Management of Meniscal Tears

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Meniscal tears of the knee are common in primary care practice, and surgical treatments of this injury are among the most frequently performed orthopedic procedures. Meniscal tears can cause catching and locking of the knee joint and occasionally produce effusions. Patients can be severely limited by these symptoms. In addition, torn menisci may lead to damage and degeneration of the joint.

The precise natural history of meniscal tears is unknown, and randomized controlled trials comparing different strategies for the treatment of meniscal tears have not been performed. Thus, the management of meniscal tears is largely attributed to the art of medicine. However, the results of basic science investigations of meniscal biology and reported clinical findings provide an evidence base from which some practical guidelines can be drawn.

Physiology of the Meniscus

The meniscus (Greek for “little moon”) of the knee joint is a crescent-shaped pad of cartilage that covers the articular surface of the tibia [1]. There are 2 menisci, 1 medial and 1 lateral, in each knee. The menisci are thick at their peripheral edges and taper centrally, giving them a wedge-like appearance when viewed from the side. Although the menisci were once believed to be vestigial, it is now understood that they play an important role in the biomechanics of the knee [2]. With its crescent shape, the meniscus promotes the mating of the rounded edge of the femur and the flat edge of the tibia and distributes the forces of weight bearing evenly throughout the tibia. In addition, the meniscus plays an important role in stabilizing the knee [3] and may participate in the process of proprioception [4].

Pathophysiology

Tears of the menisci occur in 2 distinct settings. In 1 setting, a healthy meniscus is traumatized. This type of tear frequently occurs in an athletic population where twisting movements, especially on the flexed knee, exert high forces on the meniscus. Tears can occur within the body of the meniscus, or the meniscus itself can be torn from its attachment to the inner lining of the knee, known as the capsule. When a large piece or the entire meniscus tears from the capsule, it can flip over within the joint. This injury is called a “bucket handle” tear because of the appearance of the lesion: attached at 2 ends with the middle flipped upward in the center. The large piece of displaced meniscus can block motion and is one of the rare causes of a truly locked knee.

A different type of injury is seen in older individuals, whose meniscal cartilage, no longer resilient, may tear under trivial loads. Some evidence suggests that menisci can be expected to simply wear out during a person’s lifetime. Noble et al [5] reviewed 70 autopsies of subjects younger than 55 years of age and found that nearly 20% had a horizontal cleavage tear of the meniscus and more than 10% showed some calcification; further, microscopic degeneration was seen in 76% of grossly normal medial menisci. The high prevalence of meniscal damage seen at autopsy implies that not all tears are clinically significant.

Diagnosis

History and Physical Examination

The diagnosis of isolated meniscal tears can often be made clinically. There is usually a history of a relatively minor trauma, often associated with twisting, and the patient may have pain localized at the joint line that is made worse with flexion. An effusion is commonly seen, but its presence is not diagnostic and its absence does not exclude the possibility of a meniscal tear. Physical examination maneuvers to identify meniscal tears appear to be of limited value. For example, McMurray’s test, which attempts to detect a click produced by the torn meniscus, was found to be less than 60% sensitive in 1 large study [6] and less sensitive in other series [7]. Blood in the knee (hemarthrosis) may indicate the presence of a meniscal tear. Physical examination maneuvers to identify meniscal tears appear to be of limited value. For example, McMurray’s test, which attempts to detect a click produced by the torn meniscus, was found to be less than 60% sensitive in 1 large study [6] and less sensitive in other series [7]. Blood in the knee (hemarthrosis) may indicate the presence of a meniscal tear, but it is more likely the harbinger of a more serious injury, such as an anterior cruciate ligament (ACL) tear, osteochondral fracture, or patellar dislocation [8]. In fact, because the meniscus is avascular, hemarthrosis should not be attributed to a torn meniscus; a more detailed examination for other lesions should be undertaken when hemarthrosis is a clinical finding.

Diagnostic Tests

Magnetic resonance imaging (MRI) is a helpful adjunct in making the diagnosis of meniscal tear, although its precise
use has not been determined. MRI has been shown to be reasonably sensitive and specific. In a multicenter analysis of 1014 patients, MRI was found to be approximately 90% accurate in diagnosing meniscal injuries [9]. However, results varied among centers and were dependent on the power of the magnet used and the skill of the interpreting radiologist; thus, it may be inappropriate to extrapolate the results of this study to all clinical settings. The calculation of precise values for the sensitivity and specificity of MRI is further complicated by the lack of a good standard for comparison. Arthroscopy, the diagnostic gold standard, is possibly imperfect itself. Unless special portals are made (and they are not in many cases), complete visualization of the menisci is not possible and faulty arthroscopic diagnoses will be made. In one study [10] of 400 patients, 63% of the meniscal tears demonstrated via the posterior-medial portal were not detectable by looking or probing from the anterior portal.

