



**Department of Rehabilitation Services
Physical Therapy**

Standard of Care: Meniscal Tears

Conservative management of the patient with a meniscal tear.

ICD 9 Codes:

717.4 derangement of the lateral meniscus
717.3 derangement of the medial meniscus
836.0 lateral meniscus tear
836.1 medial meniscus tear

Case Type / Diagnosis:

Functional Anatomy:

The menisci are semi lunar shaped cartilages on the medial and lateral sides of the knee joint. The medial meniscus is semicircular in shape and the lateral meniscus is almost a complete circle.^{3,10,14} The menisci are held in place firmly to the knee joint capsule by ligaments surrounding the meniscus complex. The medial meniscus is connected to the lateral meniscus anteriorly by the transverse ligament and connected to the patella by the patellomeniscal ligament (a thickening of the anterior capsule) and held in place posteriorly by the semimembranosus muscle, which can affect movement in the medial meniscus as it contracts. The anterior horn of the medial meniscus receives fibers from the anterior cruciate ligament (ACL) and the posterior horn receives fibers from the posterior cruciate ligament (PCL). The lateral meniscus is connected to the medial meniscus by the transverse ligament anteriorly, and to the patella by the patellomeniscal ligament. The lateral meniscus is also anchored posteriorly to the popliteus muscle and the PCL and to the medial femoral condyle via the menisiofemoral ligament. Muscular contractions of the popliteus muscle affects the movement of the lateral meniscus.¹¹ The medial meniscus is less mobile than the lateral meniscus secondary to its attachments to the MCL, allowing 2 to 5 mm of translation; this attachment to the MCL may be a contributor to the increased incidence of medial meniscal tearing.¹⁴ In comparison, the lateral meniscus translates 9 to 11mm in the anteroposterior plane.¹⁴

The menisci are 75% type one collagen¹⁴. The fibers run along longitudinal (circumferential) and radial patterns. The longitudinal fibers allow for axial loading while radial fibers allow for rotational loading. The peripheral 20%-30% of the medial meniscus and 10%-25% of the lateral meniscus are vascular.¹⁴ Healing is greatly enhanced in the vascular regions and the location of a tear (whether in a vascularized or non-vascularized region) affects treatment decision making. Menisci are innervated with pain receptors and joint mechanoreceptors and as such, pain and altered joint position sense can be expected with meniscal injury.⁴

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Meniscal motion is determined directly by osseous configuration of the tibiofemoral joint, but the motion is indirectly influenced by contraction of the quadriceps, semimembranosus and popliteus muscles. Meniscal motion follows the direction of femoral condyle displacement. During flexion the femoral condyles compress on the posterior horns causing anteroposterior spread. During knee extension the condyles compress on the anterior horns causing mediolateral deformation.¹⁷ Should the menisci fail to follow the femoral condyles along the tibial plateau they risk entrapment between the two articulating surfaces and sustaining injury due to compression. During terminal knee extension the tibia and femur move in opposite directions, therefore it is during the last 20-30 degrees of extension that the anterior horn of the menisci are at greatest risk.¹⁷

One function of the menisci is to *distribute loads* across the knee joint. The menisci transmit approximately 50% of the load in weight bearing (extension) and 90% of the load at 90 degrees of knee flexion. The majority of the load is transmitted through the posterior horns with flexion past 90 degrees.^{10,17} When meniscal integrity is compromised, abnormal articular contact stresses result, leading to early degenerative changes. The menisci also play a role in *knee stability*. Menisci deepen the socket of the tibia to increase contact with the femoral condyles. The meniscus can also help to limit femoral translation on the tibia. The menisci (especially the posterior horn of the medial meniscus) can be a secondary stabilizer in an ACL-deficient knee,¹⁴ although an ACL tear can also increase the risk of a medial meniscus tear, indicating that the menisci are not always able to handle the increased forces required for stabilization in the ACL-deficient knee.¹⁸ Finally, the menisci have a role in *joint lubrication*. When the knee is loaded the menisci are compressed and synovial fluid is driven into the articular cartilage, thereby decreasing friction and providing joint nutrition.^{3,17}

Mechanism of Injury and Tear Classifications:

Meniscal tears can be classified as acute or degenerative depending on the mechanism of injury. The most frequent mechanism of acute meniscal injury is non-contact stress from deceleration or acceleration coupled with a change in direction, commonly seen during a cutting maneuver. Contact stress may also cause a meniscal tear, from a varus, valgus or hyperextension force coupled with a rotational motion. This mechanism can also result in a concurrent collateral ligament sprain.¹⁷ Playing sports such as soccer and rugby has been found to be a strong risk factor for acute meniscal tears. Risk factors for degenerative meniscal tears include age (older than 60 years), male gender, work-related kneeling, squatting and stair climbing.¹⁸

Classification of meniscal tears include: complete or partial, horizontal or transverse, longitudinal/vertical or radial.¹⁷

- *Horizontal (interstitial) tears* are most often chronic from degenerative changes. These tears usually do not cause locking but they can progress to flap tears which can cause popping or clicking.
- *Vertical tears/longitudinal tears* are most often traumatic and result from the forces applied to a healthy meniscus that cause it to split vertically and in line with the circumferentially oriented collagen fibers. These tears are also known as “bucket handle”

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tears. When an unstable fragment from a bucket-handle tear moves into the intracondylar notch it blocks full extension of the knee joint.¹⁴

- *Radial tears* are those in the central aspect of the meniscus. These tears may migrate towards the periphery and turn into a “parrot beak” tear. Signs may include: swelling, giving way or catching.^{3,17}

Another classification for the type of tear is based on location of the tear in three different zones: red/red, red/white and white/white. Red/red tears are those that occur in the vascularized outer third of the meniscus, red/white tears are those in the middle-third of the meniscus where the vascular supply is predominately located at the outer edge of the tear, and white/white tears are those that occur in the inner third and where no blood supply exists.¹

Healing is influenced by the pattern of the tear and the type of vascularity. Longitudinal tears heal better than radial tears. Simple tears heal better than complex tears. Traumatic and acute tears have higher healing rates than degenerative and chronic tears.¹⁴

Overview of Medical Management:

Selecting conservative vs. surgical management is decided by seeking an intervention which maintains the best long-term results with the lowest possible risk for degenerative arthritis. Surgical management options include partial or full meniscectomy, debridement, repair or allograft transplantation. See the operative protocol for additional information on surgical treatment options and rehabilitative protocols. Current research suggests that patients with meniscal tears experience positive outcomes, reduction in symptoms and improvement in functional status with either arthroscopic partial meniscectomy or physical therapy. This makes conservative management of meniscal tears an attractive initial strategy considering it is noninvasive, low-cost, and still allows the patient to progress to surgical intervention at a later time if desired or required.⁷

Indications for Treatment:

- Pain
- Swelling/edema
- Instability
- Impaired function
- Gait impairment
- Impaired ROM
- Impaired Strength/muscle performance
- Balance and proprioception

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Contraindications / Precautions for Treatment:

With changes in the structure of the health care system, patients are more frequently accessing physical therapy services through direct access or through a referral from their primary care physician, rather than an orthopedist or orthopedic surgeon. These circumstances mean it is increasingly important to accurately diagnose the source of a patient's impairments and pain in order to rule out any diagnoses or conditions for which physical therapy is inappropriate or for which patients may require additional medical services.

Although not all of the following are measurable by the outpatient physical therapist without prior imaging, indications for meniscal repair rather than conservative management include:¹⁰

- Tears >1cm and <4cm in length
- Red-red zone tears
- Vertical tears
- Patient age <40 years
- No mechanical axis malalignment
- Acute tears (<6 weeks)
- Concurrent ACL reconstruction.

Patients with acute meniscal tears should avoid further athletic participation and excessive loading to meniscus. Please also see protocols for post operative care of meniscal repair, meniscectomy and repair with ACL reconstruction.

Differential Diagnosis (if applicable):¹⁷

- Discoid meniscus- congenital abnormality of the lateral meniscus lacking a crescent shape.
- Cystic menisci- infiltration of synovial fluid through a horizontal (typically lateral) tear.
- Popliteus tendonitis – muscle may become enlarged secondary to its rolling “unlocking the screw-home mechanism” and become entrapped.
- Plicae- repeated rubbing of the mediopatellar plica across the medial femoral condyle and the medial patellar facet may contribute to chondromalacia.
- Osteochondritis dessicans- osseous lesion to the medial femoral condyle, lateral femoral condyle and the patella. Fragment “joint mice” may cause mechanical symptoms.
- Meniscotibial ligament sprain- in conjunction with a medial collateral ligament sprain. This may be clinically indistinguishable from a meniscal tear. Only diagnosed via arthroscopy.
- Tibial spine avulsion fracture- the medial meniscus may be entrapped beneath the fracture segment.
- Fat pad syndrome- if the fat pad is converted to fibrocartilage secondary to repetitive trauma, or repetitive surgical intervention, the pad may be entrapped between the patella and the femur resulting in similar symptoms to meniscal tear.
- Osteoarthritis and other arthritic conditions.

