Evaluating the Painful Knee: 
A Hands-on Approach to Acute Ligamentous and Meniscal Injuries

C. Christopher Smith, MD

ABSTRACT

PURPOSE: To review the pertinent history and physical examination maneuvers for the patient presenting with acute knee injury.

EPIDEMIOLOGY: One in 20 patients who presents to the adult primary care clinic has knee pain.

REVIEW SUMMARY: Asking key medical history questions and the performance of a detailed physical examination are critical in making the differential diagnosis of acute ligamentous and meniscal injuries. The key provocative tests include the varus and valgus stress tests for assessing potential collateral ligament injuries, the Lachman and anterior drawer tests for anterior cruciate ligament injuries, the tibial sag and posterior drawer tests for posterior cruciate ligament injuries, and the McMurray and Apley grind tests for meniscal injuries. Test performance characteristics for these tests are presented. In primary care settings the likelihood of a ligamentous or meniscal tear following a negative physical examination was less than 1.5%. The Ottawa rules for obtaining X ray to exclude a knee fracture are reviewed; in patients presenting to emergency departments, these rules have 100% sensitivity and 49% specificity for knee fracture.

TYPE OF AVAILABLE EVIDENCE: Prospective cohort and systematic review.

GRADE OF AVAILABLE EVIDENCE: Fair.

CONCLUSION: Most primary care patients with acute knee injury and negative physical examinations can be managed conservatively with careful follow-up.

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Muscloskeletal conditions are the second most common cause (after respiratory ailments) of patient visits to office-based physicians. Of these musculoskeletal conditions, knee problems are the second most common reason (after back pain) for seeing the doctor, accounting for 10.8 million office visits annually. Knee pain sends an additional 1 million patients to emergency departments every year.1

About 1 in every 20 patients who presents to an adult primary care clinic has knee pain.2,3 As physically active baby boomers continue to age, the incidence of acute knee injuries among this generation will undoubtedly increase.4 At the other end of the age spectrum, continued growth in the number of children participating in sports may also boost the future incidence of knee injuries.5

Despite the growing reliance on primary care physicians for evaluation of acute knee injuries,6
generalists still receive inadequate training in musculoskeletal disorders. This article details the essential aspects of the knee evaluation, with a special focus on the visual inspection, palpation, and hands-on maneuvers that are so critical in making a differential diagnosis and for determining the best treatment course for acute injuries of the ligamentous and meniscal types. Several relatively simple examinations and knee maneuvers can deliver good specificity and moderate sensitivity. Review of knee anatomy will be key in determining the etiology of knee pain (Figure). Especially critical to a skilled and consistent evaluation is appreciation of the stabilizing roles of the anterior and posterior cruciate ligaments (ACL and PCL, respectively) and the medial and lateral collateral ligaments (MCL and LCL, respectively).

**HISTORY**

**PRIOR INJURY AND RISK FACTORS**

A careful history begins with an investigation of prior significant knee injuries or chronic conditions such as osteoarthritis, gout, or rheumatoid arthritis. Previous attempts to treat knee pain (including medications, physical therapy, devices, and surgery) should be noted. Other factors that may shed light on the cause of the knee pain include skeletal maturity, occupation, typical sports/activities, and the age and gender of the patient. Children and adolescents, for example, are very likely to have patellar subluxation, tibial apophysitis, or patellar tendonitis (jumper’s knee); adults are more likely to suffer from overuse syndromes such as patellofemoral pain syndrome, traumatic ligament strains, or meniscal tears; and older adults are most prone to osteoarthritis. A review of the limited available epidemiologic data shows that women have about twice the risk of ACL injuries compared to men.

**LOCATION AND NATURE OF SYMPTOMS**

Where does it hurt? Answers to this common question often indicate the obvious origin of the problem. Pain located superficially over the patella, for example, suggests prepatellar bursitis (housemaid’s knee) while deeper anterior pain can be indicative of patellofemoral syndrome. Similarly, pain along the joint lines can indicate a possible meniscal injury or a sprain of the collateral ligaments. Posterior knee pain could be a sign of a popliteal cyst (Baker’s cyst). The significance of the location of the pain as well as its onset, duration, and quality will be discussed below in the context of specific acute injuries.

