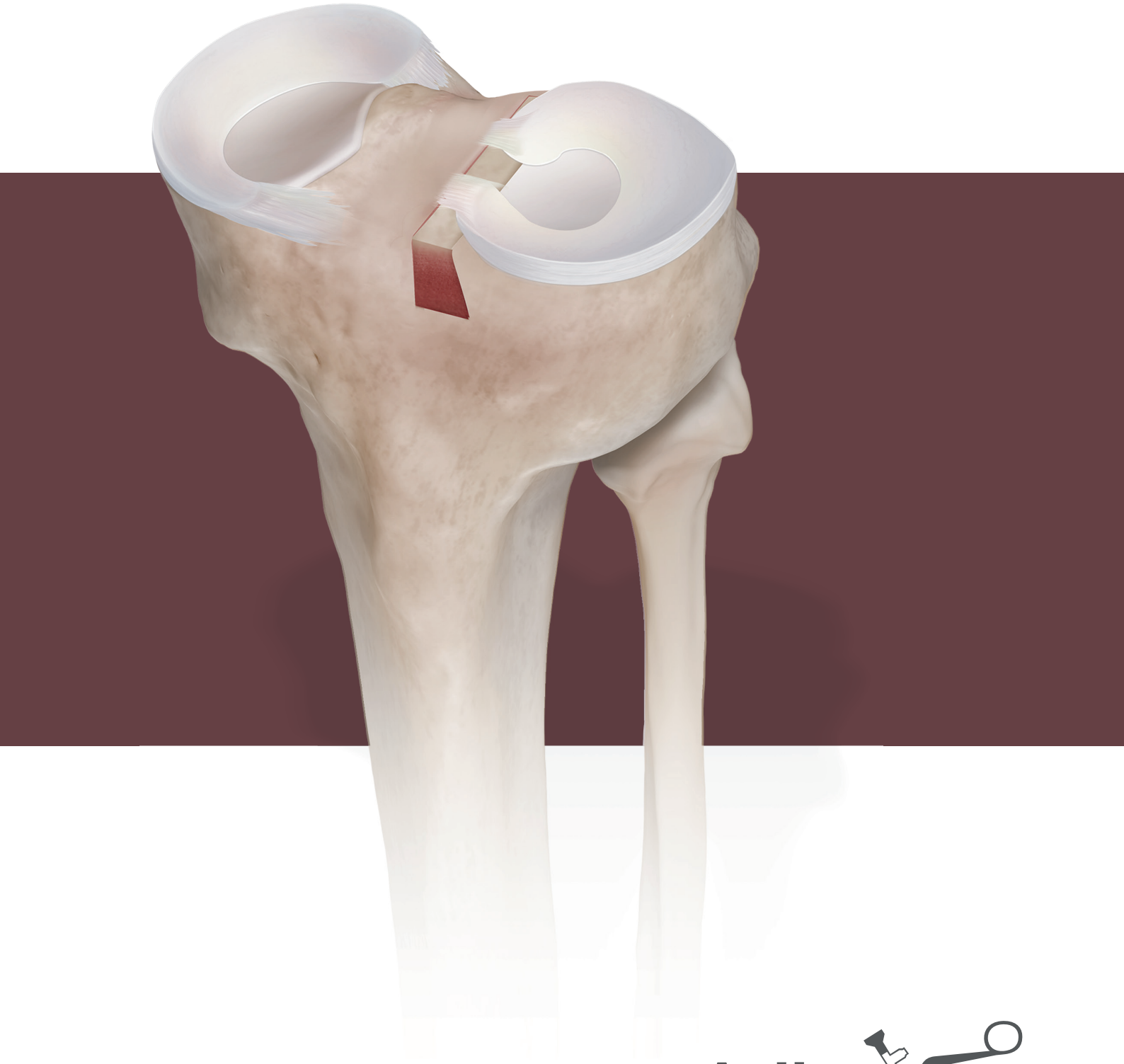
Meniscal Allograft Transplantation Featuring Dovetail Meniscal Allograft

Surgical Technique



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Introduction

Meniscal allografts have been found to be a feasible alternative in the effort to limit sequelae of arthritis that can occur with meniscal excision. Current data demonstrates that meniscus allograft transplantation provides good to excellent results in terms of pain, function, and activity levels in as many as 85% of patients at up to 8 years following transplantation.[1,2] The surgical technique for meniscal allograft transplantation of the knee continues to evolve.

Simplified graft preparation and recipient tibia preparation, to allow for the transplant to be positioned anatomically and anchored with reliable fixation, is the ultimate goal of the procedure.

The dovetail technique simplifies graft preparation with a time-saving series of cuts preparing the bone component of the graft to sit securely in the recipient semitrapezoidal slot created in the tibia. A matching semitrapezoidal shaped recipient slot created in the tibia with a series of step drills, rasps, and dilators matches the bone block preparation.

