Chapter 32: Knee Arthroscopy: The Basics ☆

Alan L. Zhang, Christina R. Allen

Definition

- Knee arthroscopy is a minimally invasive video-assisted surgical intervention for intra-articular disease of the knee.

Anatomy

- The knee can be divided into three compartments: the patellofemoral joint, the lateral tibiofemoral joint, and the medial tibiofemoral joint.
- The patellofemoral compartment is composed of the suprapatellar pouch, the patella bone, its femoral articulation (called the *trochlea*), the medial and lateral femoral condyles, and the medial and lateral patellofemoral ligaments.
- The suprapatellar pouch is a potential space that develops when the knee joint is insufflated with fluid. Within this area, adhesions, plicae, and loose bodies may be found. Adhesions are commonly found with revision surgery.
  - Synovial plicae are bands of synovium that are remnants from fetal development. Their location and size may contribute to snapping sensations and inflammation within the joint. In the suprapatellar pouch, however, they most commonly provide a location for loose bodies to hide.
  - Suprapatellar plicae may partition an entire compartment within the pouch, leaving only a centralized hole by which loose bodies may gain entrance. These holes are called *porta*.
- The patella is the largest sesamoid bone in the body. It has a medial and a lateral facet that articulate with its respective condyles. Centrally, there is an apex of the bone that sits in the trochlea.
  - The patella has the thickest cartilage in the body, which is used to withstand forces up to five times body weight.
  - With normal articulation of the patella on the femur, the cartilage of the medial facet touches the medial femoral condyle. This can be visualized with arthroscopy.
  - The patella begins to engage the trochlea at approximately 20 degrees and fully engages at 45 degrees. Lack of contact of the medial facet with the medial femoral condyle at these points in the range of motion suggests malalignment.[4]
- The medial and lateral patellofemoral ligaments are thickenings of the medial and lateral retinaculum, respectively. They originate centrally on the patella and insert onto the medial and lateral epicondyles of the femur.
  - The medial patellofemoral ligament may become disrupted or attenuated with patellar dislocations. This may predispose to further dislocations, necessitating operative repair.
  - The lateral patellofemoral ligament and retinaculum are often released in efforts to restore patellofemoral alignment.
- The medial tibiofemoral compartment is composed of the medial gutter and the tibiofemoral articulation.
  - The medial gutter is a fold of synovium in the posteromedial aspect of the joint where loose bodies may hide. Ballottement of this space is essential to ensure that no potential sources of pain exist within this region.

- The medial tibial plateau is larger in the sagittal plane than the lateral plateau (**FIG 1**). It is a concave surface that articulates with a convex femoral condyle, but the plateau has a much flatter curvature than the femoral condyle. Given the relative incongruence, contact pressures are focused on a smaller surface area, leading to higher point contact stresses and cartilage degeneration.
- The medial meniscus exists to alleviate this problem. The medial meniscus is a C-shaped structure on the perimeter of the medial tibiofemoral articulation. On cross-section, it is triangular, with the wider area along the periphery.
  - The meniscus provides better congruence between the two surfaces, participates in load sharing, and decreases point contact pressures throughout the articulation.
  - It is connected to the tibial plateau at the posterior and anterior ends at the meniscal roots. The deep medial collateral ligament attaches to the medial meniscus at its body centrally, providing stability. It is also attached to the capsule along its periphery.
  - The undersurface of the meniscus is not adherent to the plateau and can be lifted up, permitting inspection when one is suspicious of undersurface tears of the meniscus.

