. If this happens, reduce the diameter of the cutting blade by pushing the knurled knob forward and twisting counterclockwise. Once the blade turns easily, expand the blade one or two clicks at a time and rotate the reamer by hand until the necrotic bone is removed. If the torque limiter continues to prevent cutting, remove the expandable reamer and lavage the socket. To retract the blade inside the expandable reamer, push up on the knurled portion and twist counterclockwise until the white laser line is at the fully closed position to the left edge of the 6 setting.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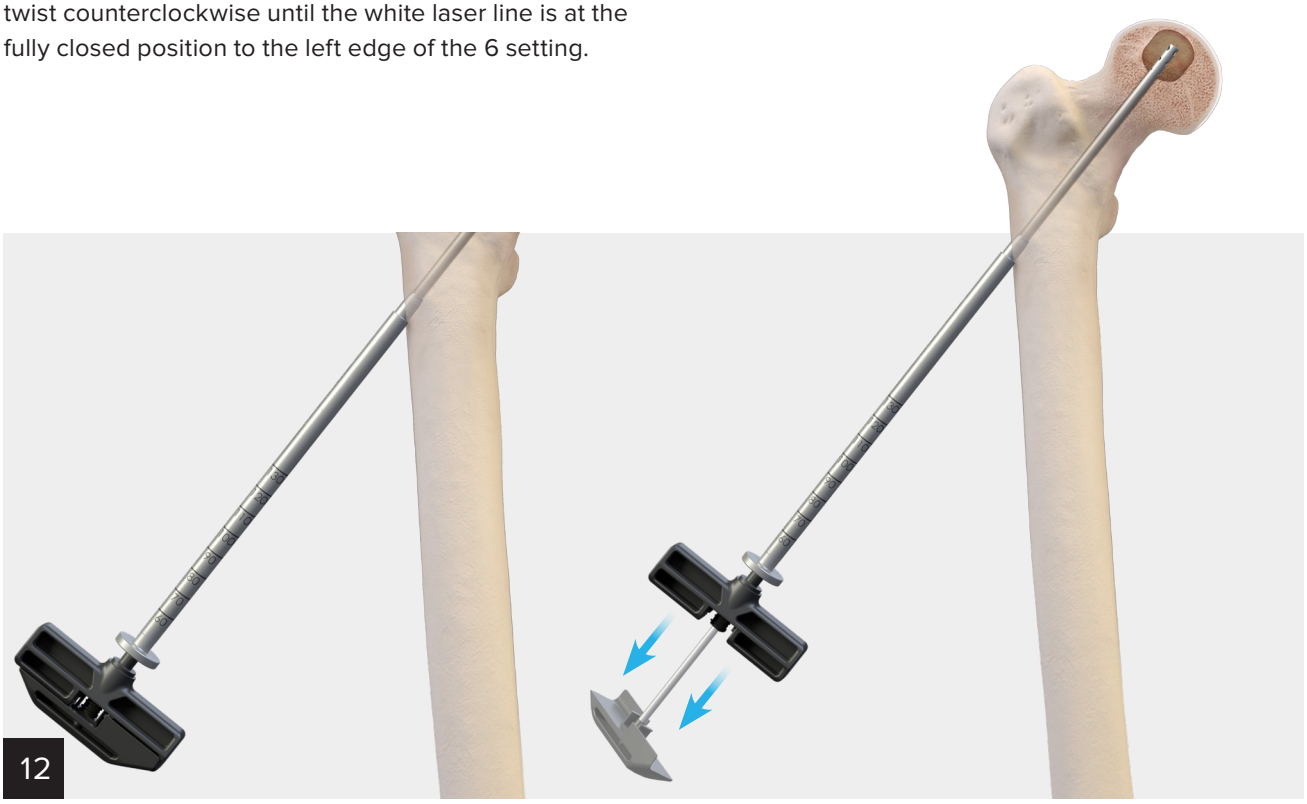
Once the blade has been expanded enough to decompress the lesion, pull backwards while rotating the handle to create a longer socket. The socket depth can be referenced off the 5 mm drill sleeve like the other drilling instruments. After reaming is complete, remove the expandable reamer. To retract the cutting blade, push the knurled knob forward and twist counterclockwise.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Insert the biologics delivery cannula into the prepared socket and remove the inner stylet. Flush out the defect with a combination of fluid and suction attached to the distal end. This will help ensure all bone debris and necrotic tissue have been removed.