The nature of the knee swelling provides another important diagnostic clue, with rapid effusion suggesting a fracture or a serious rupture of a ligament (most commonly, the ACL) and, likely, hemarthrosis. A slow-to-develop, moderate swelling is more consistent with overuse, a meniscal injury, or a mild ligament sprain.

The patient’s description of their mechanical symptoms—including the report of any ongoing sensations of locking or “giving way”—will also help the physician distinguish between various causes. Catching or locking, for example, are classic signs of a meniscal tear. The sensation of the knee giving way demonstrates instability that is possibly related to ligament rupture or patellar subluxation. While this symptom may also be related to osteoarthritis in nonacute settings, physicians need to keep in mind that reports by patients with degenerative joint disease are subjective and feelings that “the knee may give way” may indicate weakness and reflexive inhibition in patients rather than true joint instability.

Finally, factors that exacerbate or alleviate the knee problem should also be identified. A classic indicator of patellofemoral syndrome is a report of pain while going down stairs, whereas knee pain when squatting or rising from a seated position is more likely to be indicative of a meniscal injury.

**HOW DID IT HAPPEN?**

A patient’s detailed description of the mechanism of knee injury, when combined with the physician’s knowledge of anatomy, is often a critical clue in nar-
roweing the list of suspected causes of an acute trauma. In particular, the initial position of the leg, the exact movement of the patient at time of injury (eg, decelerating? twisting? hyperextending?), and the direction of any outside force on the knee will dictate the range of likely pathologies. Questions used to elicit such a description are listed in Table 1.

One of the most common ligament injuries involves the patient receiving a blow to the lateral aspect of the knee—for example, a football tackle from the side—with a resulting strain or rupture in the MCL. The ACL, on the other hand, is more often injured with a traumatic twisting motion, or during deceleration, when the foot is planted. The risk of ACL injury can be increased with a blow to the side of the knee, but this contact is not required; a quick stop and a sharp cutting motion without any contact can also produce a sprain or rupture. The patient’s memory of a “popping” sound or sensation at the time of injury is another classic indicator of a ligament injury. The PCL is less prone to injury, but a strong anterior force to the proximal tibia when the knee is flexed—as when the dashboard collides with the knee in a car accident—can injure this sturdy ligament. The menisci are most vulnerable to the shearing forces created when the patient plants a foot and twists or pivots on the leg.

The patient’s recollection of events shortly after the trauma can also be instructive. As already mentioned, immediate swelling is likely a sign of a ligament injury, whereas gradual swelling (hours or days later) is more suggestive of a meniscal injury. If the patient cannot bear weight on the joint, a fracture must be excluded. The ability to complete an activity suggests a meniscal tear or bone fracture. The menisci are most vulnerable to the shearing forces created when the patient plants a foot and twists or pivots on the leg.

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If the knee pain is nontraumatic or chronic in nature, the history will also need to focus on potential systemic disorders. Knee pain with effusion, warmth, and redness suggests an inflammatory process such as crystal-induced synovitis (eg, gout, pseudogout), seronegative spondylarthropathies (eg, Reiter’s syndrome, inflammatory bowel disease, psoriasis), rheumatoid arthritis, systemic lupus erythematous (SLE), Lyme disease, septic arthritis, or rheumatic fever. Questions of the patient should reflect these possibilities; for example, questions related to fever, chills, or recent sexual activity will help rule in or out septic arthritis. Because the knee is the joint most commonly involved in both benign and malignant neoplasms, questions about night pain, night sweats, and unintentional weight loss may also be appropriate.