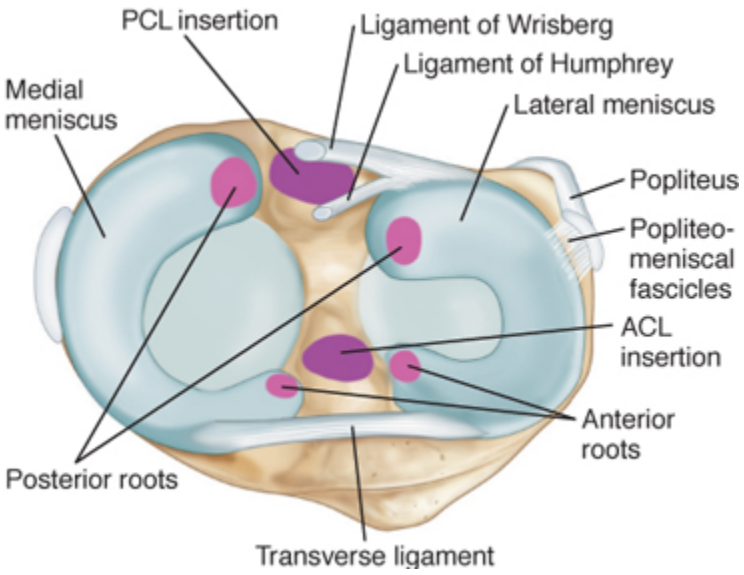
- In the lateral tibiofemoral compartment, the meniscus is shaped more like an O than a C. It has a similar cross-sectional anatomy as the medial meniscus, except it covers about 75% of the lateral tibiofemoral articulation. This is due to the geometry of the bony structures.
- Although the lateral femoral condyle is quite similar to the medial femoral condyle, the lateral tibial plateau is substantially different.
  - The lateral femoral condyle and the lateral tibial plateau are two convex surfaces. To provide appropriate congruence, a larger meniscus is necessary.
  - The popliteus tendon inserts onto the posterior body of the lateral meniscus and provides stability to the meniscal body. It attaches to the meniscus by means of three popliteomeniscal fascicles: the anteroinferior, posterosuperior, and posteroinferior fascicles. Anterior and posterior to the insertion of the tendon on the lateral meniscus is a recess of the joint capsule that does not insert onto the periphery of the meniscus. This makes the lateral meniscus more mobile than the medial meniscus.
  - The two ligaments originate from the lateral meniscus, which travel anterior or posterior to the posterior cruciate ligament (PCL) prior to inserting on the femur. The ligament of Wrisberg travels posterior to the PCL, and the ligament of Humphrey travels anterior to the PCL.
- Between the medial and lateral articulations is the intercondylar notch. It is a nonarticular portion of the knee that extends distally and posteriorly from the trochlea.
  - In the most anterior aspect of the notch lies the transverse meniscal ligament. This is a ligament that originates at the anterior horn of the medial meniscus away from the anterior root and inserts on the anterior horn of the lateral meniscus anterior to the anterior root.
  - The space between the transverse ligament and the anterior horn of the medial and lateral

menisci can be mistaken for a tear of the menisci on magnetic resonance imaging (MRI).

- There is significant bony variation in terms of the width of the intercondylar notch; this may contribute to the decision to perform a notchplasty or notch widening when performing an anterior cruciate ligament (ACL) reconstruction.
- The ACL and PCL reside within the intercondylar notch.
  - The ACL originates at the posterolateral position (about 10:30 on a right knee and 1:30 on a left knee) of the inner wall of the notch and inserts centrally and anteriorly on the tibia. In the sagittal plane, it inserts slightly posterior to the anterior horn of the lateral meniscus and about 7 mm anterior to the PCL fibers.
  - The PCL originates from the anterior aspect of the medial wall of the notch and has a broad origination that begins at about 12 o'clock position and ends around 3:30 (on a right knee). This ligament travels posterior to the ACL and inserts centrally on the posterior aspect of the tibial plateau about 10 to 15 mm inferior to the joint line. The fibers run quite close to the posterior root of the medial meniscus and one must be careful not to deviate medially when débriding PCL remnants in this region during a PCL reconstruction.

FIG 1

The tibial plateau.



Surgical Management

Preoperative Planning

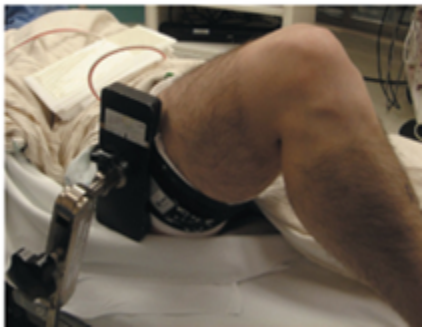
- Each patient is unique and the equipment needed for each surgery will vary. The surgeon must review the case specifics and studies before surgery and ensure that all necessary equipment is available when the surgery begins.
- On the day of surgery, the surgeon should reconfirm with the patient the laterality of the procedure, “sign your site,” and verify that there has been no change in the signs and symptoms of the injury since the last office visit.
- The surgeon performs an examination under anesthesia to reconfirm the diagnosis because this is crucial to understanding the nature of the injury. With sedation, the patient is more relaxed and able to give a more sensitive examination.

Positioning

- The patient should be supine and close to the edge of the bed.
  - The surgeon should verify that he or she will be able to get proper flexion of the leg should it be necessary to drop the foot of the bed.
- The contralateral leg can be placed in a well-padded leg holder or secured to the bed with circumferential padding.
- The use of a thigh holder versus a lateral post for arthroscopy is based on surgeon preference.
  - The thigh holder can be used with the foot of the bed dropped to 90 degrees, or the leg may be abducted and brought over the side of the bed (**FIG 2A**).
- Commercial knee holders may not be capable of holding very large knees or pediatric knees. In these cases, a lateral post is preferred (**FIG 2B**).

FIG 2

A. Use of a thigh holder for the right surgical leg, with left leg elevated and protected in a “well-leg” holder. **B.** Use of a lateral post for right knee positioning during arthroscopy.