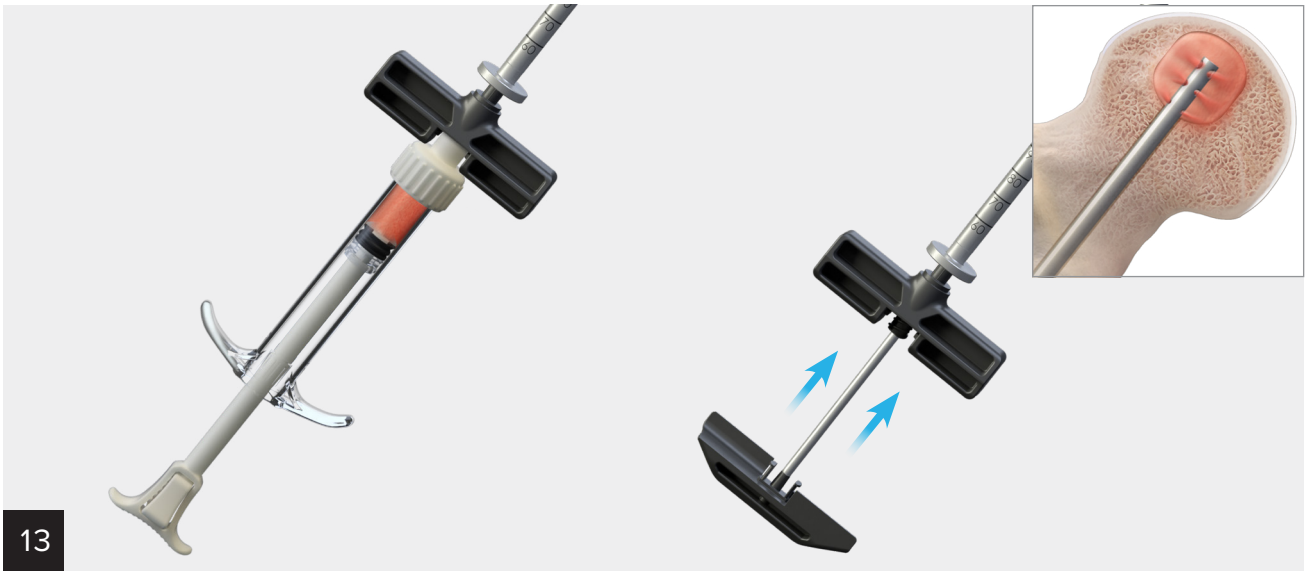
Hip AVN Technique With AlloSync™ Pure Demineralized Bone Matrix

Transfer PRP/BMA into a separate sterile basin and draw into a syringe.

Fill the mixing and delivery syringe with AlloSync Pure demineralized bone matrix (DBM). Use a female-to-female luer adapter to connect the PRP/BMA syringe. Add the autologous fluid to the mixing and delivery syringe in a 5:3 ratio of DBM to fluid.

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

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



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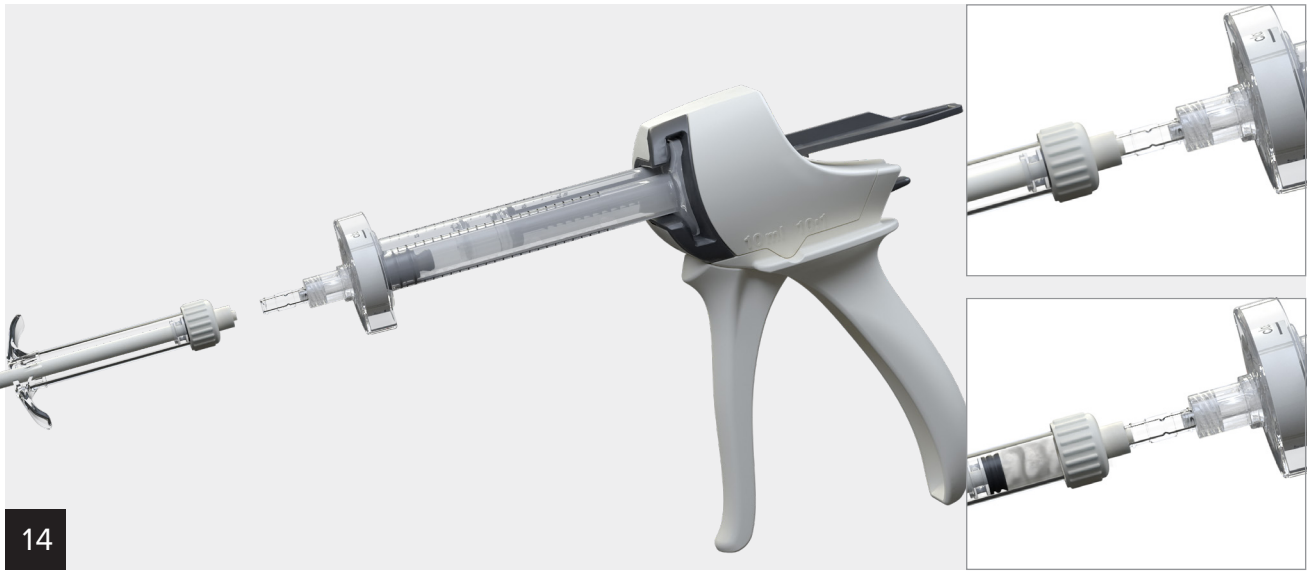
Attach the mixing and delivery syringe to the biologics delivery cannula and slowly inject the material until the syringe is empty. In order to fill the void created by the expandable reamer, use the inner stylet to expel DBM mixture from the delivery cannula.



