

Meniscal root tear

Overview

- A meniscal root tear is defined as a radial tear or avulsion of the meniscal root from the tibial plateau [1].
- A meniscal root tear completely disrupts the circumferential fibers of the meniscus [1].
- Biomechanically, a meniscal root tear results in a loss of hoop stresses and an increase in contact forces [1].
- A meniscal root tear is functionally equivalent to a total meniscectomy [1].
- Lateral meniscal root tears are associated with ACL tears [1].
- Medial meniscal root tears are associated with chondral injuries [1].
- Acute meniscal root tears should be repaired whenever possible [1].
- Indications for repair of degenerative meniscal root tears continue to evolve [1].
- The vascular supply of the meniscus is a primary determinant of healing potential [1].
- Tears in the peripheral third of the meniscus have the highest potential for healing [1].
- Meniscal root tears are listed as a general indication for meniscal repair [1].
- Concomitant ACL reconstruction may extend the indications for meniscal repair because results are typically better [1].
- Augmentation techniques, including fibrin clot, platelet-rich plasma clot, vascular access channels, and synovial rasping, may extend the indications for meniscal repair [1].
- The gold standard for meniscal repair remains the inside-out technique with vertical mattress sutures [1].
- During medial meniscal repairs, it is essential to protect the saphenous nerve branches located anterior to both the semitendinosus and gracilis muscles and posterior to the inferior border of the sartorius muscle [1].
- During lateral meniscal repairs, it is essential to protect the peroneal nerve located posterior to the biceps femoris [1].
- Rehabilitation following meniscus repair should involve avoidance of knee flexion beyond 90 degrees [1].
- The level of allowed weight bearing following meniscus repair is controversial [1].
- Success rates of 80% to 90% have been reported for meniscal repairs in several studies [1].
- The success of meniscal repair depends on location, type of tear, and chronicity [1].

- The results of meniscal repair are best with acute peripheral tears in young patients undergoing concurrent ACL reconstruction [1].
- The success rate of meniscal repair is 90% when performed in conjunction with an ACL reconstruction [1].
- The success rate of meniscal repair is 60% when performed in a knee with an intact ACL [1].
- The success rate of meniscal repair is 30% when performed in a knee with a deficient ACL [1].
- Acute meniscal root tears should be repaired early [1].
- The treatment of chronic meniscal root tears is more controversial [1].

Anatomy & Pathophysiology

MENISCAL STRUCTURE AND COMPOSITION

- The menisci are wedge-shaped fibrocartilaginous structures situated between the femoral condyles and tibial plateaus [16].
- The menisci are 65% to 75% water [4, 16, 20].
- The extracellular matrix of the meniscus is composed predominantly of type I collagen [4, 16, 20].
- Types II, III, V, and VI collagen are also present in the meniscal extracellular matrix [16, 20].
- Proteoglycans make up 1% of the dry weight of the meniscus [20].
- Fibrochondrocytes are the predominant meniscal cell type and produce the extracellular matrix [16].
- Type I collagen is most abundant in the superficial zones of the menisci to provide tensile strength [16].
- Larger concentrations of proteoglycans and water are found in the deeper zones of the meniscus and provide compressive strength [16].
- On the superficial aspects of the menisci, collagen fibers are randomly oriented [16].
- In the deeper zones of the meniscus, collagen fibers are oriented in a circumferential pattern [16, 20].
- Intermittent radially oriented tie fibers anchor the circumferential fibers in the deeper zones of the meniscus [16, 20].

GROSS ANATOMY AND ATTACHMENTS

- The medial meniscus is semicircular, or C-shaped, and covers 50% to 60% of the medial tibial plateau surface [16].
- The posterior horn of the medial meniscus is approximately 11 mm wide [16].
- The medial meniscus is attached to the deep medial collateral ligament fibers and joint capsule, limiting its mobility [16, 20].
- The inferior aspect of the posterior horn of the medial meniscus is attached to the tibia by the meniscotibial or coronary ligament [16].
- The lateral meniscus is more circular in shape than the medial meniscus [16, 20].