Approach

- The approach largely depends on what arthroscopic knee procedure is going to be performed.
- Regardless, portal placement is the key to successful knee arthroscopy.

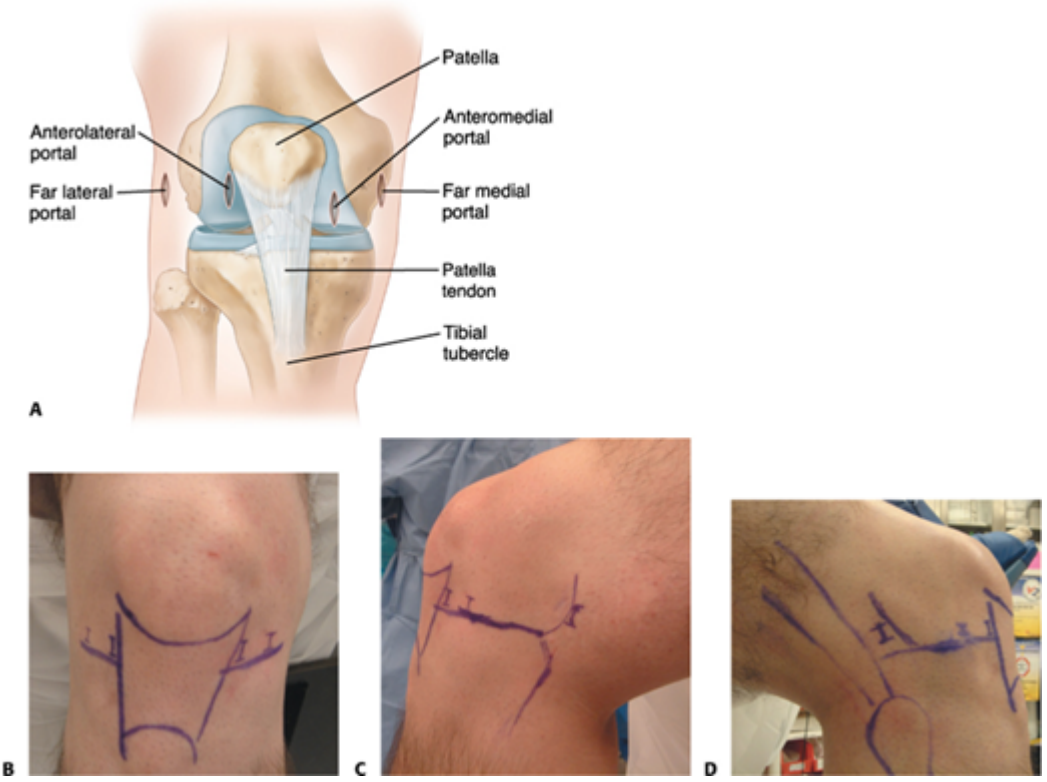
Techniques

Portal Placement

- **TECH FIG 1** shows the locations of the far lateral, anterolateral, anteromedial, and far medial portals and their relationships to landmarks of the knee.

TECH FIG 1

Artist's rendition (**A**) and anterior view (**B**) of the right knee showing portal placement of far lateral, anterolateral, anteromedial, and far medial portals and their relationships to the inferior pole of the patella, the medial and lateral joint line, and the patellar tendon. **C.** Medial view of right knee showing anteromedial, far medial, and posteromedial portal placement and their relationships to the medial tibial plateau and medial femoral condyle. **D.** Lateral view of right knee far lateral, anterolateral, and posterolateral portal placement and their relationships to the lateral tibial plateau, lateral femoral condyle, fibula, and biceps tendon.



Anterolateral Portal

- Most arthroscopic visualization is performed through this portal.
- It is created just lateral to the patella tendon. The incision is usually placed just inferior to the inferior aspect of the patella. Alternatively, the incision can also be referenced from the tibia.
- The incision should measure 1 cm long.
- Typically, the incision is made vertically, but some surgeons prefer a horizontal incision, which may theoretically decrease risk of injury to the infrapatellar branch of the saphenous nerve.

Anteromedial Portal

- This is the primary working portal.
- Its position is highly dependent on the work that needs to be done.
- Traditionally, it is slightly more inferior than the anterolateral portal and just medial to the patella tendon, but the surgeon should be liberal about moving the location of this portal to optimize the surgical goals of the arthroscopy (ie, meniscal surgery vs. mosaicplasty).
- The surgeon can use a spinal needle to localize the optimal portal placement under direct visualization before making the anteromedial portal incision.

Superomedial or Superolateral Portal

- A superior portal can be placed either medial or lateral to the quadriceps tendon.
  - We prefer a superolateral portal because it results in less vastus medialis oblique inhibition.
- This portal can be used as an inflow or outflow portal or to perform procedures in the suprapatellar pouch (ie, loose body removal, medial retinaculum plication, synovectomy, or evaluation of patella tracking).
- This portal is placed about 2.5 cm proximal to the superior pole of the patella at the edge of the quadriceps tendon.