Subsequent peripheral graft fixation to the capsular rim with 2-0 FiberWire® suture achieves the goal of creating a solid meniscal allograft construct. Preferably performed for lateral meniscal incompetence, the dovetail technique anatomically recreates the normal lateral meniscal relationships within the knee.

Healing of the allograft meniscus through the combination of peripheral capsular sutures and graft to host bone lends to the decision of the surgeon to proceed with a functional rehabilitation.

Indications[3]

- Patients younger than 50 years old with a chief complaint of pain limiting their desired activities
- BMI <35 kg/m^2
- Previous meniscectomy (or nonviable meniscus state) with pain localized to the affected compartment
- Normal or correctable coronal and sagittal alignment
- Normal or correctable ligamentous stability
- Normal or correctable articular cartilage
- Willingness to comply with rehabilitation protocol
- Realistic postsurgical activity expectations

Preoperative Radiographs

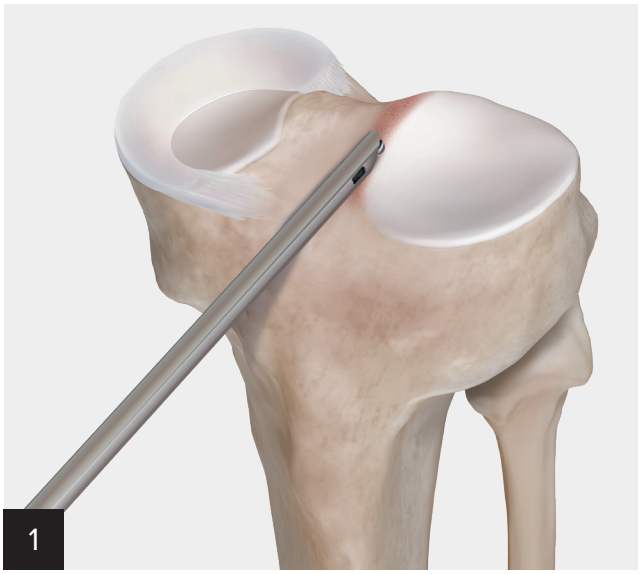
The preoperative x-rays listed below are necessary to evaluate the knee joint and determine appropriate meniscal allograft sizing.[4] Magnification markers are required to obtain a properly sized allograft meniscal transplant. **Note: MRI scans may be helpful in evaluating the knee joint and can be used for accurate transplantation matching.**

- 45° flexion P/A weight-bearing (with magnification marker)
- Standing A/P
- Non–weight-bearing lateral (with magnification marker)
- Merchant view
- Long-cassette alignment view

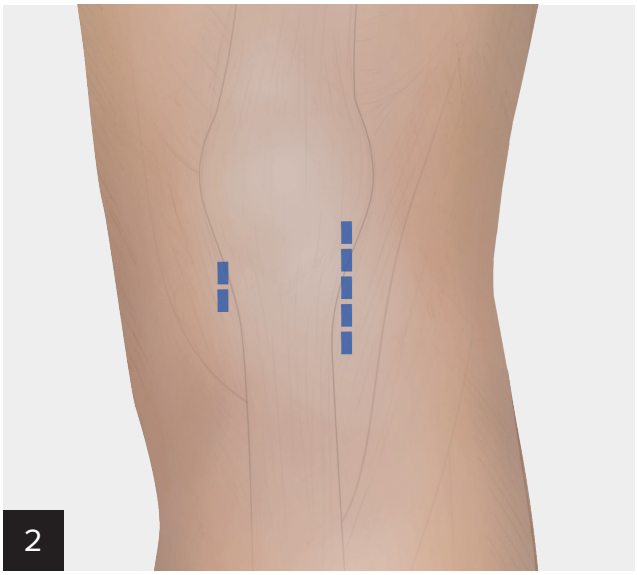
Meniscal allograft transplantation technique is best performed by a combined arthroscopic and arthroscopically assisted mini arthrotomy overlying the lateral peripatellar tendon region. An additional incision along the lateral side of knee is necessary for suture fixation of the transplant to the lateral capsule.

The procedure is begun with a standard diagnostic arthroscopy. Customarily for this technique the medial portal is initially created so as to align the lateral portal with visualization over the anterior horn attachment site.

Portals are created with particular attention made to the lateral portal, which is made in line with the anterior horn attachment of the lateral meniscus, closely approximating the lateral edge of the patella tendon. The arthrotomy will incorporate this portal in the later stages of the procedure. Debridement of the meniscal remnant is carried out to the peripheral capsule and a tuft of capsular attachment of meniscus is left to serve as a reference for anchoring of the transplant and to provide secure tissue to sew into peripherally.



Using a CoolCut™ burr, flatten the lateral spine to create a slight trough invading the cortex of the tibial plateau and parallel to the articular surface. This path falls in line with the posterior and anterior horn attachments and will serve as the area where the trapezoidal bone trough will be created. Both anterior and posterior horn attachment sites should be readily visualized.