- The lateral meniscus has equally sized anterior and posterior horns [16].
- The lateral meniscus covers 84% of the condylar surface [20].
- The lateral meniscus is 12 to 13 mm wide and 3 to 5 mm thick [20].
- The medial meniscus is wider in diameter than the lateral meniscus [20].
- The medial meniscus covers 64% of the condyle surface and is 10 mm wide and 3 to 5 mm thick [20].
- At the posterior lateral meniscal attachment, popliteomeniscal fascicles extend from the meniscus to the posterior capsule, creating the popliteal hiatus [16].
- The menisiofemoral ligaments connect the posterior horn of the lateral meniscus to the medial femoral condyle [16].
- The anterior menisiofemoral ligament of Humphrey courses anterior to the posterior cruciate ligament [16].
- The posterior menisiofemoral ligament of Wrisberg courses posterior to the posterior cruciate ligament [16].
- The lateral meniscus has less continuous attachment to the capsule than the medial meniscus, resulting in more mobility [16].
- The transverse intermeniscal ligament is the most common connection between the medial and lateral menisci, present in 60% to 94% of knees [16].
- The medial and lateral menisci have anterior and posterior root attachments to the tibia that prevent meniscal extrusion during load bearing [20].

VASCULAR SUPPLY AND HEALING ZONES

- The vascular supply of the menisci comes from the superior, middle, and inferior genicular arteries [16].
- The peripheral 10% to 30% of the meniscus is well vascularized by synovial and capsular branches [16].
- The anterior and posterior root attachments of the meniscus are well vascularized by synovial branches [16].
- The outer third of the meniscus is the red/red zone, which is well vascularized [16, 20].
- The middle third of the meniscus is the red/white zone, at the border of the vascularized and avascular zones [16, 20].
- The inner third of the meniscus is the white/white zone, which is devoid of a vascular supply [16, 20].
- Approximately 50% of the meniscus is vascularized at birth [20].
- Only 10% to 25% of the meniscus is vascularized in the adult [20].
- The vascularity of the meniscus decreases with advancing age [4].
- The location of a meniscal tear relative to vascular zones helps guide treatment because the potential for healing increases with vascularity [16].
- Tears in the peripheral third have the highest potential for healing [1, 2].

BIOMECHANICS AND LOAD DISTRIBUTION

- The menisci function in proprioceptive feedback, load distribution, joint lubrication, and maintenance of tibiofemoral joint stability and congruity [16].
- In knee extension, as much as 50% of the load is absorbed by the meniscus [4, 16, 20].
- The percentage of load-sharing by the meniscus increases to 90% at 90° of knee flexion [4, 20].
- Beyond 90° of flexion, most of the force is transmitted to the posterior horns of the menisci [20].
- The lateral meniscus provides more biomechanical protection to the joint than the medial meniscus [20].
- When the meniscus is removed completely, articular cartilage contact stress increases by two to three times that experienced when the meniscus is intact [20].
- Removal of the inner third of the meniscus results in a 10% reduction in contact area and a 65% increase in contact stress on the articular cartilage [20].
- A radial tear of the medial meniscus extending from the inner rim to the peripheral third, while preserving the peripheral third, has not been found to change maximum contact pressure and contact area [20].
- A radial tear involving 90% of the medial meniscus results in a posterocentral shift in peak-pressure location [20].
- A vertical tear of the medial meniscus causes increased contact area and maximum contact pressure in both the lateral and medial compartments [20].

MENISCAL ROOT TEAR PATHOPHYSIOLOGY

- Medial meniscus root tears result in peak articular cartilage contact pressure similar to that seen after a complete meniscectomy [20].
- Medial meniscus root tears have been associated with the progression of osteoarthritis [20].
- Root tears much more commonly occur at the posterior horn attachment [14].
- A root tear can be an avulsion injury of the meniscal attachment or a radial tear within 1 cm of the insertion [14].
- Disruption of circumferential meniscal fibers in root tears leads to a loss of ability to transmit hoop stresses, with biomechanical effects approaching total meniscectomy [14].
- The posterior medial root is more commonly affected than the posterior lateral root [14].
- Posterior medial meniscus root tears occur with a higher incidence in middle-aged and obese patients and are typically degenerative tears [14].
- Traumatic posterior medial meniscus root tears are often associated with multiligamentous knee injury or injury occurring during deep knee flexion [14].
- The medial posterior root is less mobile than the lateral root and is therefore more susceptible to isolated injury [14].
- Lateral root tears are most common in association with ligamentous injury [1, 2, 14].
- Medial root tears are associated with chondral injuries [1, 2].