Central (Transpatellar) Portal

- This portal uses a vertical incision through the central third of the patellar tendon at the level of the joint line.
- It is mostly used to facilitate access to the intercondylar notch.
- Occasionally, this portal may be required when performing a modified Gillquist maneuver (examination of the posterior horns of the menisci through the intercondylar notch) in a patient with a stenotic intercondylar notch.

Posteromedial Portal

- When pathology presents in the posteromedial knee, this portal may be used as a working portal.
- To assess the proper placement of this portal, the surgeon performs a modified Gillquist maneuver[3] through the anterolateral portal (technique details are given in the Diagnostic Arthroscopy section) and uses the 70-degree arthroscope to transilluminate the skin overlying the posteromedial capsule.
  - A spinal needle is placed at the center of the transilluminated skin. This position should be about 1 to 2 cm above the joint line.
  - When comfortable with the position of the needle, the surgeon makes a 1-cm skin incision with a no. 11 blade and places a cannula with a blunt obturator to penetrate the capsule. This helps to protect the soft tissues in this area from damage and reduces fluid extravasation into the surrounding soft tissues.
  - The saphenous nerve travels near this area and is at risk of injury with creation of this portal.

Posterolateral Portal

- The indications and technique for this portal are similar to those for the posteromedial portal.
- The surgeon performs the modified Gillquist maneuver through the anteromedial portal and transilluminates the skin overlying the posterolateral capsule of the knee with the 70-degree arthroscope as described earlier.
- A spinal needle is used to confirm proper portal placement. This portal should be at the lateral aspect of the posterolateral compartment to avoid the large neurovascular structures.
- Before making the skin incision, the surgeon should ensure that the planned incision is anterior to the biceps tendon to avoid the peroneal nerve.

Far Lateral and Far Medial Portals

- These portals are made 2 cm either lateral or medial to their respective anterior portals.
- They can be used to aid in work that needs to be done posterior to the femoral condyles.

Diagnostic Arthroscopy

Marking Landmarks

- Marking the landmarks of the knee with a sterile surgical marker can be helpful.
- The surgeon can mark the inferior pole of the patella, the patella tendon, and the tibial tubercle.
- The tibial joint line is marked off medially and laterally. This will assist in the accurate placement of the anterolateral and anteromedial portals.

Anterolateral Portal

- Using a no. 11 blade knife, the surgeon places a vertically oriented 1-cm incision just lateral to the patellar tendon and inferior to the patella with the knee at 60 to 90 degrees of flexion.
- The bevel of the knife is buried (blade facing away from the meniscus) to ensure the capsule has been penetrated.
- The knife is angled toward the intercondylar notch to prevent damage to the lateral femoral condyle.

Anteromedial Portal

- Creation of an anteromedial portal is necessary to complete a thorough diagnostic arthroscopy.
- The surgeon may use a probe placed though this portal to palpate the cartilage for injury and perform a complete evaluation of the menisci once the arthroscope has been inserted.
- The position of this portal varies depending on the work being performed and can be placed under direct arthroscopic visualization with a spinal needle. Typically, it is 1 cm medial to the patella tendon and slightly inferior to the anterolateral portal.

Introduction of Obturator and Sheath

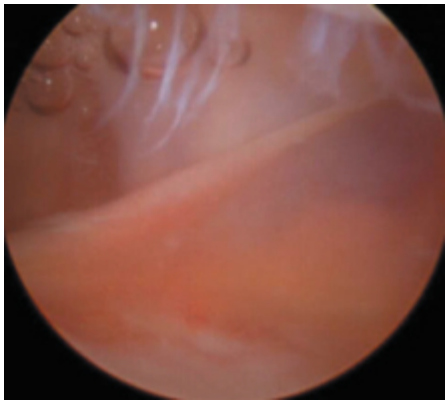
- With the knee flexed at 60 to 90 degrees, the arthroscope sheath is placed with a blunt obturator through the anterolateral portal, aiming toward the intercondylar notch.
- Intra-articular position is confirmed by palpating the obturator anterior to the medial compartment.
- By dropping his or her hand, the surgeon pulls the obturator and sheath back slightly.
- As the knee is brought to an extended position, the obturator and sheath is gently advanced into the suprapatellar pouch.

Visualization of Suprapatellar Pouch

- The camera is placed in the suprapatellar pouch (**TECH FIG 2**).
- The size of the pouch is evaluated.
- The surgeon looks for adhesions and loose bodies.

TECH FIG 2

Arthroscopic view of the suprapatellar pouch showing adhesion running obliquely.