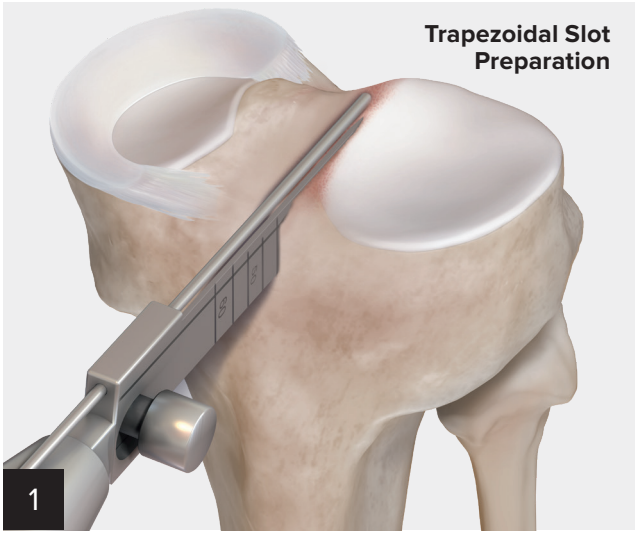


Make a lateral peripatellar incision by extending the lateral portal incision. Initially, leave the capsule intact to enable continued arthroscopic technique and avoid fluid extravasation. Make the incision just lateral and in line with the patellar tendon. A right angle retractor may be used to retract the patellar tendon, exposing the anterior horn of the meniscus, which is subsequently debrided. The incision will be used to create the trapezoidal bone slot.

Tibial Preparation Options

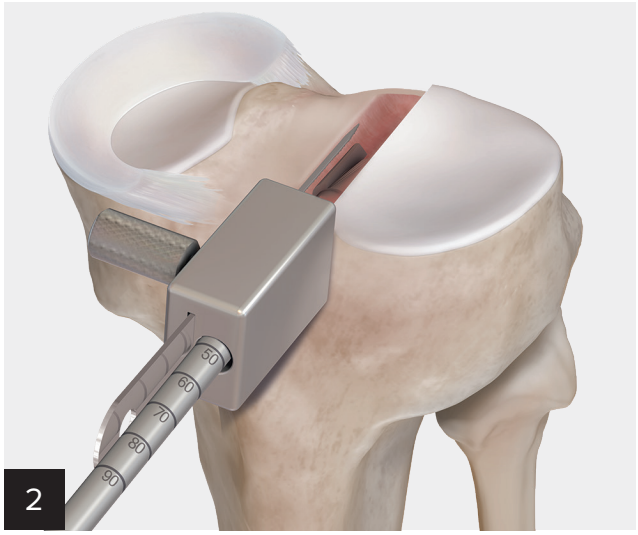
This technique will provide two options for preparing the tibia for the dovetail bone block of the meniscal allograft – an Osteotome Guide Option and a Drill Guide Option.

Osteotome Guide Option

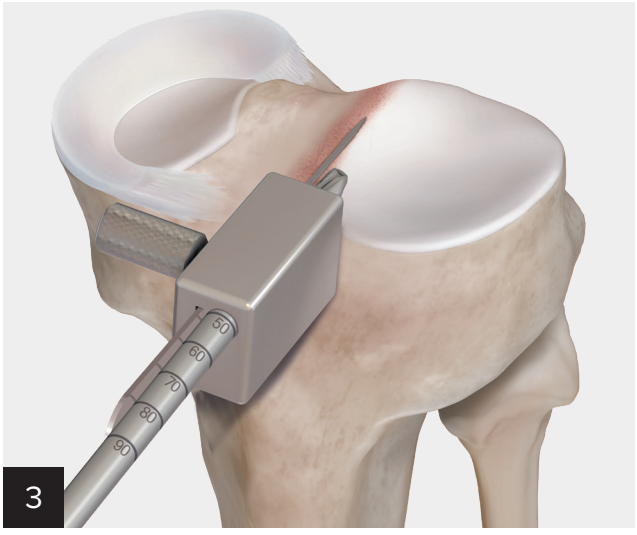


Select the alignment rod and position it along the burred area of tibial plateau to align with the anterior and posterior horn attachments. Orient the osteotome, with depth line and length markings, vertically just off the patella tendon and is advanced using a mallet into the tibial plateau. **Note: The depth line is used to reference positioning of the osteotome in line with the A/P slope of the tibia.**

Advance the osteotome while maintaining direct visualization with the arthroscope placed through the anteromedial portal, until it contacts the posterior cortex of the tibia plateau.