- Tears of the posterior medial meniscal root can increase contact pressure, external rotation, and lateral tibial translation [14].
- A lateral root tear substantially decreases the contact area and increases contact pressure in the lateral compartment [14].
- Both degenerative and acute traumatic meniscal root tears can occur [14].
- There is an increased rate of osteoarthritis in knees after meniscal tears and meniscectomy, particularly on the lateral side [1, 2].

Classification

- Meniscal tears can be classified according to location in relation to the vascular supply [1, 2].
- Meniscal tears can be classified according to position, including anterior, middle, posterior third, and root [1, 2].
- Meniscal tears can be classified according to appearance and orientation [1, 2].
- Numerous classifications of meniscal tears have been proposed based on location, type of tear, etiology, and other factors [3].
- Commonly used classifications of meniscal tears are based on the type of tear found at surgery [3].
- The commonly used surgical classifications include longitudinal tears, radial and oblique tears, horizontal cleavage tears, complex tears, tears associated with cystic menisci, and tears associated with discoid menisci [3].
- The posterior root tear is a type of radial tear at the posterior root attachment of the meniscus [3].
- The ramp lesion is a form of longitudinal tear at the menisco-capsular junction or the menisco-tibial attachment of the meniscus [3].
- The O'Connor classification of meniscal tears includes longitudinal tears, horizontal tears, oblique tears, radial tears, and variations [5].
- Variations in the O'Connor classification include flap tears, complex tears, and degenerative meniscal tears [5].
- Longitudinal tears are oriented parallel to the edge of the meniscus [5].
- A bucket-handle tear occurs when a displaceable inner fragment from a complete longitudinal tear displaces over into the intercondylar notch [5].
- A peripheral tear is a longitudinal tear located near the meniscocapsular attachment of the meniscus [5].
- A red-red tear is a peripheral vertical tear in zone I of the meniscus [5].
- A red-white tear is a longitudinal tear between zone I and II of the meniscus [5].
- Horizontal tears involve a cleavage plane that divides the superior and inferior surfaces of the meniscus [5].
- Oblique tears are full-thickness tears running obliquely from the inner edge of the meniscus out into the body of the meniscus [5].
- A posterior oblique tear has its base in the posterior horn of the meniscus [5].

- An anterior oblique tear has its base in the anterior horn of the meniscus [5].
- Radial tears are vertically oriented, extending from the inner edge of the meniscus toward its periphery [5].
- Flap tears are similar to oblique tears but usually have a horizontal cleavage element rather than being purely vertical in orientation [5].
- Superior or inferior flap tears are named depending on where the flap is based on the surface of the meniscus [5].
- Complex tears may contain elements of longitudinal, horizontal, oblique, and radial tear types [5].
- Degenerative tears often refer to complex tears presenting with marked irregularity and complex tearing within the meniscus [5].

Clinical Presentation

HISTORY AND MECHANISM

- Meniscal tears are unusual in patients younger than 10 years [6].
- Most meniscal tears in adolescents and young adults occur with a twisting injury or with a change in direction [6].
- Middle-aged and older adults can sustain meniscal tears from squatting or falling [6].
- Patients with a traumatic meniscal tear may report pain onset during a twisting mechanism or during deep knee flexion [28].
- Occasionally, an audible or palpable popping is reported with a traumatic meniscal tear [28].
- Approximately one-half to two-thirds of patients with a meniscal tear report knee swelling [28].
- With an acute meniscal tear, an effusion often develops several hours after injury [6].
- This delayed effusion differs from an anterior cruciate ligament (ACL) injury, in which swelling develops rapidly within the first few hours [6].
- Chronic meniscal tears demonstrate intermittent effusions, often with mechanical symptoms [6].
- Mechanical symptoms such as catching or frank locking have been reported in 12% to 69% of patients with meniscal tears [28].
- Patients with meniscal injuries localize pain to the joint line or posterior knee [6].
- Patients may describe mechanical symptoms of locking or catching [6].