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Evaluation:

Medical History: A complete review of the medical history questionnaire, medical records and medical history in the hospital computer system should be completed. Diagnostic imaging and/or operative notes should also be examined. The sensitivity and specificity of detecting a meniscal tear using MRI are in the range of 82-96%.³ It is relevant to note that meniscus tears are common incidental findings on MRI images of the knee, as up to 60% of tears in one large longitudinal study were found in knees without any symptoms.³

History of Present Illness:

Questions regarding:

1. The mechanism of injury- traumatic or atraumatic.
2. Presence of locking, giving way or catching (displaced fragments can act as mechanical block.)
3. Aggravating and alleviating factors.
4. Presence of pain- likely only if the tear is in the peripheral 1/3 of the meniscus as degenerative tears to the middle 2/3 are less likely to be painful since they are devoid of free nerve endings.
5. Swelling– if a tear is in the red zone swelling usually develops in 1-3 days. Swelling 1-2 hours after trauma usually indicates a concurrent ligamentous injury or fracture.^{13,14,17}

Social History: The patient's home, work, recreational and social activities should be investigated especially if degenerative meniscal injury is suspected as known risk factors for degenerative tears include work-related squatting, kneeling and stair-climbing.¹⁸

Medications: Patients may be taking non-steroidal anti- inflammatory medications, and may have had a corticosteroid injection.

Examination

This section is intended to capture the most commonly used assessment tools for this case type/diagnosis. It is not intended to be either inclusive or exclusive of assessment tools.

Screening: The lumbar spine and full lower quarter should be routinely screened in all patients with knee pain.

Pain: Measured by the VAS, VRS or NRS scales.

Inspection: Decreased thigh girth and atrophy of quadriceps secondary to reflex inhibition can be a sign of chronic tear.

Posture: Varus knee malalignment tends to overload the medial knee compartment. Valgus malalignment overloads the lateral meniscus. Patients with poor alignment tend to have more degenerative tears, which have a poorer healing capacity. Patients' foot alignment should also be assessed.

Palpation: Edema may be activity dependent. Edema may or may not be present depending upon the site of the tear (vascular or avascular region). Girth measurements may be taken to track edema or atrophy.

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Palpation of the tibiofemoral joint line to assess for the presence of joint line tenderness (see special tests below for relevance of joint line tenderness.)

Range of motion: Check for lack of knee extension or full flexion. A displaced flap may limit motion. Knee, hip and ankle passive and active ROM should be noted.

Muscle performance: Using manual muscle testing, resisted isometric testing and/or hand-held dynamometry.

Special tests for meniscal integrity:

- The McMurray test involves loading the lateral and medial meniscus, from a fully flexed position with external rotation or internal rotation with the patient in the supine position. Clicking is suggestive of a meniscal tear. Pain during knee flexion implicates the posterior horns. Pain with extension implicates the anterior horns. Internal rotation tests the lateral meniscus while external rotation tests the medial meniscus. The McMurray test has a sensitivity of 70% and a specificity of 71%.⁶
- The Apley compression test is comprised of rotation plus compression then rotation plus distraction with the patient prone and the knee flexed at 90 degrees. If pain is present with distraction the lesion is more likely ligamentous. If the pain is with compression the lesion is more likely meniscus. Meta analysis demonstrates that the Apley compression test sensitivity is 60% and specificity is 70%.⁶
- Thessaly's test involves the patient rotating on the involved knee in the weight-bearing position with the knee at 5 degrees of flexion and then at 20 degrees of flexion and noting any pain or locking or catching with rotation. The test's sensitivity is better at 20 degrees than at 5 degrees and sensitivity ranges from 59 to 89% for the medial meniscus and 67 to 92% for the lateral meniscus with specificity ranging from 83 to 97% medially and 95 to 96% laterally. Thessaly's can be a very painful test for the patient with meniscal pathology and should be administered with caution as it is performed in a weight-bearing position.⁹
- Joint line tenderness involves palpation of the joint line directly and is 63% sensitive and 77% specific.⁶ Joint line tenderness can be non-specific if ACL or MCL involvement or osteoarthritis is suspected.