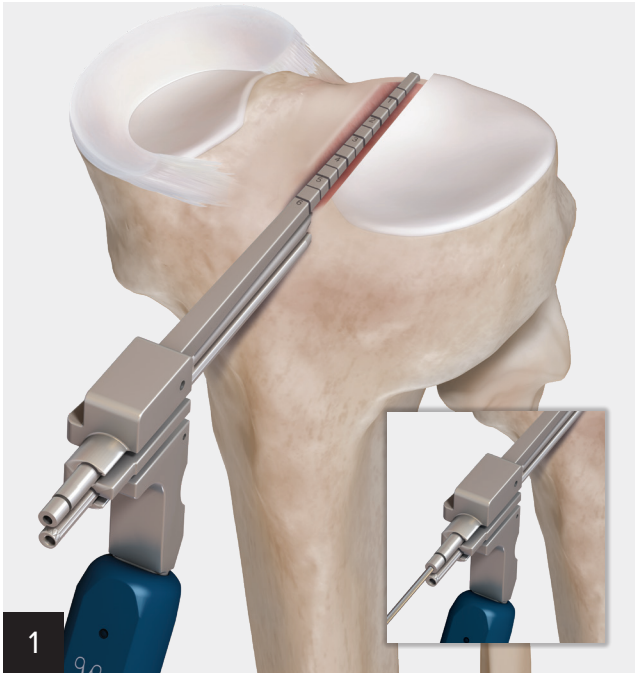


Select the 6 mm drill and advance it into the tibia under power and direct visualization until it contacts the posterior tibia cortex. Use the depth markings on the drill to reference the osteotome's depth. With proper advancement, the superior surface of the tibia will be removed. **Note: Take care to avoid penetration through the posterior cortex or migration superiorly into the lateral femoral condyle.**

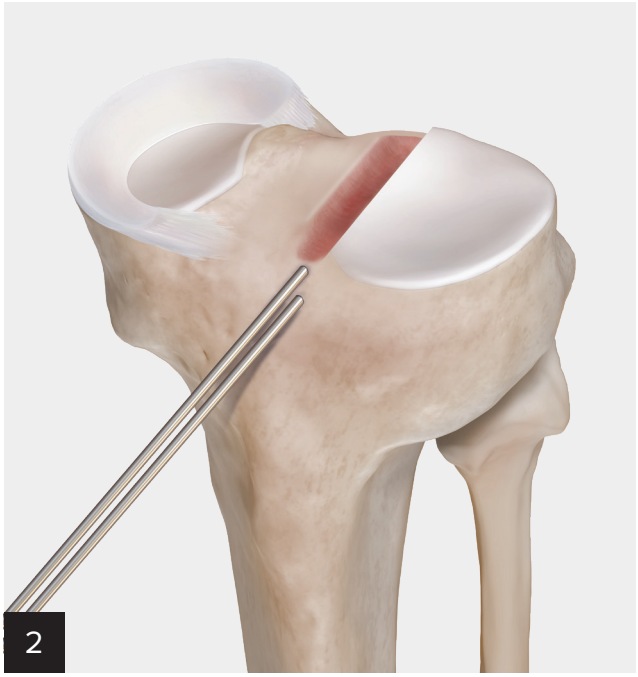


Clear the tunnel of the bone remnants from drilling, then secure cutting guide #2 to the osteotome in similar fashion as described previously. Pass a 7 mm drill through the guide using power to advance, maintaining visualization until the drill contacts the posterior tibial cortex. **Note: Completion of drilling with the 6 and 7 mm drills begins the process of creating the trapezoidal-shaped recipient site. A curette may be used to further debride the tunnel created prior to proceeding with the trapezoidal rasp and dilator.**

Drill Guide Option

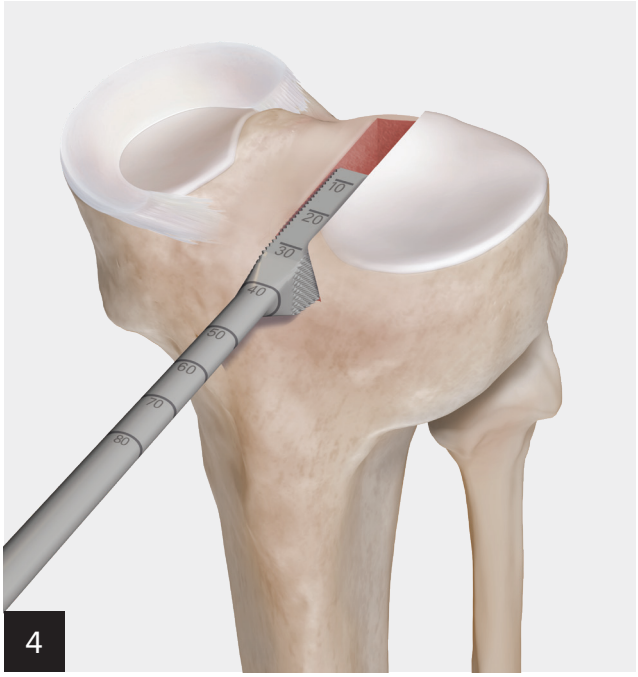


Maneuver the end of the marking hook and firmly grasp the posterior tibia, resting the hook in the burred area. Insert the full round drill sleeve into the proximal passage of the drill guide and advance to bone. A tibial A/P measurement can be read off the graduations of this drill sleeve. Insert and advance the keyed drill sleeve into the distal passage of the guide according to laser markings. RL/LM facing up for a right lateral or left medial and RM/LL facing up for a right medial or left lateral.