PHYSICAL EXAMINATION

- Small joint effusions and joint line tenderness with palpation are common findings with meniscal tears [6].
- In a patient with an isolated meniscal tear, joint line tenderness was found to be an accurate test in 81% to 90% of patients [28].
- The McMurray test is accurate in 57% to 77% of patients with an isolated meniscal tear [28].
- The Thessaly test is accurate in 61% to 80% of patients with an isolated meniscal tear [28].

- Manipulative maneuvers, including the McMurray and Apley tests, may produce a palpable or audible click with localized tenderness, but they are not specific for meniscal pathology [6].
- In the Thessaly test, the patient flexes the knee to 20° while standing on the affected extremity and twists in internal and external rotation [6].
- The Thessaly maneuver often reproduces pain in patients with a meniscal tear [6].
- Range of motion is typically normal in patients with meniscal tears [6].
- Longitudinal bucket-handle tears may block full extension of the knee joint [6].
- Patients may report tightness in flexion if an effusion is present [6].
- In patients with associated ligamentous or chondral injury, meniscal-specific physical examination tests lose specificity for meniscal pathology [28].

IMAGING

- MRI remains the noninvasive diagnostic procedure of choice for confirming meniscal pathology [6].
- The sensitivity and specificity of 1.5-Tesla (T) and 3.0-T MRI diagnosis of medial meniscal tears, as confirmed with arthroscopy, were found to be 93% to 96% and 88% to 90%, respectively [28].
- MRI was less sensitive (77% to 82%) but more specific (98% to 99%) for lateral meniscal tears [28].
- A study of 3.0-T MRI for detecting posterior meniscal root tears found sensitivity of 77% and specificity of 73% [28].
- The decreased accuracy of MRI for diagnosing root tears may be attributable in part to the radial orientation of many posterior root tears, making them more difficult to visualize on MRI [28].
- In grade III MRI classification of meniscal tears, increased signal intensity reaches the articular surface of the meniscus [6].
- The criteria for MRI diagnosis of a meniscal tear include increased signal intensity extending to an articular surface from within the normally low-signal meniscal substance [28].
- The criteria for MRI diagnosis of a meniscal tear include distortion of the shape or size of the meniscus, which signifies missing meniscal tissue [28].
- The criteria for MRI diagnosis of a meniscal tear include a displaced meniscal fragment [28].
- To be considered a relevant finding, a tear seen on MRI should correspond to the patient's history and clinical examination findings [28].
- Standard knee radiographs should be obtained to evaluate for bone injuries or abnormalities [6].
- A weight-bearing radiograph is necessary to evaluate for osteoarthritis [6].
- The presence of osteoarthritis on radiographs suggests a degenerative meniscal tear [28].
- Avulsion fractures or tibial plateau fractures can be associated with an acute meniscal tear [28].
- A high proportion of surgical split-depressed lateral plateau fractures (> 2 mm of depression) also have peripheral longitudinal meniscal tears warranting repair [28].
- Meniscal injury is identified on MRI in 31% of asymptomatic athletes [8].

- Meniscal injury is identified on MRI in 91% of patients with knee osteoarthritis [8].
- In nonarthritic knees, focal joint line tenderness, effusion, and positive meniscal signs on physical examination may indicate meniscal pathology as a symptomatic source worthy of surgical intervention [8].
- In the presence of osteoarthritis, mechanical symptoms such as locking or catching in combination with unstable meniscal tears on MRI warrant intervention [8].
- Débridement of stable meniscal tears in the presence of osteoarthritis is unlikely to provide lasting relief [8].

Investigations

- MRI has demonstrated a high negative predictive value for meniscal tears [6].
- A well-performed MRI of a knee with no meniscal pathology will rarely demonstrate a tear [6].
- A right-to-left difference of at least 2 mm on weight-bearing radiographs represents a significant difference that will be verified by articular cartilage chondrosis at the time of arthroscopy [6].
- The accuracy of the clinical diagnosis of meniscal tears has been demonstrated to be 70% to 75% in several large studies [6].
- The Thessaly test often reproduces pain in patients with a meniscal tear [6].
- Manipulative maneuvers, including the McMurray and Apley tests, may produce a palpable or audible click with localized tenderness but are not specific for meniscal pathology [6].
- Range of motion typically is normal in patients with meniscal tears [6].
- Graft size accurate to within 5% of the native meniscus is crucial to success for meniscal transplantation, and sizing is typically done using radiographs but may also be accomplished using MRI [12].