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Quickset™ cement can be used to backfill the rest of the remaining 5 mm socket (the preparation steps for preparing Quickset cement are outlined on page 11 of this surgical technique guide). After preparing the Quickset cement, transfer it into a mixing and delivery syringe. Delivery from the syringe will reduce the chance of overpressurization during delivery.

Quickset is a trademark of Graftys, S.A.

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Slowly inject the Quickset™ cement into the delivery cannula until the syringe is empty. The inner stylet can then be used to help deliver any additional Quickset cement that remains in the drill sleeve. As the cement is being expelled, slowly retract the delivery cannula to backfill the entire length of the drilled socket.

AlloSync™ Pure Demineralized Bone Matrix

AlloSync Pure is a dehydrated osteoinductive and osteoconductive demineralized bone matrix derived from 100% human allograft bone with no extrinsic carriers. AlloSync Pure bone matrix resists irrigation and can be used in a fluid environment. Clinicians can control the handling properties of AlloSync Pure bone matrix, which includes decreasing the viscosity for injectable applications or increasing the viscosity to add autograft and/or allograft.

Features and Benefits

AlloSync bone products may provide osteoinductive and osteoconductive properties:

- Osteoinduction – signaling molecules such as bone morphogenetic proteins (BMPs) that aid in cell differentiation down osteoblastic pathways
- Every lot of DBM is tested for osteoinductive potential, using either an in-vitro assay or in-vivo model
- Osteoconduction – scaffolding from DBM particles for osteoblasts to form new bone
- Additional scaffolding properties are provided in AlloSync cancellous bone (CB) with the addition of cancellous bone chips

Superior handling characteristics via the reverse phase medium (rpm) carrier:

- RPM is an inert, biocompatible copolymer made from polypropylene oxide and polyethylene oxide
- Material is flowable at room temperature and thickens to become more viscous at body temperature
- RPM allows the DBM graft to be moldable and packed into any defect size or shape
- AlloSync bone products will resist irrigation and can be used in a fluid environment without the fear of graft migration, unlike some other DBMs

AlloSync bone products offer ease of use and terminal sterility:

- Provided as a ready-to-use, off-the-shelf product that requires no thawing or premixing
- Terminal sterilization using electron beam results in a sterility assurance level (SAL) of 10-6 – process is not harmful to the DBM or its bioactivity
- Some competitive DBM products are only offered as aseptically processed products – SAL of 10-3
- Room temperature storage