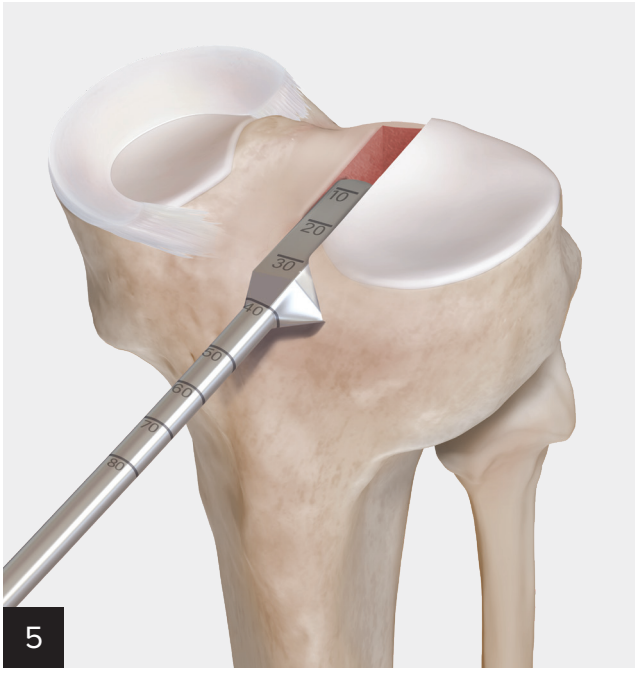


Drill the 2.4 mm guidewires through the drill sleeve, taking care not to drill through the posterior cortex. A depth stop is provided to help facilitate this drilling. Once the guidewires are placed, the drill sleeves can be removed. It is easier to remove the distal keyed drill sleeve first and then remove the proximal drill sleeve. The guide body can also be removed from the joint space. The result is two guidewires with the distal set at an offset, away from the tibial spine.

Ream a 6 mm tunnel over the proximal guidewire. Ream a 7 mm tunnel over the distal guidewire and remove the guidewire. **Note: Caution should be taken to avoid drilling through the posterior cortex.** It helps to use a grasper to hold the distal guidewire out of the way when reaming the 6 mm tunnel. The proximal guidewire can be removed. The result shown is the beginning of the dovetail bone slot that can be finished with the existing bone rasps and dilators.

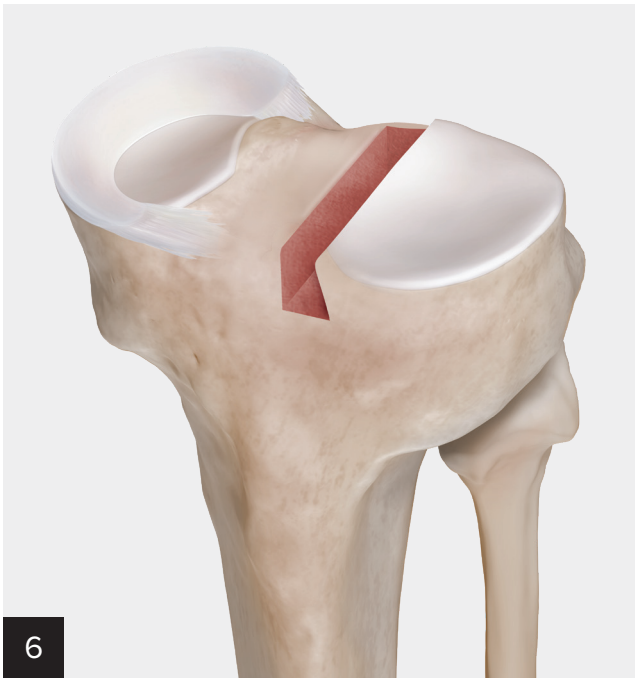


Insert the appropriate sided dilating rasp into the slot created (vertical side towards the midline). **Note: top of the rasp should remain flush to the articular surface of the tibia.** Slowly advance the rasp with a combination of malleting and hand rasping until it reaches the posterior tibial cortex. **Note: The rasp should follow the A/P slope of the tibia throughout its course. Its position will reflect the bone graft component of the transplant.**