It should be noted that while no single physical examination test can accurately diagnose a torn meniscus, and it is difficult to definitely confirm meniscus pathology unless the patient experiences an acute locking episode during examination, diagnostic accuracy improves when clusters of tests are used. Clinical assessment and diagnosis can be aided by the use of a composite score called the Meniscal Pathology Composite Score (MPCS). The MPCS is a combination of 5 tests:

- a history of catching and locking
- joint line tenderness
- pain with forced hyperextension
- pain with maximal knee passive flexion
- pain or an audible click with McMurray's test.¹²

When all five are present, there is a 92.5% positive predictive value of finding a meniscus tear, with three of the five present there is a 75% positive predictive value in the MPCS.¹²

Special tests for ligamentous integrity: To rule out or in associated knee pathology.

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Full descriptions for knee special tests can be found in many reference texts including Magee's *Orthopedic Physical Assessment* and *Ortho Notes: Clinical Examination Pocket Guide*.^{5,13}

Joint play/mobility: Assess joint mobility/play for hypo, normal or hypermobility of both the patellofemoral and the femoral-tibial joints.

Balance: Romberg testing should be used, but at a minimum single leg stance times with eyes open should be noted.

Gait: Observe gait and note any deviations or pain with ambulation and record devices used.

Functional assessment: The Lower Extremity Functional Scale may be used to assess patient's ongoing functional disability.

Functional testing:

Provocative step up/step down or a functional hop test can be used for the athletic population but should be used with caution during the initial evaluation if acute pain/edema is present.

Assessment:

Problem List

- Pain
- Edema
- Decreased ROM
- Impaired strength
- Impaired functional mobility
- Impaired gait
- Impaired balance and/or proprioception
- Knowledge deficit regarding activity modification and progression of activity

Prognosis: Physical therapy treatment, with the option to pursue arthroscopic partial meniscectomy if improvements in function and decrease in symptoms is not achieved, is likely to result in considerable improvements in functional abilities and a decrease in knee pain. In the results from a large multicenter randomized controlled trial, patients who were treated with physical therapy alone did not experience significantly different outcomes than those treated with arthroscopic partial meniscectomy.⁷

Goals: When setting goals and timelines for goal achievement for the patient with a meniscal tear being treated non-operatively, it is important to consider the patient's age, BMI, mechanism of injury, time since injury, significant comorbidities, patient motivation, and compliance. The time-frames listed below are broad in order to encompass the heterogeneity of the potential patient population. Measurable parameters and specific timelines should be included for all goals on the initial evaluation form and should meet with all Medicare and insurance guidelines in order to ensure that patient treatment and progression is accurately documented and appropriately reimbursed.

1. Pain free gait, functional mobility and ADL's in 6-12 weeks as reported on pain scales and/or functional outcome measures.
2. Non-palpable edema in 2-4 weeks.
3. Full range of motion of the involved side equaling the non-involved side in 2-4 weeks.

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4. At least 4+/5 MMT all lower extremity planes in 6-10 weeks.
5. Non-antalgic, normalized gait with/without assistive device in 6-8 weeks.
6. Independent with home ther-ex program both initial and discharged in 6-12 weeks.

Treatment Planning / Interventions

Established Pathway ___ Yes, see attached. X No

Established Protocol ___ Yes, see attached. X No

It is an important part of physical therapy intervention and treatment management to consider the patient's insurance and allowed number of visits per diagnosis or within a certain time period. Careful consideration of any limitations on number or frequency of visits should be taken into account when developing a treatment plan for any patient, including those with meniscal pathology being treated conservatively. This may take the form of ensuring that a patient is comfortable with a therapeutic exercise protocol with appropriate regressions and progressions as needed and then seeing the patient less frequently as they progress on their own, or actively documenting a patient's need for more physical therapy services and advocating for the patient directly with the insurance company or administrator.

Interventions most commonly used for this case type/diagnosis.