Experienced orthopedists know that the clinical history alone often strongly suggests the mechanism of acute injury. For instance, patients with all 3 of the classic signs of a popping sound, immediate swelling, and subsequent giving way or laxity are likely have an ACL injury. However, while the clinical history is often valuable in diagnosing acute knee injuries, even the most detail-laden history will often fail to distinguish between meniscal and ligamentous injuries or to identify which ligament has been damaged. For this final degree of diagnostic accuracy, a physical examination is necessary.

**Physical Examination**

Several systematic reviews of the literature have demonstrated that physical examination provides a specific and moderately sensitive strategy for diagnosing a knee injury.\(^2\,10\,11\,16\,17\) One recent synthesis of the literature found that skillful physical examination is accurate enough to properly diagnose the great majority of ligamentous or meniscal injuries.\(^3\) The researchers calculated that, in primary care settings, the likelihood of a ligamentous or meniscal tear following a negative physical examination was less than 1.5%. In view of these findings, in the hands of an experienced clinician, most patients with negative results in the various examinations described below can be managed conservatively with careful follow-up.

**Inspection**

The systematic physical examination (Table 2) begins with close observation of the patient’s gait and includes evaluation of the need for braces, crutches, or a wheelchair. Alignment is checked with the patient standing with feet together. A varus deformity (bow-legged stance) may be associated with progression of medial osteoarthritis, whereas a valgus deformity (knock-kneed stance) may be associated with progression of medial osteoarthritis.\(^18\) Some sports medicine specialists have associated the valgus deformity with an increased Q angle, added strain on the knee, and heightened risk of patellofemoral pain syndrome; however, these associations have been called into question.

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**Table 1. Key Questions About the Trauma**

<table>
<thead>
<tr>
<th>Question</th>
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</thead>
<tbody>
<tr>
<td>How did you hurt it? (What were you doing? What was your leg position? What was the direction of force?)</td>
</tr>
<tr>
<td>Did you feel or hear a “pop”?</td>
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<tr>
<td>Was there immediate swelling (eg, within an hour), or did the swelling come on more gradually (eg, after 12 to 24 hours)?</td>
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<tr>
<td>Were you able to bear weight afterward?</td>
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<tr>
<td>Were you able to return to the sport or activity afterward?</td>
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<tr>
<td>Since the event, have you had sensations of the knee “locking” or “giving way”?</td>
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</tbody>
</table>

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as subsequent studies have demonstrated similar Q angles in affected and nonaffected legs.19 If the patient’s affected leg is non-weight bearing, atrophy of the quadriceps muscles is common and can occur as soon as 48 hours after the trauma. Bruising or deformity of the leg can be a sign of significant injury.

**PALPATION**

Examining both knees allows the physician to compare the affected and unaffected anatomic structures side by side. Office evaluation of the uninjured knee first also reassures the patient and limits apprehension. Ideally, palpation should begin with the knee at 90 degrees; however, a painful, swollen knee is sometimes more easily examined in full extension. Starting at the tibial tuberosity and searching for tenderness, warmth, or swelling, palpation should move up the patellar tendon to the patella itself and then completely around the patella. The various bursae of the knee should then be palpated, including the prepatellar and anserine bursae. Putting the leg in slight internal rotation (ie, twisting it inward toward the other knee) opens up the medial joint line and helps to identify the anserine bursae, which is found midway between the tibial tuberosity and the anterior aspect of the medial joint line. Similarly, internal and external rotations will open up the joint space and provide access to the medial and lateral joint lines, respectively, allowing for easier palpation of the medial and lateral menisci. Tenderness at the joint line may indicate a meniscal injury. Because tears of the MCL and LCL tend to occur at the insertion points rather than mid-ligament, injuries to these ligaments will typically produce pain slightly above or below the joint line. However, direct palpation of the collateral ligaments can help distinguish between a ligament sprain and a meniscal injury. Finally, the iliotibial band should be palpated as the knee is actively flexed and extended; any snapping of the band over the lateral femoral condyle should be noted.20

The next phase of the palpation focuses on any evidence of intra-articular and extra-articular swelling. With the patient supine and the leg extended, a normal knee will have slightly concave areas on either side of the patella. Loss of these peripatellar grooves is the first clue of intra-articular effusion. There are 2 main techniques for exploring subtle bulges or convexities in the peripatellar region, and the key to both is comparing the affected with the unaffected knee.