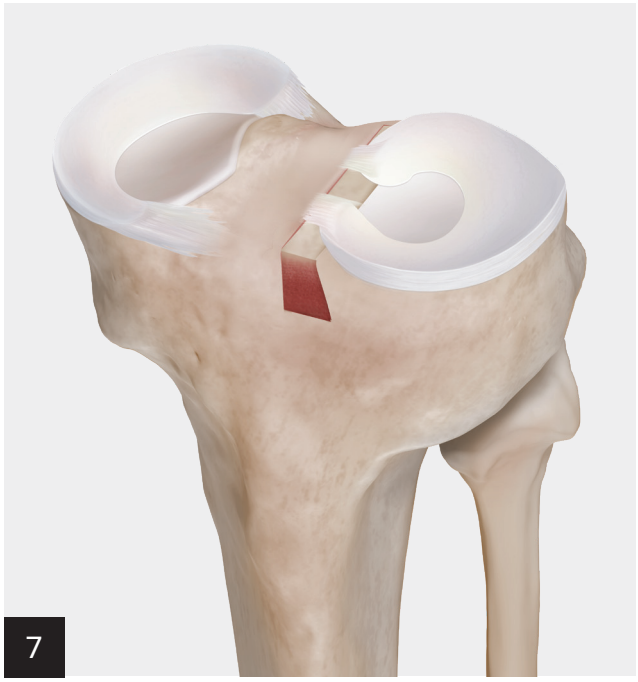
Select the appropriate sided dovetail meniscal allograft dilator and insert it into the trapezoidal slot until it contacts the posterior cortex of the tibia. The rasp or curette may be exchanged to fine-tune the slot prior to graft placement.

Drill Guide Option (Cont.)



6

Begin final preparation for passing of the graft into the recipient slot. Clear the trapezoidal slot of remaining bone debris in the posterior portion of the tibia. As the graft is delivered to the field, lead the graft passing suture out the posterior lateral capsule via a standard inside/out meniscal suturing technique.



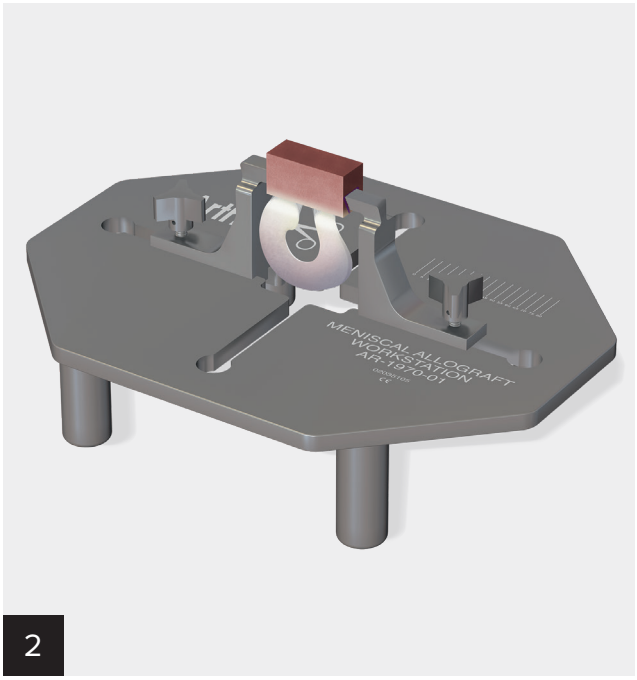
7

Use a dovetail meniscal allograft tamp to position the bone block into the slot. Bring the knee into a figure 4 position, opening the lateral compartment. Pull the passing sutures from the outside and advance the graft into position. **Note: The posterior horn must clear the femoral condyle before the bone plug will fully seat against the posterior cortex.** Once the graft is fully seated into position, place the knee through a range of motion assuring final positioning prior to proceeding with suturing the periphery of the graft to the capsule. The bone block should remain flush with the tibia articular surface from front to back of the tibia. At the conclusion of the procedure, irrigate the wound and close in a standard layered fashion. Apply a sterile dressing with a knee range of motion brace and Cryotherapy device.

Meniscal Allograft Preparation

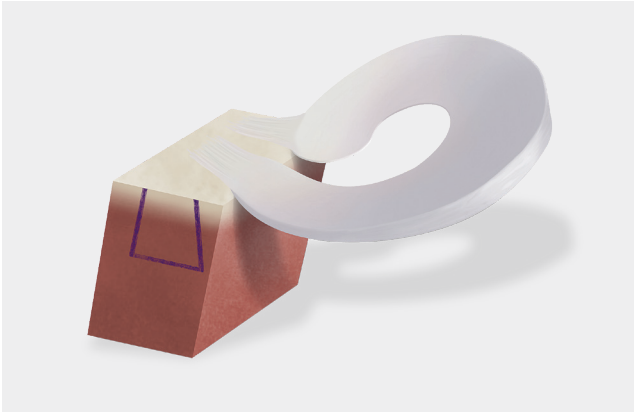
1

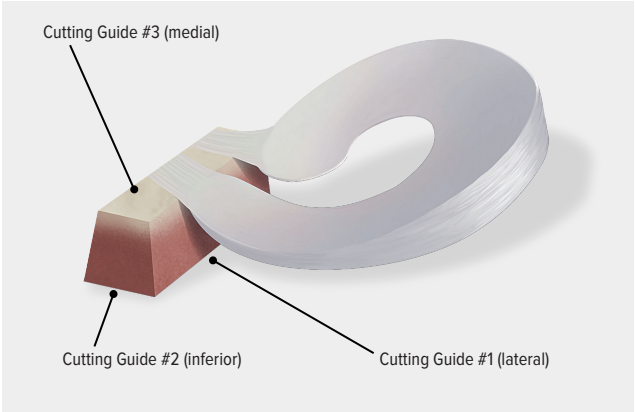
The allograft meniscus is initially evaluated to ensure it matches the recipient. The bone block is trimmed of excess bone and soft tissue to better identify the meniscal origin and insertion sites. This also allows for a better fit into the dovetail meniscal allograft workstation. Based on the A/P length of the trapezoidal slot created in the tibia, mark the graft and cut to similar length.