Treatment

NON-OPERATIVE MANAGEMENT

- In the absence of intermittent swelling, catching, and locking, meniscal tears—particularly degenerative tears—may be treated conservatively [1].
- Nonsurgical management is a consideration for stable peripheral tears shorter than 5 to 10 mm in length [7].
- Nonsurgical management is a consideration for some degenerative tears that do not cause mechanical symptoms [7].
- Nonsurgical management is a consideration for tears in the setting of substantial osteoarthritis (Kellgren-Lawrence grade 3 or 4) [7].
- Nonsurgical management can include ice, NSAIDs, or physical therapy for range of motion and general strengthening of the lower extremities [4].

- Patients with symptoms that fail to improve with conservative measures may benefit from operative treatment [1].

OPERATIVE MANAGEMENT: PARTIAL MENISCECTOMY

- Arthroscopic partial meniscectomy is indicated for radial, oblique, flap, horizontal cleavage, and complex tears [4].
- Arthroscopic partial meniscectomy is indicated for tears located in the white-white avascular zone [4].
- Irreparable unstable tears causing mechanical symptoms (locked knee) can be treated with partial meniscectomy [7].
- Tears in the avascular zone, such as radial or flap tears, can be treated with partial meniscectomy [7].
- The goal of arthroscopic partial meniscectomy is to débride degenerative or torn meniscal tissue, leaving a stable contoured rim and preserving as much tissue as possible [4].
- Peak contact articular cartilage stresses increase proportionally to the amount of meniscus removed [4].
- Partial meniscectomy increases peak stresses in the affected compartment [1].
- Long-term follow-up of partial meniscectomy for the treatment of meniscal tears found an increase in osteoarthritic changes within the affected compartment [7].
- Partial meniscectomy for the management of radial tears that were within 1 cm of the posterior horn insertion led to progression of osteoarthritis in 35% of patients at a mean 77-month follow-up [7].
- At 5- to 7-year follow-up of 46 patients, one-third had progression of Kellgren-Lawrence grade 0 to 2 osteoarthritis to grade 3 or 4 osteoarthritis [7].
- Although the modified Lysholm Knee Questionnaire score often significantly improved after partial meniscectomy, only 56% of patients reported pain improvement [7].
- Studies have demonstrated greater than 80% satisfactory function at minimum 5-year follow-up after arthroscopic partial meniscectomy [4].
- Degenerative changes and a decrease in function occur more quickly in patients who have undergone arthroscopic lateral meniscectomy [4].
- Factors that predict better long-term function following arthroscopic partial meniscectomy include age younger than 40 years, normal lower extremity alignment, minimal arthritic changes noted at the time of arthroscopy, and a single fragment tear [4].

OPERATIVE MANAGEMENT: MENISCAL REPAIR

- Acute root tears should be repaired whenever possible [1].
- Meniscal root tear is an indication for meniscal repair [1].
- Surgical indications for meniscus root repair include a symptomatic tear that has failed nonsurgical management, minimal osteoarthritis, and no significant joint malalignment [14].
- Indications for surgical repair of meniscal root tears include young patients with traumatic tears and excellent chondral health [23].