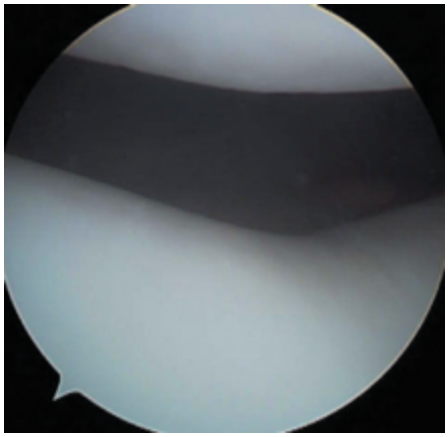


Visualization of the Patella

- The camera is aimed anteriorly (toward the ceiling) to visualize the patella.
- The arthroscope is retracted until the patella comes into view (**TECH FIG 3**).
- Pictures of the medial and lateral facets are taken.
- The surgeon's free hand can be used to mobilize the patella for better visualization.
- The cartilage of the patella is probed for evidence for softening, chondral flaps, or fissures.

TECH FIG 3

Arthroscopic view of the apex of the patella and trochlea.



Visualization of the Trochlea and Condyles

- The arthroscope is aimed toward the femur, and the trochlea and anterior aspects of the medial and lateral femoral condyles are inspected.
- The probe is used to palpate the cartilage for evidence of softening, fissures, and unstable cartilage flaps.

Assessment of Patellar Tracking

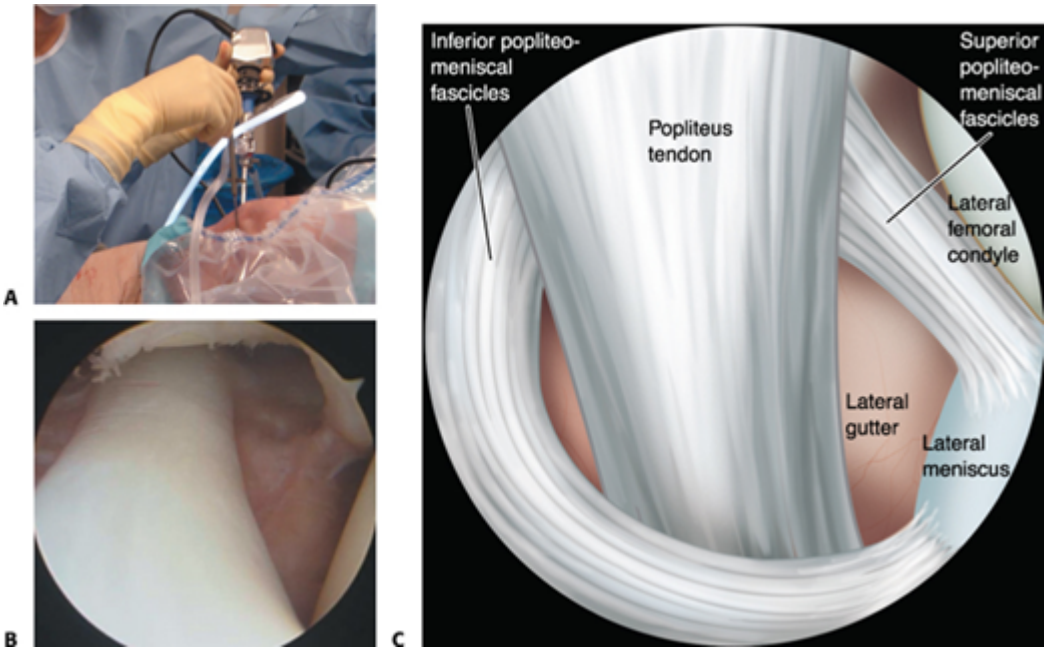
- The arthroscope is retracted further and the knee is ranged from flexion to extension to assess patellar tracking.
- The medial facet of the patella should engage the medial aspect of the trochlea at 20 degrees and fully engage in the trochlea at 45 degrees.
- Lateral facet overhang may suggest a tight lateral retinaculum and maltracking.

Lateral Gutter

- The arthroscope is advanced up into the suprapatellar pouch so the tip is proximal to the patella.
- With the patient's knee extended, the surgeon brings the arthroscope over the lateral femoral condyle. The surgeon's hand is raised so that the camera is angling down toward the floor, and the light source is turned so that it is looking distally (**TECH FIG 4A**).
- The lateral gutter (located between the lateral femoral condyle and the lateral capsule of the knee joint) will be visualized.
- By pushing posteriorly, the insertion of the popliteus tendon and the three popliteomeniscal fascicles of the lateral meniscus may be visualized (**TECH FIG 4B,C**).

TECH FIG 4

A. Surgeon and arthroscope positioning for performing arthroscopic evaluation of the posterolateral corner of the knee. Arthroscopic view (**B**) and artist's rendition (**C**) of the posterolateral corner of the knee. The popliteus runs superiorly, and the popliteomeniscal fascicles attach the posterior horn of the lateral meniscus to the popliteus.