2

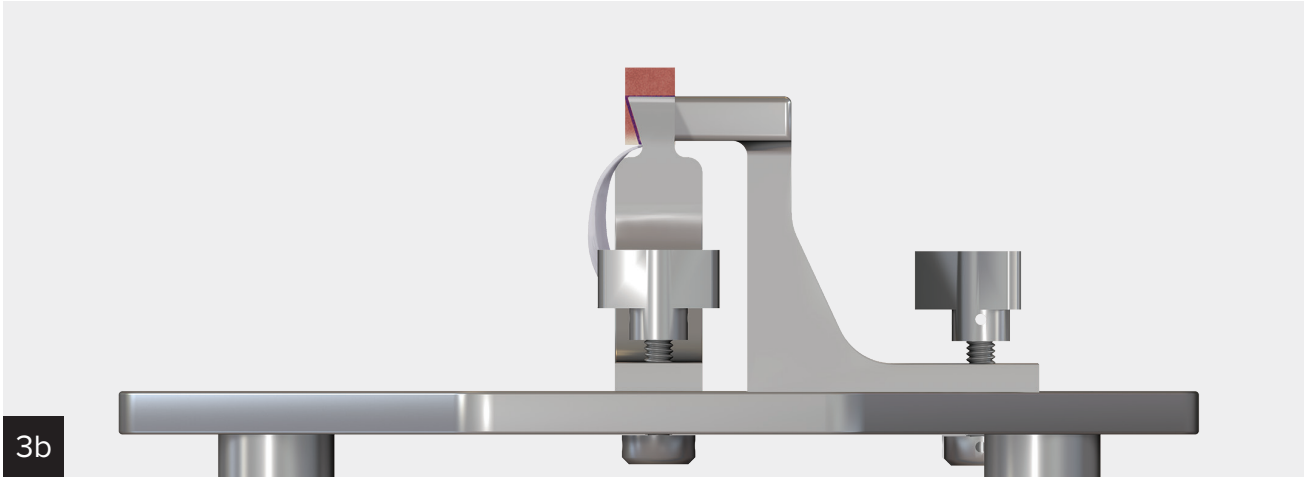
Position the allograft upside down, allowing the meniscus to hang free away from the bone block. Align the medial edge of the dovetail sketch line with the vertical face of the holding posts. Align the level of each soft-tissue attachment to the lower face of the holding posts. Secure the ends into the workstation graft holding posts as shown.



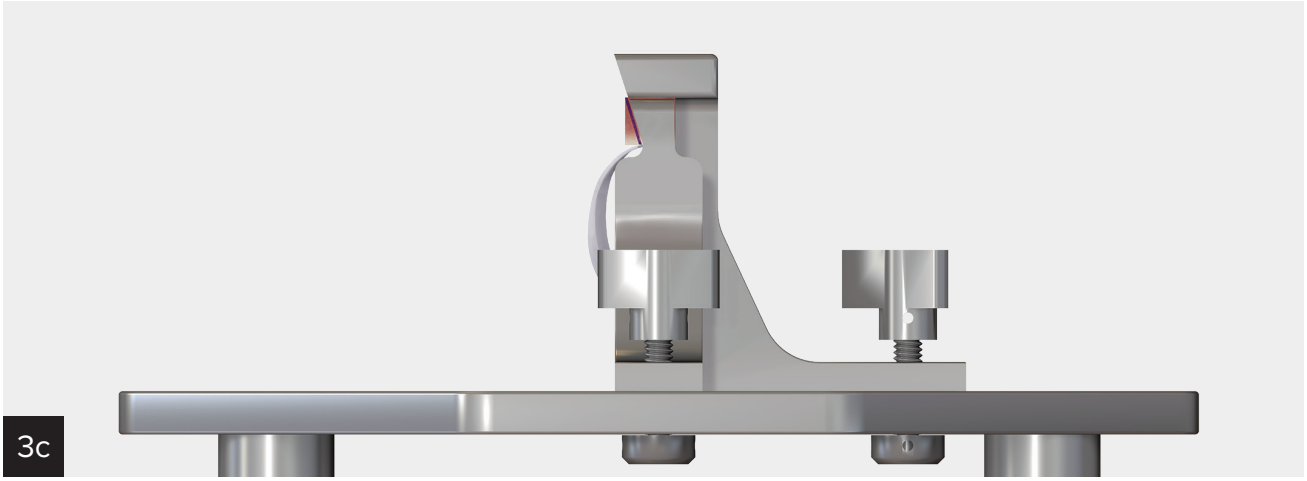


Make vertical and parallel saw cuts on each end of the bone plug to establish the desired length. Using the trapezoidal rasp for tibia slot preparation, draw an outline of the dovetail bone block on the end of the bone plug. Make the vertical (midline) sketch line at the midline aspect of the soft-tissue attachments. **Note: the angled cut is on the lateral side of the bone plug. The vertical (midline) sketch line is made at the midline aspect of the soft-tissue attachments.** Use the three modular cutting guides to create the final shape of the dovetail bone block as shown above.