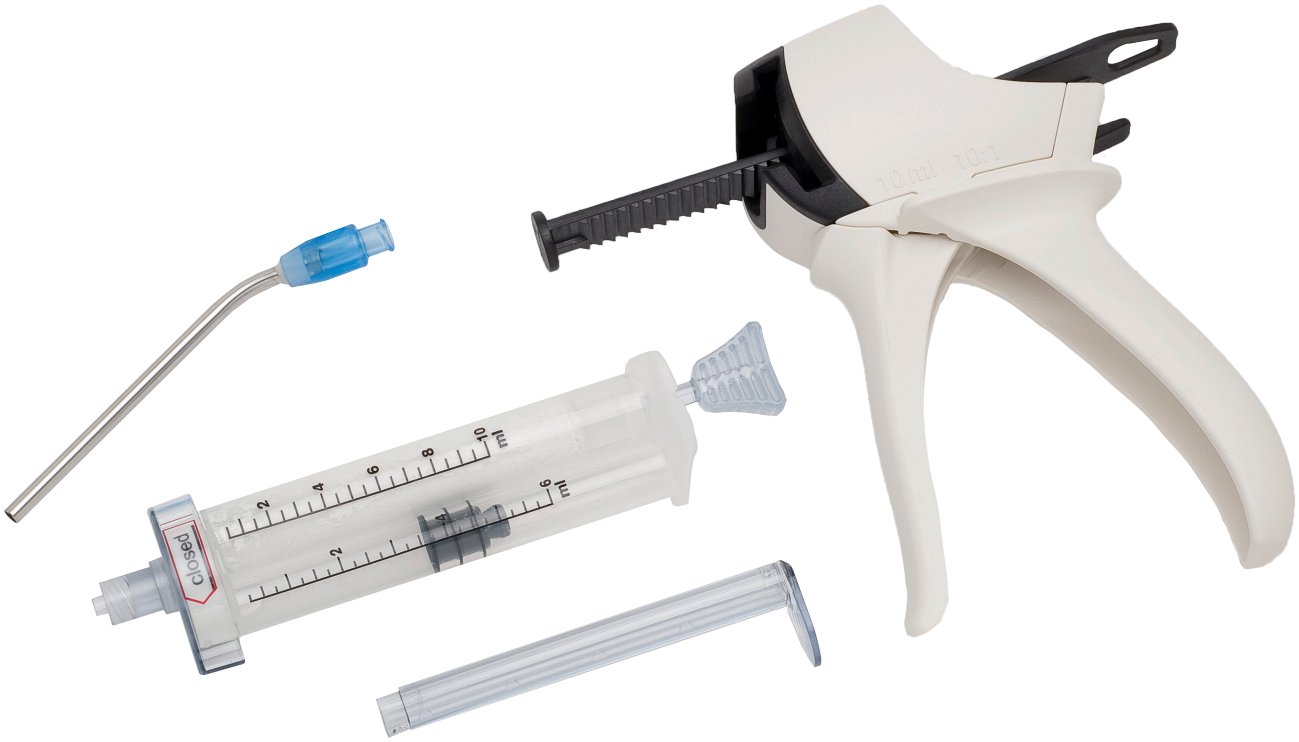
Quickset™ Calcium Phosphate Cement

The key to bone graft resorption and substitution is the porosity of the bone graft being used. Arthrex Quickset cement was designed to maximize porosity on a micro and macro scale without compromising the material's strength or injectability.

