Dynamic Chiropractic

REHAB / RECOVERY / PHYSIOTHERAPY

# Managing the Meniscus (Part 1)

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While chiropractic care is most frequently associated with treatment of the neck or back, as chiropractors continue to enhance their skills with extremity manipulation, therapeutic exercise, elastic therapeutic taping, and soft-tissue techniques such as Graston and ART, they can expect to see more patients with extremity injuries. Those who specialize in sports chiropractic can also be expected to routinely encounter extremity injuries. Therefore, it is important to remain up-to-date with the most current knowledge of extremity injuries, including knee injuries. In this article and the next, let's focus on the epidemiology, anatomy, diagnosis, surgical treatment, and conservative management of knee meniscus injuries.

The incidence of knee meniscus injuries is 60-70 per 100,000, with a male:female ratio of 2.5-4:1.[1] Although meniscus injuries are commonly sustained by athletes, the majority of meniscus lesions actually do not occur from sports injuries.

While many meniscus injuries can be treated conservatively, a subset of patients ultimately requires some type of orthopedic surgery. In fact, some have reported that partial meniscectomy surgery is the most common orthopedic surgical procedure performed.[2]

Setting the Anatomical Stage

The menisci are composed of semilunar cartilage with an outer aspect that is thick and convex, and an inner aspect that is thin and concave.[3] Both menisci are composed of three distinct parts: an anterior horn, a body (middle zone) and a posterior horn.

The medial meniscus is c-shaped and attached to the MCL and joint capsule. Because of these attachments, the medial meniscus is less mobile than the lateral meniscus and thus, more prone to injury. The lateral meniscus is o-shaped and more mobile, which decreases the risk of injury.

A developmental anomaly known as a discoid meniscus can occur, which has an incidence of 3.5-5 percent.[1] A discoid meniscus is more commonly seen in the lateral meniscus, is thicker, and covers more surface area than a normal meniscus. It is more susceptible to injury.

Meniscus tears occur most often in the posterior horn because of the posterior horn's decreased mobility compared to the anterior horn. The vascular supply to the menisci is from the medial and lateral geniculate arteries.[3]

The blood supply of the meniscus is based upon an anatomical distribution into three specific zones and is critical for healing. The outer third of the meniscus is named the red-red zone and has excellent healing potential. The middle third is named the red-white zone and has a good healing prognosis, while the inner third is named the white-white zone and has poor healing prognosis.[4]

After 50 years of age, the blood supply to the menisci decreases, as does the healing potential.[3]

Form and Function

The function of the menisci is to aid in load transmission, promote stability, aid in shock absorption, provide lubrication / nutrition to the articular cartilage, and provide proprioceptive feedback.[5] Mechanoreceptors include Golgi tendon organs, Ruffini endings, and Pacinian corpuscles. They are most prevalent in the outer third of the meniscus, with the inner third having essentially no innervation.[3]

Meniscus proprioceptive feedback helps control muscle tone and reflex muscle coordination for knee movement. Decreased afferentation from meniscus injuries can lead to instability and an acceleration of knee joint degeneration.

The meniscus decreases knee contact stress, with the medial meniscus transmitting 50 percent of the joint load and the lateral meniscus transmitting 70 percent of the joint load.[4] After a partial meniscectomy, peak joint contact stress is increased by 65 percent.[6] A partial lateral meniscectomy increases contact stress more than a partial medial meniscectomy, which further increases the risk of knee osteoarthritis.

Biomechanically, knee flexion moves the meniscus posteriorly, while knee extension moves the meniscus anteriorly.[7]

Meniscus Injuries

A meniscus injury can result from a single trauma or occur as a result of degeneration. Traumatic injuries typically occur in a weight-bearing position with knee twisting or hyperflexion.[1] Although immediate pain and a decrease in knee flexion may occur, effusion typically takes 24-48 hours.

A loss of knee extension with locking can occur with a bucket-handle tear. Degenerative tears can occur without any trauma and generally affect those over the age of 40. Common signs and symptoms of a meniscus tear include medial or lateral knee pain, popping, clicking, locking, and recurrent knee swelling after exercise.[8]

It is important to note that one-third of meniscus tears are associated with ACL tears. Acute ACL tears most often occur with lateral meniscus tears, while chronic ACL tears tend to damage the medial meniscus.[1]

Meniscus tears can occur in a single plane or in multiple cleavage planes with degenerative or complex tears. The most common tears include horizontal cleavage tears, oblique tears (flap, parrot beak), radial (transverse) tears, and vertical or vertical longitudinal tears (bucket-handle).[1]

Horizontal cleavage tears increase with age and often result in the formation of a meniscal cyst, which can be another source of knee pain.[9] Bucket-handle tears tend to occur in younger patients, are associated with ACL tears, are unstable, and may result in knee extension lock.[1] Complex or degenerative tears occur in multiple cleavage planes, increase in incidence with age, and are more common in the posterior horn.[4]

Diagnosing the Problem

While knee X-rays do not show meniscus tears, they can be useful to rule out a fracture, osteochondral injury, or a loose body,[10] and also evaluate for signs of knee osteoarthritis. The gold standard for evaluating a meniscus tear is diagnostic arthroscopy.[1] However, this is an invasive procedure with risks that include saphenous / peroneal nerve injury, superficial or deep infections, or vascular injuries.[11] Because of these risks, diagnostic arthroscopy has been replaced by MRI.