Visualization of the Lateral Meniscocapsular Junction and the Anterior Knee

- The arthroscope is retracted to visualize the attachment of the lateral meniscus to the capsule. This is best performed with the knee in 20 degrees of flexion.
- A varus stress is applied to the knee at 30 degrees of flexion.
- The lens of the arthroscope is turned medially to visualize the anterior horn of the lateral meniscus.
- The anterior horn of the medial meniscus may also be seen more medially if the view is not blocked by synovium or the anterior fat pad.

Medial Gutter

- The arthroscope is returned to the suprapatellar pouch, and then the surgeon migrates over the medial femoral condyle to the medial gutter.
- By lifting his or her hand and aiming the light source so that the arthroscope is angling toward the floor

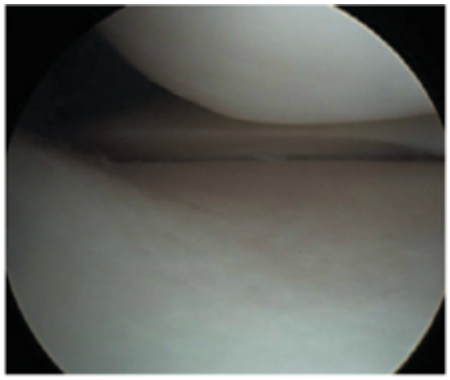
again, the surgeon can visualize the medial gutter (space between the medial femoral condyle and the medial capsule of the knee joint).
- Ballottement is performed to check for loose bodies.
- A medial meniscal cyst and displaced medial meniscal flap tears may be visualized using this view as well.

Medial Compartment

- From the medial gutter, the medial compartment is entered by bringing the arthroscope toward the midline until the medial femoral condyle is viewed (**TECH FIG 5A**).
- The knee is moved through a range of motion from full extension to full flexion. The entire medial femoral condyle is evaluated for cartilage defects.
- The surgeon probes for softening, fissures, and flaps and checks for plica snapping over the condyle as well.
- The posterior portion of the medial compartment is usually best visualized with the leg at 30 degrees, with a valgus stress applied to the knee (**TECH FIG 5B**).
- The medial compartment may widen abnormally with valgus stress so that significant space between the medial tibial plateau and medial femoral condyle exists.
    - The surgeon should suspect a medial collateral ligament injury when this occurs. This is especially true if the meniscus lifts up off the tibial plateau, indicating significant tibial-sided medial collateral ligament laxity.
- The tibial plateau is visualized and probed for chondral abnormalities. The surgeon should visualize the posterior root, posterior horn, body, anterior horn, and anterior root of the meniscus.
- The undersurface of the meniscus is probed and inspected. The meniscus is tested with a hoop stress test.
- The perimeter of the tibial plateau is probed for flipped flap tears of the meniscus.
- In patients who are not ligamentously lax, the posterior horn periphery may be difficult to visualize.
    - In this case, a modified Gillquist maneuver may allow better visualization of the posterior horn of the medial meniscus.
- Instruments angled up work best in the medial compartment because the tibial plateau is a convex surface.

TECH FIG 5

A. Arthroscopic view of the medial compartment, including the medial femoral condyle, medial tibial plateau, and medial meniscus. **B.** Surgeon performing diagnostic arthroscopy in medial compartment. The patient's leg rests on the surgeon's hip, which allows application of a valgus and flexion force for access to the posterior medial compartment.