This section is intended to capture the most commonly used interventions for this case type/diagnosis. It is not intended to be either inclusive or exclusive of appropriate interventions.

Acute:

- Diminish inflammation and swelling with use of modalities as needed. See modalities protocols for specific parameters.
- Restore ROM, emphasizing full knee extension and flexion to tolerance.
- Facilitate quadriceps activity with e-stimulation and therapeutic exercise (likely starting with exercises in non-weight-bearing until weight-bearing activity is tolerated.)
- Normalize gait pattern using assistive devices and braces as needed.
- Endurance activity using modes that decrease impact and load on the knee joint including bike, swimming (no frog kick), and/or elliptical machines.
- Therapeutic exercises (all therex should be pain-free) in this stage may include:
 - Isometric quad sets
 - Isometric glute sets
 - Supine heel slides
 - Straight leg raise (with/without external rotation to isolate vastus medialis.)
 - Seated knee extensions through partial or full range of motion
 - Clamshells or sidelying hip abduction (to activate glute medius and initiate hip strengthening.)
 - Supine hip extension (bridge exercises.)
 - Prone hamstring flexion (with/without ankle weight.)

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Sub-Acute:

- Continue with inflammation and ROM management.
- Progression to closed kinetic chain therapeutic exercise and progressive resistive therapeutic exercise. Focus on hamstring and quadriceps strengthening secondary to their dynamic role in meniscal movement.
- Emphasize increasing or progressing hip strength in order to reduce load on knee and promote normalized/improved biomechanics.
- Balance and proprioception drills.
- Therapeutic exercises (all therex should be pain-free) in this stage may include those from the prior stage as well as:
 - Seated knee extension through partial or full range of motion with ankle weights.
 - Step-down with heel touch.
 - Squats through partial to full range of motion on Total Gym.
 - Standing mini-squats (with band to promote hip ABDuctor activation.)
 - Standing terminal knee extension against band resistance.
 - Bilateral and single-leg stance practice on varied surfaces (foam, BOSU ball.)
 - Monster walks (side-stepping in mini-squat position with ABDuction band.)
 - Single-leg hip-hinge exercises (assisted or against gravity before adding weight.)

Chronic:

- Normalize gait.
- Progress strength to 85% of the contralateral side
- Progress to sport specific drills and education regarding progressed home therapeutic exercise program.
- Unloading braces might be helpful with degenerative tears to restore full functional mobility in a patient with a varus or valgus alignment.
- Continue to monitor response to all exercise progressions and watch for swelling, increased pain or decreased function as warning signs that patient is being progressed too quickly.

Frequency & Duration:

Outpatient care 1-2x/week for 2-3 months as indicated by patient's status and progression.

Patient / family education

Education includes home program, footwear modification, use of assistive device, pain and edema management techniques, and activity modification and progression. Education should also include the importance of weight management and weight loss if appropriate for the patient. Research indicates that in addition to excess body-weight causing increased stress on all weight-bearing joints in the body, that patients with meniscal tears who gain weight experience increased cartilage loss and increased pain, whereas those who lose weight experience the reverse.¹⁹

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Recommendations and referrals to other providers.

Orthopedic referral is recommended especially if mechanical symptoms, ligamentous instability or osseous injury are present or if the patient experiences continued symptoms after 3 months. Nutritionist referral is recommended for those patients who are overweight and may benefit from weight reduction to preserve cartilage and decrease pain.

Re-evaluation

Standard Time Frame: 30 days or less if appropriate.

Other Possible Triggers: A significant change in signs and symptoms, new trauma, new orthotics may trigger a gait assessment, or a change in medication for iontophoresis etc.

Discharge Planning

Commonly expected outcomes at discharge:

1. Non-antalgic gait.
2. Pain free /full range of motion.
3. Lower extremity strength at least 4+/5.
4. Independent with home program.
5. Normal age-appropriate balance and proprioception.
6. Resolved palpable edema.

Patient's discharge instructions

Patients should be instructed to continue with their maintenance home program 3 times per week if symptoms have resolved and to follow up with their MD or physical therapist as needed if symptoms return.

Patients who plan to return to higher level sports or activities should be provided with additional education on the appropriate parameters and goals to meet prior to initiating high-level activities and should be educated on the gradual reintroduction of high-level sports and activities in order to prevent the risk of further injury or aggravation of the torn meniscus.¹⁵

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