Secure cutting guide #1 into the workstation and position it so the vertical cutting face is aligned with the vertical face of the holding post. Use a sagittal saw to complete the cut.



Secure cutting guide #2 in the workstation and position it f lush to the bone block (vertical cut) to complete a horizontal (inferior side) cut of the bone block with a sagittal saw.



Use cutting guide #3 to secure the workstation in contact with the medial bone surface and align it to guide the angled cut of the bone block. Complete the bone cut using a sagittal saw.

Ordering Information

Dovetail Meniscal Allograft Set (AR-1970S) includes:

Product Description	Item Number
Dovetail Meniscal Allograft Workstation (AR-**1970**):	
Dovetail Meniscal Allograft Workstation Base Dovetail	AR-**1970-01**
Meniscal Allograft Workstation Holding Post Dovetail	AR-**1970-2A**
Meniscal Allograft Workstation Holding Post Cutting	AR-**1970-2B**
Guide #1	AR-**1970-03**
Cutting Guide #2	AR-**1970-04**
Cutting Guide #3	AR-**1970-05**
Dovetail Meniscal Allograft Osteotome Blades, qty. 2	AR-**2960**
Dovetail Meniscal Allograft Osteotome Handle	AR-**2961**
Dovetail Meniscal Allograft Alignment Rod	AR-**2961A**
Dovetail Meniscal Allograft Drill Guides, qty. 2	AR-**2962**
Dovetail Meniscal Allograft Dilating Rasp, left	AR-**2963L**
Dovetail Meniscal Allograft Dilating Rasp, right	AR-**2963R**
Dilating Rasp, slot, meniscal allograft	AR-**2963BR**
Dovetail Meniscal Allograft Dilator, left	AR-**2964PL**
Dovetail Meniscal Allograft Dilator, right	AR-**2964PR**
Slap Hammer	AR-**2964SH**
Dovetail Meniscal Allograft Tamp	AR-**2964T**
Dovetail Meniscal Allograft Graft Sizing Block	AR-**2965**
Kirk Mallet	AR-**2966**
Dovetail Tibial Drill Guide	AR-**1965G**
Drill Sleeve, 2.4 mm Ofset	AR-**1965G-01**
Drill Sleeve, 2.4 mm depth	AR-**1965G-02**
Stop	AR-**1965G-03**
2.4 mm Guide Pin, qty. 2	AR-**1250L**
Acorn Reamer, 6 mm	AR-**1406**
Acorn Reamer, 7 mm	AR-**1407**
Dovetail Meniscal Allograft Instrumentation Case	AR-**1970C**
Dovetail Meniscal Allograft Case Insert	AR-**1970C-1**

Accessories

Product Description	Item Number
Protector Meniscus Suturing Set (AR-**4060S**), sterile, includes:	
Malleable Curved Cannula w/ Handle, qty. 1	
Nitinol Suture Needle w/ Wire Loop End, qty. 1	
Adjustable Needle Holder, qty. 1	
2-0 FiberWire® Meniscus Repair Needles	AR-**7223**
2-0 FiberWire Meniscus Repair Needles, small diameter	AR-**7223SM**

Products advertised in this brochure/surgical technique guide may not be available in all countries. For information on availability, please contact Arthrex Customer Service or your local Arthrex representative.

References

1. El Attar M, Dhollander A, Verdonk R, Almqvist KF, Verdonk P. Twenty-six years of meniscal allograft transplantation: is it still experimental? A meta-analysis of 44 trials. *Knee Surg Sport Traumatol Arthrosc.* 2011;19:147-157. doi:10.1007/s00167-010-1351-6.

2. Verdonk PCM, Demurie A, Almqvist KF, Veys EM, Verbruggen G, Verdonk R. Transplantation of viable meniscal allograft. *J Bone Joint Surg Am.* 2005;87-A(4):715-725. doi:10.2106/JBJS.C.01344.

3. Frank MR, Cole BJ. Meniscus transplantation. *Curr Rev Musculoskelet Med.* 2015;8:443-450. doi:10.1007/s12178-015-9309-4.

4. Lee SR, Kim JG, Nam SW. The tips and pitfalls of meniscus allograft transplantation. *Knee Surg Relat Res*. 2012;24(3):137-145. doi:10.5792/ksrr.2012.24.3.137.