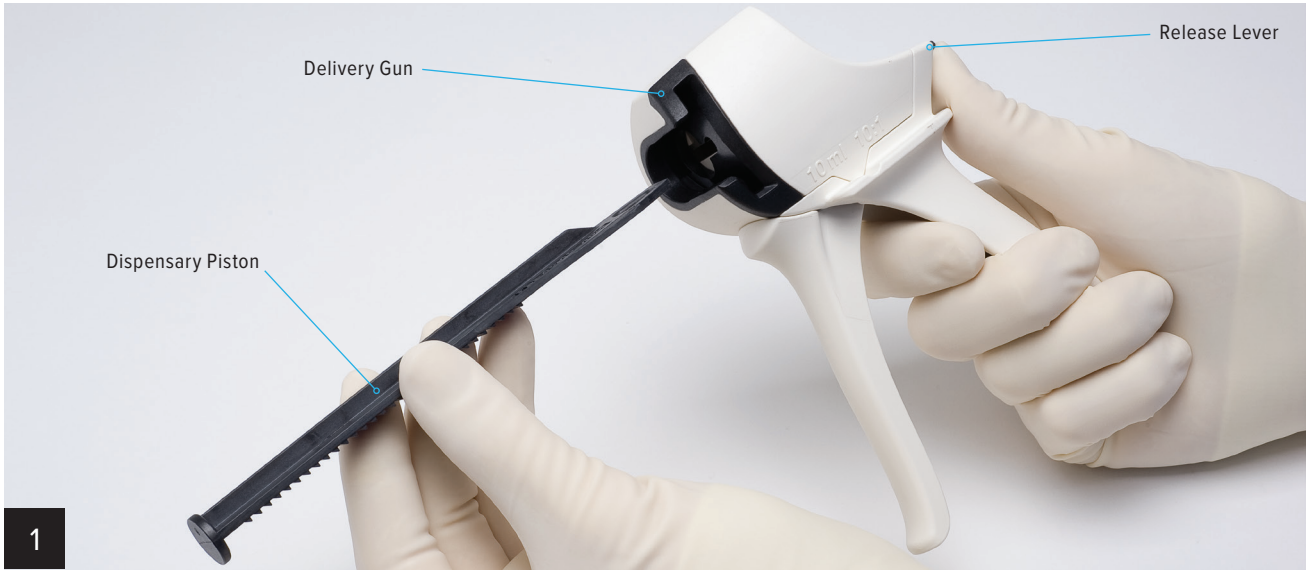
Features and Benefits

Arthrex Quickset is a macroporous, injectable, hardening, resorbable bone cement provided in an easy-to-use, closed mixing system:

- The mixing system is a dual-chambered syringe containing a powder and mixing liquid
- The powder chamber contains a mixture of calcium phosphates and an organic polysaccharide polymer; the polysaccharide is a highly biocompatible polymer that optimizes viscosity, cohesiveness, and macroporosity
- The mixing liquid consists of a sodium phosphate solution, which facilitates the setting time (crystallization) of the Quickset cement
- The end product is a calcium-deficient apatite very similar to the mineral phase of bone



Quickset™ Cement: Directions for Use



Lift up on the release lever and insert the dispenser piston (teeth facing down). Guide the piston through the delivery gun until it is flush.

Rotate the collar to “transfer.” Hold the syringe with the tip facing upwards, insert the pushrod into the liquid chamber and advance it until all the liquid has passed into the powder chamber.

Push and pull the mixing element back and forth while rotating it in a repeated left-to-right motion for 2 minutes.

After mixing, pull the mixing element as far back as possible; bend until it breaks at its base.

Rotate the collar to “inject.” Insert the syringe into the gun with the markings on the syringe facing upwards. Compress the trigger to push the piston forward and expel any excess air.

Connect the 7G cannula to the syringe and dispense the resorbable bone cement. To inject a second dose, press up on the release lever, pull back the piston to its starting point, remove the first syringe and insert a second syringe.

Ordering Information

AVN and OCD Reaming Set (AR-**3510S***)

Product Description	Item Number
Kits	
AVN Disposable Kit	AR-**3519H**
OCD Knee Kit	AR-**3519K**
Instruments	
Universal Marking Hook, AVN Universal Marking Hook, OCD	AR-**3514H** AR-**3514K**
Drill Guide Handle, AVN	AR-**1510HH**
Drill Sleeve, AVN Drill Sleeve, OCD	AR-**3515H** AR-**3515K**
Drill Sleeve Insert, AVN Drill Sleeve Insert, OCD	AR-**3516H** AR-**3516K**
Blunt-Tip Obturator, AVN Blunt-Tip Obturator, OCD	AR-**3515HD** AR-**3515KD**
T-Handle	AR-**623-27**
Torque Adapter	G**207163**
Side-Release RetroConstruction™ Handle	AR-**1510HR**
Slotted Mallet	AR-**9231-21**
AVN/OCD Instrument Case	AR-**3510C**

*The torque limiter in instrument set (AR-**3510S**) should be sent in for calibration either after six months of use, 150 autoclave cycles, or approximately 3000 “clicks,” whichever occurs first. Contact the Service and Repair Department at Arthrex for further instructions.

AlloSync™ Pure

Product Description	Item Number
1 cc	ABS-**2010-01**
2.5 cc	ABS-**2010-02**
5 cc	ABS-**2010-05**
10 cc	ABS-**2010-10**

AlloSync DBM Gel

Product Description	Item Number
DBM Gel, 1 cc	ABS-**2013-01**
DBM Gel, 5 cc	ABS-**2013-05**
DBM Gel, 10 cc	ABS-**2013-10**

Quickset™ Cement

Product Description	Item Number
Quickset, 5 cc	ABS-**3005**
Quickset, 8 cc	ABS-**3008**
Quickset, 16 cc	ABS-**3106**

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 your Arthrex representative 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 and/or outcomes.

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