MRI is quite accurate, with a systematic review by Crawford, et al., (2007) showing medial meniscus tear sensitivity of 91.4 percent, lateral meniscus tear sensitivity of 76 percent, medial

meniscus specificity of 81.1 percent and lateral meniscus specificity of 93.3 percent.[11] Because MRI is not a perfect test, clinical correlation is necessary when evaluating patients suspected of having a meniscus tear.

It is worth noting that 16 percent of asymptomatic knees demonstrate meniscus tears, and 36 percent of asymptomatic knees in individuals older than 45 years have meniscus tears.[12] In particular, horizontal and oblique tears are often asymptomatic. On the other hand, radial, vertical, complex, and displaced tears tend to correlate well with symptoms. Imaging of the pediatric and adolescent knee can be more difficult because of normal hypervascularity that may be mistaken for a meniscus tear.

MR arthrography is occasionally used with suspected recurrent tears or recurrent pain after meniscectomy or repair. MRI of the meniscus uses a four-grade system ranging from 0-III.[1] A normal meniscus has a low-intensity signal and is graded as 0. Increased signal intensity that does not touch a free edge of the meniscus can indicate myxoid degeneration, which is asymptomatic and graded as I or II.

A true meniscus tear demonstrates an increase in signal intensity extending from the meniscus to one or more articular surfaces on two or more slices, and is graded as III. Other abnormalities that may be seen on MRI include an enlarged or discoid meniscus and a meniscal cyst.[13] Meniscal cysts have a high-intensity signal and are seen on 4-6 percent of knee MRI scans, occurring more often medially than laterally.[9]

There are many different tests for meniscus lesions; the following are the most accurate and commonly performed tests. Most clinicians are aware of non-weight-bearing tests to detect meniscus tears, but there are newer weight-bearing tests. Therefore, meniscus tests can be categorized into non-weight-bearing tests such as joint-line tenderness, McMurray's test, and Apley's test; as well as newer weight-bearing tests such as Thessaly's test and Ege's test.

Generally speaking, meniscus tests are less accurate with acute injuries, concomitant ligamentous injuries or degenerative lesions.[12] It is generally recognized that while individual tests in isolation may not be helpful, using multiple tests will improve diagnostic accuracy.[8]

Joint-line palpation for tenderness is not pathognomonic for a meniscus tear and according to a systematic review and meta-analysis by Hegedus, et al., (2007) has a pooled sensitivity of 63.3 percent and a pooled specificity of 77.4 percent.[14] Individual studies show a sensitivity ranging from 27-93 percent and specificity ranging from 13-96 percent.[15] There is a higher sensitivity and specificity for lateral meniscus tears.[8]

Palpation of the medial meniscus is enhanced with knee flexion and internal tibial rotation, and for the lateral meniscus with knee flexion and external tibial rotation.[8] Joint-line palpation is not sensitive or specific in the presence of an ACL injury.[8] Joint-line tenderness is also found in patients with knee osteoarthritis.

McMurray's Test

*McMurray's test* is the most commonly performed meniscus test.[8] For this test, the knee is fully flexed with the foot held by grasping the heel and then turning the leg into internal rotation to test

the lateral meniscus or external rotation to test the medial meniscus and then extending the knee.[15] The criteria for a positive test varies from pain to a palpable or audible thud.

According to Hegedus, et al., pooled sensitivity was 70.5 percent and pooled specificity was 71.1 percent.[14] Individual studies have found sensitivity ranging from 14-88 percent and specificity ranging from 20-98 percent.[15] McMurray's test is best used as a specific test that will help to rule in a tear when the test is positive.[15]

Apley's Test

*Apley's test* is performed by flexing the knee to 90 degrees in the prone position and compressing the foot while adding tibial rotation, and then distracting the tibia and adding rotation.[15] A positive test for a meniscus tear is when compression is more painful than distraction.

Pooled sensitivity of this test was 60.7 percent and pooled specificity was 70.2 percent in the Hegedus, et al., systematic review.[14] The sensitivity of individual studies ranges from 13-81 percent and specificity from 56-100 percent.[15] This test may be more valuable as a specific test to rule in a meniscus tear when this test is positive.[15]

Thessaly's Test

*Thessaly's test* is a weight-bearing test first researched in 2005 by Karachalios, et al.[16] This test was shown to be more accurate than McMurray's and Apley's, although it is less accurate in the presence of an ACL tear.[8]

For this test, the patient is standing on one leg and first flexes the knee approximately 20 degrees and rotates the body to the left and right three times.[15] Like McMurray's test, internal rotation tests the lateral meniscus and external rotation tests the medial meniscus.

A positive test is joint pain, locking or catching. The sensitivity of this test ranges from 89-92 percent and specificity from 96-97 percent when performed more than four weeks from the time of injury.[16]

Ege's Test

The other weight-bearing test is *Ege's test*, which was developed in 2005 by Akseki. In this test, the patient is standing with the feet 30-40 cm apart and slowly squats with legs in maximum external rotation to test the medial meniscus, and maximum internal rotation to test the lateral meniscus.[15] A positive test is knee pain or clicking.

The sensitivity of this test ranges from 64-67 percent and the specificity ranges from 81-90 percent when performed more than six weeks after a meniscus injury.[17] This test is not as accurate for detecting degenerative meniscus tears.[17]

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*Editor's Note*: Part 2 of this article is scheduled to appear in the June 1 issue and discusses surgical and conservative management of meniscus injuries.

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