**Ballottement.** In the ballottement method, the non-dominant hand squeezes the musculature in the suprapatellar region, pushing any excess fluid into the infrapatellar region. Meanwhile, the dominant hand exerts pressure superiorly from the tibia while using the index finger to push down on the patella against the patellofemoral groove. When an effusion is present, the extra fluid is detected under the patella when compared to the unaffected side. Without swelling, the patella will remain more snugly against the groove between the femoral condyles and will thus lack a sense of "give" when tapped.

**Milking.** This simple technique involves compressing fluid from the medial to the lateral aspect, and then swiping it back again by pressing on the lateral side of the knee. If swelling is present, a fluid bulge distends the normally concave area medial to the patella.

Localized swelling is usually indicative of extra-articular swelling. Conditions such as prepatellar bursitis and Baker’s cyst (when the swelling is at the back of the knee) may present in this fashion. Localized swelling over the MCL or LCL after these ligaments are strained may also be noted.

A diagnostic aspiration is warranted in patients with significant knee swelling and no history of trauma. The most common causes of noninflammatory effusions are osteoarthritis, oyxeruse, or mild injury. Evidence of acute synovial inflammation in such patients suggests crystal-induced diseases, septic arthritis, spondyloarthropathies, rheumatic fever, and SLE. Although most patients who present with acute knee

<table>
<thead>
<tr>
<th>Table 2. Checklist for Physical Examination of the Knee</th>
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<tr>
<td><strong>Inspection</strong></td>
</tr>
<tr>
<td>• Gait</td>
</tr>
<tr>
<td>• Alignment</td>
</tr>
<tr>
<td>• Quadriceps atrophy</td>
</tr>
<tr>
<td>• Bruising</td>
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<tr>
<td>• Deformity</td>
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<tr>
<td><strong>Palpation</strong></td>
</tr>
<tr>
<td>• Tibial tuberosity to the patella</td>
</tr>
<tr>
<td>• Bursae</td>
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<tr>
<td>• Joint lines</td>
</tr>
<tr>
<td>• Popliteal fossa</td>
</tr>
<tr>
<td>• Intra- and extra-articular swelling</td>
</tr>
<tr>
<td>– Ballottement</td>
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<tr>
<td>– Milking</td>
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<tr>
<td><strong>Range of Motion</strong></td>
</tr>
<tr>
<td>• Passive and active</td>
</tr>
<tr>
<td>– Flexion (normal = 130 to 150 degrees)</td>
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<tr>
<td>– Extension (normal = 0 to -10 degrees)</td>
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<tr>
<td>• Patella tracking</td>
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<tr>
<td><strong>Specific Maneuvres</strong></td>
</tr>
<tr>
<td>• Valgus and varus stress test</td>
</tr>
<tr>
<td>• Anterior and posterior drawer tests</td>
</tr>
<tr>
<td>• Lachman test</td>
</tr>
<tr>
<td>• Tibial sag test</td>
</tr>
<tr>
<td>• Apley’s compression test</td>
</tr>
<tr>
<td>• McMurray’s test</td>
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</tbody>
</table>
pain following an obvious trauma do not need arthrocentesis, drainage of a hemarthrosis following injury can often provide symptomatic relief and can also assist in the diagnosis. The vascular injury associated with hemorrhosis most often indicates a partial or complete disruption of the ACL.

**Range of Motion**

Functional testing of the knee begins with tests of active and passive range of motion. The normal range of flexion is 130 to 150 degrees, and the normal range of extension is 0 to minus 10 degrees. The location and movement of the patella should be noted during these initial tests, with special attention to abnormal tracking, crepitus, or pain, all of which indicate patellar problems. Pain or a reduced active range of motion with preserved passive range of motion suggests a soft tissue disorder such as tendonitis, bursitis, or a muscle injury. A decrease in both passive and active ranges of motion is more likely due to some intra-articular process, such as a synovitis or a structural abnormality of the joint; osteoarthritis or a gouty effusion with related inflammation are possible causes.