A

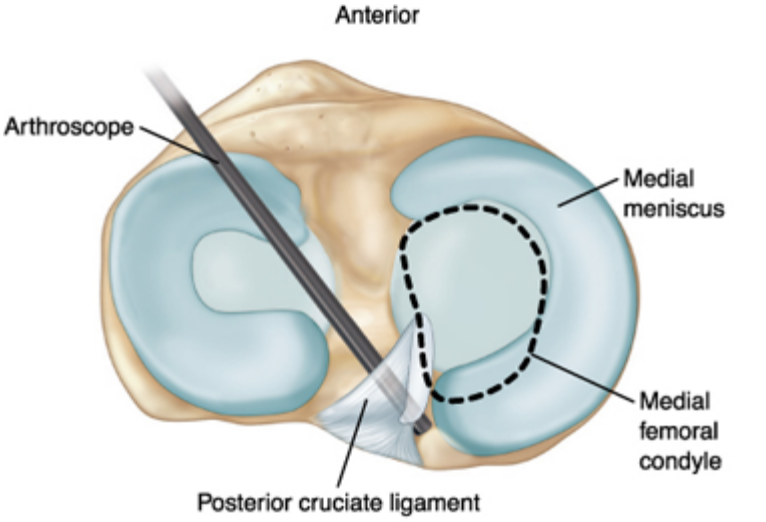
B

Posteromedial Knee

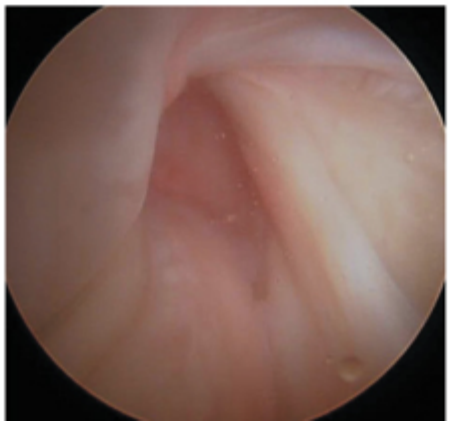
- The surgeon performs the modified Gillquist maneuver.
  - The arthroscope is removed from the sheath and the blunt obturator is placed in the sheath. The knee should be placed in 70 to 90 degrees of flexion.
  - The blunt obturator and sheath is placed into the anterolateral portal and advanced into the space between the medial aspect of the intercondylar notch and the PCL (**TECH FIG 6A**).
  - Gentle pressure is applied until the obturator slides posteriorly.
  - The blunt obturator is replaced with the 70-degree arthroscope and camera, and the surgeon visualizes the posterior horn of the medial meniscus, the posterior medial femoral condyle, the posterior meniscal root and the capsular attachment, and the insertion of the PCL on the back of the tibial plateau (**TECH FIG 6B**). The surgeon can check for loose bodies as well.

TECH FIG 6

A. Artist's rendition of modified Gillquist maneuver, showing arthroscope passing between PCL and medial femoral condyle. **B.** Arthroscopic view of the posteromedial knee after Gillquist maneuver using a 70-degree arthroscope, including the medial meniscocapsular junction, medial femoral condyle, and medial gutter.



A



B

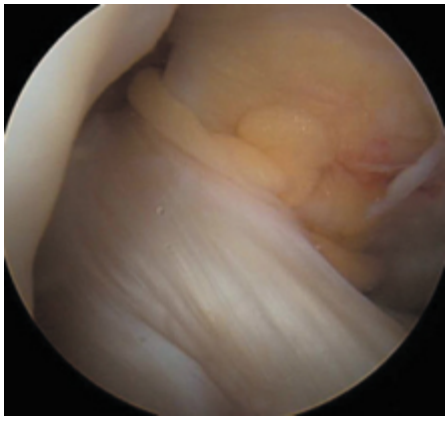
Intercondylar Notch

- The leg is relaxed and allowed to dangle at the side of the bed.
- The cruciate ligaments are inspected in the intercondylar notch and their competency and laxity are tested (**TECH FIG 7**).

TECH FIG 7

Arthroscopic view of the intercondylar notch.

The ACL is well visualized on the left, with the PCL on the right more obscured by fat and synovial tissue.

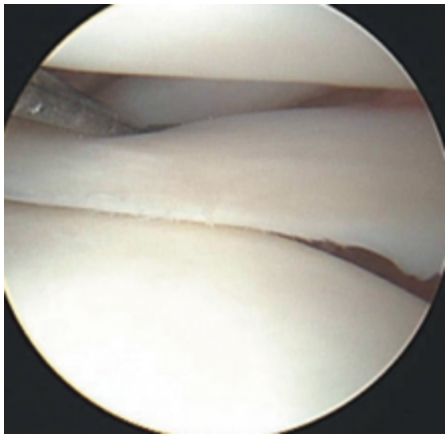


Lateral Compartment

- The arthroscope and probe can be situated in the intercondylar notch near the medial aspect of the lateral femoral condyle.
- The leg is placed in a figure-4 position with the knee flexed to 90 degrees while varus stress is applied. Ninety degrees of flexion is the optimal position for visualizing the posterolateral compartment of the knee.
    - When using a leg holder, varus stress can produce similar results.
- When the lateral compartment opens up so there is significant space between the lateral tibial plateau and lateral femoral condyle, the surgeon should suspect a posterolateral corner injury.
- The knee is moved through a range of motion from full extension to full flexion and the entire lateral femoral condyle and lateral tibial plateau are evaluated for cartilage defects (**TECH FIG 8**).
- The surgeon should probe for softening, fissures, and flaps.
- The meniscus is inspected and probed on its surface and undersurface.
- The popliteus tendon is checked for tears.
- The popliteal hiatus is checked for abnormal instability.
- The surgeon should visualize the posterior root, posterior horn, body, anterior horn, and anterior root of the meniscus.
- The undersurface of the meniscus is probed and inspected, and the meniscus is tested with a hoop stress test.
- The perimeter of the tibial plateau is probed for flipped flap tears of the meniscus.
- The surgeon should inspect the posterior horn of the lateral meniscus. This may require a variation of the modified Gillquist maneuver (mentioned previously).