In a prospective study [11], MRI was performed before arthroscopy in 125 patients with suspected meniscal tears. Patients had stable ligaments and no pathologic radiographic findings or prior surgery. In 43 knees (34%), the clinical diagnosis of meniscal tear was discarded because of MRI results, demonstrating that MRI often can alter a clinical plan made on the basis of history and physical alone.

There may be a subset of patients in whom MRI is biologically accurate but clinically falsely positive. This is inferred from the work of Boden et al [12], who found a high incidence of abnormal findings in asymptomatic volunteers. This underscores the importance of correlating diagnostic test findings with clinical signs and symptoms.

The major limitations of MRI are its cost (approximately $1700, although costs vary among institutions) and its inability to dictate a treatment plan in many cases. MRI simply demonstrates the anatomy (Figure); it does not provide important clinical information, such as severity of the patient’s symptoms, impact of the meniscal tear on knee function, and the patient’s willingness to defer treatment in hopes of spontaneous recovery.

**Treatment**

Treatment for meniscal tears may be classified into 3 categories: nonoperative therapy, meniscectomy, and meniscal repair.

**Nonoperative Therapy**

Nonoperative therapy includes exercise, physical therapy and other physical modalities, and use of anti-inflammatory medications. The purpose of exercise and physical therapy is to prevent muscular atrophy, although benefits may be derived from retaining range of motion, from generalized conditioning, or from a placebo effect. Although there is no formal role for bracing knees with meniscal tears, some patients report a subjective improvement while wearing a wrap or sleeve, perhaps due to retained body warmth or increased proprioception from skin stimulation. Despite the lack of evidence or theoretical basis for its efficacy, bracing is probably worth employing since it is both safe and inexpensive.

Tears that appear small on MRI are good candidates for nonoperative therapy [13]. A risk of nonoperative therapy is that a new injury can worsen the original tear, but this risk is small. Weiss et al [14] followed 52 patients with small meniscal tears and found that in 2 to 10 years of follow-up, only 8 patients eventually needed treatment for extension of their initial injury.

A conservative approach to treatment of meniscal tears is supported by studies from Europe, where national health programs militate a cautious approach. Noble and Erat [15] followed 200 patients who were on a waiting list for meniscectomy. Symptoms improved in 20% of patients, leading them to defer surgery. Hede et al [16] likewise analyzed the outcome of 36 patients who had symptoms suggestive of meniscal tears and were on a waiting list for arthroscopy for at least 6 months. The authors found that 9 of the 36 patients were asymptomatic by the time of their turn for surgery and 23 patients had partial relief. No patients had worsening of symptoms and 14 patients canceled their surgery because of improvement. However, most said they had to give up their favorite sports activity to achieve this improvement.

**Surgical Treatment**

Meniscectomy. Painful tears of the menisci were once treated with complete resection. However, in 1948 Fairbank [17] reviewed the clinical outcomes of 80 patients who had medial...
meniscectomies and found that two thirds of them had progressive flattening of the condyle, narrowing of the joint space, and ridge formation. These signs of articular degeneration are now known as Fairbank’s changes. More recently, Hede et al [18] studied 200 patients who were randomly assigned to partial or total meniscectomy and followed for 8 years. The authors found that postoperative function of the knee was directly related to the amount of meniscal tissue that remained. Patients who had partial meniscectomies had less degeneration and a better clinical outcome than those who lost the entire meniscus. In current practice, complete meniscectomy is avoided whenever possible.

In partial meniscectomy, the aim of surgery is to remove the torn piece of cartilage while retaining as much normal cartilage as possible. After the tear is resected, the surgical tools are used to sculpt the remaining meniscus so there are no loose edges. The expected outcome from arthroscopic partial meniscectomy is relief of pain and return to function. Whipple et al [19] reported that 99% of patients who have an isolated meniscal tear and partial arthroscopic meniscectomy achieve at least some relief from this operation. Schimmer et al [20] found that at 12 years after meniscectomy, 95% of patients who had no other lesion (such as an articular defect) had good or excellent results compared with only 62% of those who had a second injury.

Arthroscopic partial meniscectomy may not prevent degeneration but may delay it. In a longitudinal study [21] of 147 athletes who had meniscectomy for an isolated meniscal injury, approximately half were completely asymptomatic at 5 years, but only one third were completely asymptomatic at 15 years. Radiographic evidence of degeneration rose from 40% to 90% in the interval between the 2 time points.

Researchers have looked at the impact of patient factors on outcomes in partial meniscectomy. Matsuse and Thompson [22] retrospectively analyzed 68 knees in patients older than 40 years who had undergone a partial medial meniscectomy. Patients were divided into 2 groups; the first consisted of 53 knees that did not have extensive articular damage, and the second consisted of 15 knees that had significant articular cartilage damage. At a minimum follow-up of 5 years, 87% of cases in the first group had an excellent outcome, and only 1 knee had a poor result. In the second group, only 1 knee had an excellent outcome and 4 knees had a poor result. Aune et al [23] found that the presence of a flap tear of articular cartilage was associated with a less favorable outcome from meniscectomy, while Katz et al [24] identified cartilage damage, workers’ compensation case pending, and low preoperative functional status as predictors of poor outcomes. Factors that have been shown to be associated with good outcomes in arthroscopic partial meniscectomy include proper alignment and the absence of ligament injury [25], patient age younger than 40 years, symptoms present less than 1 year, patellar signs or symptoms absent [26], and no preoperative radiographic evidence of degeneration [27].