**Maneuvers to Assess Acute Knee Pain**

Several provocative maneuvers can be used to assess knee stability and diagnose specific conditions. The maneuvers used to evaluate the most common acute knee injuries are discussed below. [Brief videotaped examples of Dr Smith performing the most common knee maneuvers, discussed below, accompany this article online at www.JHASIM.com.]

**Medial and Lateral Collateral Ligament Injuries**

The classic sprained knee is most often caused by damage to the MCL. Typically, collateral ligament sprains result from a direct blow to the lateral or medial side of the knee, causing a forced valgus (MCL strain) or varus stress (LCL strain), respectively. The patient may notice pain and a tearing sensation at the time of injury, but a mild MCL or LCL injury may not prevent him or her from continuing the activity. The amount of swelling, if any, will depend on the severity of the sprain. Because the proximal MCL is the most common site of damage, tenderness is often localized to the proximal insertion point at the distal femur and extends to the joint line.

**Valgus and Varus Stress Tests.** In patients with suspected injuries to the medial or collateral ligaments, valgus and varus stress tests should be performed to assess stability. To isolate the collateral ligaments the tests should be performed with the knee slightly flexed (approximately 30 degrees). With one hand on the outer aspect of the knee applying medial pressure and the other hand on the inner aspect of the distal tibia applying lateral pressure, the physician can induce a valgus stress, testing for tenderness or laxity along the MCL. Similarly, by applying lateral pressure to the inner knee and medial pressure to the outer tibia, varus stress is created, testing for injury to the LCL. In each of these stress tests, the physician should seek a firm endpoint and less than 5 mm of laxity. A firm endpoint indicates that the ligament is intact, whereas a soft or absent endpoint means a complete rupture. While collateral ligament testing is commonly performed and accepted as reliable, there is a dearth of well-designed studies that validate the sensitivity and specificity of these maneuvers.

As with the other maneuvers to be described in sections below, measuring a solid endpoint accurately is a clinical skill that will improve with practice and comparison. Using the patient’s uninjured knee provides an excellent immediate comparison. Taking a moment to perform the stress test on other patients without knee injuries also helps physicians gain the necessary feel for distinguishing between solid and nonsolid endpoints.

The degree of laxity noted with stress testing will influence treatment decisions. For example, a first-degree sprain will have tenderness along the ligament but less than 5 mm of laxity at 30 degrees of flexion and a solid endpoint. A second-degree sprain will show more than 5 mm of laxity but will still have a solid endpoint, indicating a partial tear. A third-degree sprain, however, will display significant laxity and a soft endpoint. If laxity is noted at both 30 degrees of flexion and also at full extension during this stress testing, there may also be damage to the capsular components and/cruciate ligaments.

Isolated first- and second-degree sprains can usually be managed conservatively with rest, ice, compression, and elevation along with an anti-inflammatory medication. Physical therapy can help the patient restore the range of motion and regain muscle strength. For second-degree sprains, a knee brace may prevent recurrences. While most third-degree sprains are still referred to orthopedic surgeons, evidence demonstrates that third-degree collateral ligament tears (particularly if no underlying ACL or PCL injuries are suspected) may respond better to conservative therapy than to surgical care. Physical therapy and bracing are particularly important during the 4- to 8-week course of therapy for third-degree MCL injuries.