- Anatomic root repair rather than meniscectomy should be considered to restore the patient's native anatomy and meniscal biomechanics in an effort to slow osteoarthritis progression [14].
- Several repair techniques have been described for meniscus root tears, including suture anchor repair and pullout suture repair through a tibial tunnel [14].
- Meniscus root repair has considerably better short-term to medium-term outcomes compared with meniscectomy [14].
- Meniscus root repair is associated with minimal progression of radiographic osteoarthritis [14].
- There is no consensus on the optimal repair technique for meniscus root tears [14].
- A locking suture technique has demonstrated biomechanical superiority to a nonlocking construct for meniscus root repair [14].
- Poor results following posterior medial meniscus root repair have been reported in morbidly obese patients (body mass index > 35) [14].
- Poor results following posterior medial meniscus root repair have been reported in patients with severe chondrosis [14].
- Poor results following posterior medial meniscus root repair have been reported in patients with varus malalignment greater than 5° [14].
- A conservative postoperative rehabilitation program is recommended following meniscus root repair [14].
- Non-weight bearing for a period of 4 to 6 weeks is recommended following meniscus root repair [14].
- Avoidance of deep knee flexion for at least 12 weeks postoperatively is recommended following meniscus root repair [14].
- At 4-year follow-up, patients who underwent repair of a medial meniscal root tear had less progression of osteoarthritis than those who underwent partial medial meniscectomy [7].
- At 4-year follow-up, patients who underwent repair of a medial meniscal root tear had better clinical scores than those who underwent partial medial meniscectomy [7].
- The risk for symptomatic osteoarthritis progression following meniscal repair is 25% to 50% lower than that following arthroscopic partial meniscectomy [7].
- The risk for symptomatic osteoarthritis progression following meniscal repair remains approximately twice as high as the general population [7].
- Preservation of the integrity of the articular cartilage on quantitative MRI has been associated with healed meniscal repairs [7].
- In a systematic review of management for traumatic meniscal tears, short-term revision surgery rates were higher after meniscal repair than after meniscectomy (16.5% versus 1.4%) [7].
- In a systematic review of management for traumatic meniscal tears, long-term revision surgery rates were higher after meniscal repair than after meniscectomy (20.7% versus 3.9%) [7].
- There were no plain radiographic degenerative changes in 78% of knees after meniscal repair [7].
- There were no plain radiographic degenerative changes in 64% of knees after meniscectomy [7].

- Nearly 80% of patients with arthroscopic meniscal repair had no osteoarthritis progression at 8- to 10-year follow-up [7].
- Only 40% of patients with meniscectomy had no osteoarthritis progression at 8- to 10-year follow-up [7].
- Approximately 96% of the patients who underwent arthroscopic meniscal repair returned to their preinjury level of sports activity [7].
- Only half of the patients who underwent a partial meniscectomy returned to their preinjury level of sports activity [7].
- The failure and revision surgery rate was found to be higher for medial than lateral meniscal repairs at short-term and medium-term follow-up [7].
- Concomitant ACL reconstruction positively correlated with healing of meniscal repairs [7].
- Age younger than 30 years trended toward a positive correlation with healing of meniscal repairs [7].
- Tears longer than 2 cm are negatively associated with healing rates of meniscal repairs [7].
- Smoking is negatively associated with healing rates of meniscal repairs [7].
- Clinical success rates for all meniscal repair techniques in stable knees range from 70% to 95% [4].
- Second-look arthroscopy has shown lower rates of success for meniscal repair, ranging from 45% to 91% [4].
- Ligamentously unstable knees decrease the success rate of meniscal repair to 30% to 70% [4].
- Meniscal repair success is greater than 90% when performed in conjunction with an ACL reconstruction [4].
- Success rate is 90% when meniscal repair is performed in conjunction with an ACL reconstruction [1].
- Success rate is 60% when meniscal repair is performed in a knee with an intact ACL [1].
- Success rate is 30% when meniscal repair is performed in a knee with a deficient ACL [1].
- Four techniques are commonly used for meniscal repair: open, “outside-in,” “inside-out,” and “all-inside” [1].
- Newer techniques for all-inside repairs are popular because of their ease of use [1].
- The latest generation of “all-inside” devices allows tensioning of the construct [1].
- Open repair usually is reserved for peripheral tears in the posterior horn approached through a capsular incision [4].
- Arthroscopic inside-out repairs are performed using absorbable or nonabsorbable sutures placed using zone-appropriate cannulas [4].
- The arthroscopic outside-in technique usually is reserved for anterior horn tears [4].
- Arthroscopic all-inside repairs involve absorbable stents or sutures tied to stents placed through arthroscopic portals [4].
- All-inside repairs may offer reduced neurovascular risk [4].
- No all-inside device improves on the load to failure of vertically placed inside-out sutures [4].
- Complications of meniscal repair include failure to heal the tear, knee stiffness, and potential damage to the articular surface from mechanical devices used to repair the tear [4].

- Proper tensioning of root repair is a clinical pearl for the treatment of meniscal root tears [23].
- Proper anatomic placement of root repair on tibia is a clinical pearl for the treatment of meniscal root tears [23].
- Intimate knowledge of root insertional anatomy is essential for restoration of meniscal function [23].