**Meniscal repair.** The goal of meniscal repair is not only pain relief but the avoidance of Fairbank’s changes. In this operation, torn edges of the meniscus are sutured in an attempt to preserve the form and function of the cartilage. Johnson et al [28] studied 50 cases of arthroscopically repaired meniscal tears. After more than 10 years, over 75% had no locking, catching, or giving way; a normal physical examination; and, at worst, only mild pain. This evidence suggests that repair can successfully relieve the symptoms of meniscal tears. Moreover, radiographic follow-up showed that minimal joint changes were present in 8% of the repaired knees and in 3% of the nonrepaired knees. A study [29] that examined 23 open meniscal repairs at an average follow-up of 12.9 years found that only 6 of the 23 repaired knees developed degenerative changes. DeHaven et al’s [30] 10-year follow-up evaluation of 33 open meniscal repairs found that only 15% of stable knee joints developed degenerative changes. The outcomes of patients in these studies represent a dramatic improvement over the results of Fairbank and suggest that repaired cartilage can prevent degenerative changes.

Meniscal repair cannot be applied in all cases. The absence of blood vessels in the meniscus makes the cartilage extremely reluctant to heal and prevents widespread use of the meniscal repair operation [31]. Experimental studies in animals as well as clinical studies in humans have shown that only the peripheral portion of the meniscus is vascular and amenable to repair (the so-called “red zone”). Tears located toward the center, where blood and its healing factors are absent (“white zone” injuries), are not suited to repair. Rubman et al [32] reported that 20% of patients who had an arthroscopic meniscal repair in the avascular zone required a second operation. The authors noted that this was a high reoperation rate but advocated attempting such a repair because the potential benefit—saving the meniscus—is great.

Bringing a blood supply to the avascular meniscus can help it heal. Cannon and Vittori [33] reported that meniscal repair at the time of an ACL reconstruction had a 91% healing rate compared with a 50% rate in those who did not have ACL surgery. This may be due to the fact that ligament reconstruction entails drilling through the bone and thus bringing blood and its healing factors into the knee. Likewise, trephination of vascular channels or placing a fibrin clot can improve healing rates outside of the red zone [34–36]. Short-term follow-up [30,37] shows that approximately 90% of sutured menisci do heal assuming that an ACL tear, if present, is reconstructed. Morgan et al [38] investigated 74 meniscal repairs and found a 16% failure rate. All failures were symptomatic, whereas all of the patients with
either healed or incompletely healed lesions were without symptoms. Accordingly, simply questioning the patient may serve as a reasonable method to determine short-term meniscal healing.

Matching Patients with Therapy

Arthroscopy is minimally invasive, so the disruption of normal tissue is not extensive. Complications are infrequent [39], and the absence of extensive surgical dissection allows for rapid rehabilitation. Still, patients may have activity limitations after arthroscopic surgery [40,41], and some authors recommend rehabilitation after arthroscopy.

Current protocols suggest that arthroscopic partial meniscectomy is a reasonable choice for active, symptomatic people with relatively normal joints, but a trial of physical therapy and observation is also a fair approach. Leaving the tear alone is certainly in order for asymptomatic individuals, and treatment of the underlying arthritis is the best approach for patients with degeneration of the articular surfaces as well as torn menisci. Patients who may potentially benefit from surgical repair should be offered this option.

Patient values and preferences should guide decisions about treatment. Thus, practitioners must inform patients about the risks and benefits of alternative therapies and elicit their preferences. Patients who are prevented from participating in favorite activities may judge themselves to be severely limited as a result of their injury and may assign a high value to surgery despite its attendant risks. Patients who are minimally bothered by symptoms or who would like to wait to see if symptoms abate will rate surgery less preferable.

The elicitation of preference is an inexact science. Cognitive psychologists are well aware that the “framing” of options (the choice of words used to describe outcomes) may introduce bias. Tversky and Kahneman [42] have found that people will make different choices in equivalent situations based on whether the choice is framed as a loss or a gain. In our practice, we try to present options as neutrally as possible and encourage patients to obtain information from many sources, including other patients who are willing to share their experiences.

Summary

The menisci are small pads of cartilage within the knee whose normal form and function are essential for pain-free usage and avoidance of arthritis. Healthy meniscus can tear when the knee is traumatized but also when relatively minor forces are applied to the knee, such as during athletic activities. Older menisci frequently tear, but this damage may not cause signs and symptoms. Physical examination and MRI can be used to identify pathology, but with imperfect accuracy. Treatment should be tailored to patient preferences and not necessarily to the pathology itself.

References