**Anterior and Posterior Cruciate Ligament Injuries**

As described above, ACL injuries often present with a history of forced hyperextension, noncontact deceleration, or a “cutting” or twisting movement. The patient often feels or hears a pop and experiences immediate instability. They are usually unable to continue the activ-
ity. Effusion is rapid and often bloody upon arthrocentesis. Injuries to the PCL are less common and typically involve direct trauma to the proximal tibia when the knee is flexed. The most common causes are a sports-related fall directly onto the tibial tubercle with the foot in plantar flexion or a car accident in which the knee smashes against the dashboard.25

Lachman and Anterior Drawer Tests. These maneuvers can isolate an ACL injury.2,10,11,17,26 In both tests, the patient is supine and the physician assesses the integrity of the ACL by pulling the tibia and evaluating the endpoint and degree of tibial translation. In the Lachman test, the knee is at 20 degrees of flexion; with one hand stabilizing the femur, the other hand grasps the proximal tibia and briskly pulls the tibia forward.26 A soft or mushy endpoint when compared to the unaffected knee is indicative of ACL damage. In the anterior drawer test, the knee is positioned at 90 degrees, the examiner sits on the patient’s foot and then (after ensuring the hamstrings are relaxed) uses both hands to pull the proximal tibia forward swiftly. A normal ACL will show about 6 to 8 mm of laxity, but a damaged ACL will show greater tibial displacement, especially when compared to the opposite side.

A recent systematic analysis of these ACL examination techniques in 11 studies indicated that the Lachman maneuver was more sensitive (87%) and specific (93%) than the anterior drawer sign (Table 3).2 Two additional systematic reviews demonstrated similar sensitivity and specificity for the Lachman maneuver; both also showed it to be superior to the anterior drawer in diagnosing ACL injuries. The composite physical examination was reasonably sensitive (74%-82%) and rather specific (94%-95%) in diagnosing ACL tears.11,17

Patients with ACL injuries often present with large, painful effusions, limiting the physical examination. Because 70% of all knee hemarthroses in acutely injured patients are due to ACL injuries, arthrocenteses can be both diagnostic and therapeutic, while also allowing more sensitive physical examinations.27

Tibial Sag and Posterior Drawer Test. In the tibial sag test, the patient lies supine with the knee flexed at 90 degrees. If the tibial plateau, which normally extends 1 cm beyond the femoral condyle, is displaced posteriorly on the femur or “sags” back to a point where the tibial tubercle is obscured, the PCL may be injured. In the posterior drawer test, the knee is at 90 degrees when the examiner grasps the knee and sits on the foot (similar to the anterior drawer test) and then pushes posteriorly on the proximal tibia. Increased displacement and a soft endpoint compared to the unaffected knee indicate PCL damage. In general, the posterior drawer has a high sensitivity and specificity for PCL injuries; accuracy is increased with accompanying tests, such as the sag sign.10,11

Treatment for ACL injuries depends on the presence of associated structural damage, the degree of instability, and the patient’s lifestyle and desired level of activity. Gross instability almost always requires surgical repair. For those athletic individuals who wish to return to strenuous physical activity, reconstruction of the ACL is also usually necessary. Sedentary individuals or those unable to commit to a prolonged period of rehabilitation may opt for conservative management. Physical therapy and bracing are the alternatives to surgery.

PCL injuries are generally more stable than ACL injuries. While radiographs may be appropriate to rule out bony avulsion, isolated PCL injuries can usually be managed conservatively with a short period of bracing and immobilization of the knee followed by controlled mobilization and aggressive quadriceps-strengthening exercises.

Meniscal Injuries

Injuries to the menisci are more common—but also more subtle and variable—than those of the ligaments. Their relative avascularity and limited nerve supply limit swelling and pain after injury and partially account for the difficulty of this diagnosis.10,11 Meniscal injuries can present as either acute or chronic knee pain. A twisting or cutting motion while bearing weight often produces injuries of the acute type, but patients can often continue with their activities. Patients with underlying osteoarthritis are prone to develop minor degenerative tears in the meniscus; for example, when they shift from a standing to a squatting position. Whether the symptoms are acute or chronic, patients often report clicking, catching, giving way, or locking of the knee. Symptoms of locking are particularly common if the meniscal tear extends anteriorly, beyond the collateral ligament; this is commonly referred to as a bucket-handle tear. The associated pain is most often intermittent, occurring with rotational movements.