OPERATIVE MANAGEMENT: MENISCAL TRANSPLANTATION

- Meniscal allograft transplantation has been reserved for the patient who remains symptomatic in activities of daily living after partial or total meniscectomy [4].
- Meniscal allograft transplantation has been reserved for the patient who develops recurrent pain after partial or total meniscectomy [4].
- Meniscal allograft transplantation is usually reserved for patients who are skeletally mature but younger than 50 years [4].
- Contraindications for meniscal allograft transplantation include uncorrected lower extremity malalignment [4].
- Contraindications for meniscal allograft transplantation include uncorrected ligamentous instability [4].
- Contraindications for meniscal allograft transplantation include inflammatory arthritis [4].
- Contraindications for meniscal allograft transplantation include significant chondral changes in the treated compartment [4].
- Return to strenuous sports generally is not recommended after meniscal allograft transplantation [4].
- Subjective improvement in tibiofemoral pain and increased activity levels are seen after meniscal transplant [4].
- A long-term benefit for preventing the progression of osteoarthritis has not been established for meniscal allograft transplantation [4].
- Grafts have performed better when placed with a bone block or plug [4].
- Preservation of at least some peripheral rim is important to prevent peripheral extrusion after meniscal transplant [4].
- Meniscal allograft is indicated in a patient who has had a previous meniscectomy [27].
- Meniscal allograft is indicated in a patient who is 50 years or younger [27].
- Meniscal allograft is indicated in a patient who has symptoms localized to the tibiofemoral compartment [27].
- Meniscal allograft is indicated in a patient with no advanced arthrosis as evidenced by flattening of the condyles or excessive osteophyte formation [27].
- A joint space of 2 mm or greater on standing posteroanterior view is necessary for meniscal allograft [27].
- Contraindications for meniscal allograft include malalignment [27].
- Contraindications for meniscal allograft include instability that the patient does not wish to have corrected [27].
- Contraindications for meniscal allograft include chondromalacia greater than grade III [27].

- Contraindications for meniscal allograft include previous joint infection [27].
- Best results are obtained with a meniscal allograft that has a bone block or a bone bridge attached [27].
- In a meta-analysis evaluating meniscal transplants, lateral transplants performed better than medial transplants [27].
- At 5- to 10-year follow-up, approximately 85% of meniscal transplants survived [27].
- At longer than 10-year follow-up, survival rates of approximately 55% are reported for meniscal transplants [27].
- Meniscal transplantation allows patients to return to the same level of athletic competition 75% to 85% of the time [8].
- Overall failure rate (conversion to total knee arthroplasty) for meniscal transplantation ranges from 10% to 29% in long-term follow-up [8].
- Both medial and lateral meniscal allograft transplantation result in significant improvements in pain, quality of life, and functional outcomes compared with preoperative scores [8].
- Meniscal transplantation is contraindicated in knees with diffuse arthritic changes [8].
- Meniscal transplantation is contraindicated in morbid obesity [8].
- Meniscal transplantation is contraindicated in patients over 50 years of age [8].
- Meniscal transplantation is contraindicated in knees with unaddressed ligamentous instability [8].
- Meniscal transplantation is contraindicated in knees with limb malalignment [8].
- Meniscal transplantation is contraindicated in knees with chondral defects [8].

Complications

- A meniscal root tear results in a loss of hoop stresses and an increase in contact forces [1].
- Success of meniscal repair depends on location, type of tear, and chronicity [1].
- The treatment of chronic meniscal root tears is more controversial than that of acute tears [1].

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- [23] Campbell S Operative Orthopaedics 4 Volume Set. TRANSTIBIAL PULL-OUT REPAIR OF RADIAL OR MENISCAL ROOT TEAR > ALL-INSIDE TECHNIQUE.
- [27] Campbell S Operative Orthopaedics 4 Volume Set. TRANSTIBIAL PULL-OUT REPAIR OF RADIAL OR MENISCAL ROOT TEAR > MENISCAL REPLACEMENT.
- [28] Orthopaedic Knowledge Update Sports Medicine 6. Meniscal Injuries > Diagnosis.