TECH FIG 8

Arthroscopic view of the lateral compartment, including the lateral femoral condyle, lateral tibial plateau, lateral meniscus, and popliteus tendon.



Modified Gillquist Maneuver for the Posterolateral Compartment

- The arthroscope is removed from the sheath and the blunt obturator is placed in the sheath. The knee should be placed in 70 to 90 degrees of flexion.
- The blunt obturator and sheath is placed into the anteromedial portal and advanced into the space between the lateral aspect of the intercondylar notch and the ACL.
- Gentle pressure is applied until the obturator slides under the ACL next to the lateral femoral condyle posteriorly to the posterolateral compartment.
- The blunt obturator is replaced with the 70-degree arthroscope and camera. The posterior horn of the lateral meniscus, the posterior lateral femoral condyle, the posterior meniscal root, and the capsular attachment are visualized. The surgeon can check for loose bodies as well.

Pearls and Pitfalls

Preoperative planning	• The surgeon should be sure to have all instruments and implants available that will be helpful to the surgery. A 70-degree arthroscope can be useful in most cases. Shoulder arthroscopy instrumentation and cannula systems can be helpful with more complex surgeries as well. The surgeon should talk to the patient before the surgery and perform an examination under anesthesia to confirm the pathology necessitating surgery.
Proper portal placement	• Surgical portal incisions should be tailored to the needs of the case. If a portal is not adequate or optimal, the surgeon should make a new portal. Larger or heavier patients may require larger portals for better maneuvering.
Avoiding the fat pad and synovium	• These soft tissue structures have a rich vascular supply and nervous innervation. Débridement of these structures will increase postoperative pain and prolong rehabilitation.
Pump pressure	• High pump pressures can result in fluid extravasation into the soft tissues, leading to the potential for compartment syndrome. This is especially true in trauma patients and older patients. The surgeon may want to consider gravity inflow or lower pump pressures in such situations.
Older patients	• Older patients are more likely to sustain an injury to the collateral ligaments when varus or valgus stresses are applied to gain compartment visualization. The surgeon should be gentle with their knees.
Tight compartments	• Some patients have ligamentously tight knees, making it difficult to reach the posterior aspect of the medial and lateral tibiofemoral compartments. The surgeon should use all portals available, including the far medial and lateral as well as the posteromedial and posterolateral portals, to properly address the pathology.

Postoperative Care

- Once the procedure has ended, postoperative care has begun.
- Excess fluid is eliminated from the knee with suction.
- Although there is some variation in portal closure, we prefer a simple skin closure with a nonabsorbable monofilament suture.
  - Regardless of suture type or technique, the surgeon should obtain a tight closure.
- Intra-articular and portal injection of local anesthetic may help with postoperative pain management.
- Deep vein thrombosis prophylaxis may be accomplished with a compression dressing from the toes to the thigh, elevation, mobilization, and ankle pumps.[5],[7]
- Regardless of postoperative weight-bearing status, most patients will require crutches for mobility.
- Cryotherapy has been shown to improve pain scores after knee arthroscopy and is recommended.
- Motion and weight-bearing status are determined by the procedure performed and the patient's needs.
- Pain control with narcotics will likely be necessary for the first few weeks.

Complications

- Infection
- Loss of motion
- Iatrogenic cartilage injury
- Nerve injury: saphenous nerve, peroneal nerve, femoral nerve, sciatic nerve[6]
- Vascular injury[2]
- Deep vein thrombosis
- Compartment syndrome
- Arthrofibrosis
- Reflex sympathetic dystrophy
- Persistent hemarthrosis[1]

References

1. DeLee JC. Complications of arthroscopy and arthroscopic surgery: results of a national survey. *Arthroscopy* 1985;1:214–220.
2. Furie E, Yerys P, Cutcliffe D, et al. Risk factors for arthroscopic popliteal artery laceration. *Arthroscopy* 1995;11:324–327.
3. Gillquist J, Hagberg G. A new modification of the technique of arthroscopy of the knee joint. *Acta Chir Scand* 1976;142:123–130.
4. Hungerford DS, Barry M. Biomechanics of the patellofemoral joint. *Clin Orthop* 1989;241:203.
5. Jaureguito JW, Greenwald AE, Wilcox JF, et al. The incidence of deep venous thrombosis after arthroscopic knee surgery. *Am J Sports Med* 1999;27:707–710.
6. Kim TK, Savino RM, McFarland EG, et al. Neurovascular complications of knee arthroscopy. *Am J Sports Med* 2002;30:619–626.
7. Williams JS Jr, Hulstyn MJ, Fadale PD, et al. Incidence of deep vein thrombosis after arthroscopic knee surgery: a prospective study. *Arthroscopy* 1995;11:701–705.