When to X-ray the Knee

The most common specific indications for knee X-ray are often referred to as “Ottawa rules” and are shown in Table 4.28,29 Most patients with knee pain and no red flags for fracture have soft tissue injuries, which generally do not require knee radiographs.15 However, if the examination leads the physician to suspect an ACL injury, a radiograph may be warranted since this injury is associated with intra-articular fractures and avulsion fractures of the lateral tibial plateau. In this setting of ACL injuries, an MRI is also sometimes useful to confirm the ACL injury and to rule out meniscal pathology, because meniscal injuries frequently accompany ACL tears30 and may contribute to future symptoms and instability.
Swelling with meniscal injuries, unlike that with ACL injuries, can be delayed for several hours.

Even for an experienced orthopedist, the physical examination alone is often of limited value in detecting meniscal injuries.10,11,16 Palpation for distinct joint-line tenderness is still a useful indicator of meniscal injury, especially when associated with effusion and “locking”-type symptoms. Sensitivity of the joint-line tenderness examination has been estimated in the range of 70% to 79%, with a specificity of 15% to 45%.2,11,16 In other words, the patient with a meniscal tear is likely to have joint-line tenderness, but many patients with other knee pathologies are also likely to share this positive sign.

**McMurray and Apley Grind Tests.** These tests can assist in the diagnosis of a meniscal tear.10,11,16,31,32 In the McMurray test, with the patient supine, the knee is brought to maximal flex (90 degrees). The medial meniscus is evaluated by grasping the heel and externally rotating the tibia while the other hand applies varus stress at the knee during leg extension. The lateral meniscus is evaluated in a similar fashion, but with internal rotation and application of valgus stress.31 A positive test produces pain, a palpable “thud” or “click” at the joint line, and, not infrequently, a quick cry of, “that’s it!” from the patient. Note that crepitus or minor clicks without pain or joint-line tenderness are not unusual and should not be considered a positive finding. In the Apley compression test, the patient lays prone and the knee is flexed to 90 degrees. With the examiner’s knee holding down the patient’s thigh, the ankle and foot are grasped and used to rotate the tibia externally and internally.32 A downward load is then placed on the tibia. Pain upon compression is considered positive.

Two recent comprehensive literature reviews determined the McMurray test to have relatively poor sensitivity (48%-52%), but high specificity (86%-97%) for diagnosing meniscal pathology.2,16 The high specificity of the McMurray test, as demonstrated in these 2 reviews, suggests that this maneuver will usually be negative in patients who lack meniscal damage. However, another reviewer found the mean sensitivity and specificity of the McMurray test to be 53% and 59%, respectively.11 The performance of the Apley grind test has been studied less often and very limited data are available. The bottom line is that neither the joint-line tenderness test nor the McMurray test is especially sensitive on its own; together, however, the cumulative data can help the physician make the difficult diagnosis of meniscal injury. The composite physical examination for diagnosing meniscal injuries has a sensitivity of 77% to 86% and specificity of 72% to 91%.2,11

Patients with signs of meniscal injuries should also be evaluated for ACL tears, because more than one third of these injuries are associated with ACL tears.30 If the initial injury is difficult to evaluate because of a large effusion, the knee can be reexamined after 1 week of conservative therapy.

Most patients with positive tests for meniscal tears should be referred to an orthopedic surgeon. A magnetic resonance image (MRI) or arthroscopy may be necessary to help confirm and evaluate a meniscal tear.14 Conservative management may be appropriate in some cases of small or incomplete tears or small stable peripheral tears without associated pathologies. On the other hand, most meniscal tears eventually require surgery as well as an aggressive postsurgical course of rehabilitation.6

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**Table 3. Comparative Sensitivities and Specificities of the Main Tests**

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Sensitivity (Lower 95% Confidence Interval)</th>
<th>Specificity (Lower 95% Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnosing ACL Tears</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lachman test (9 studies)</td>
<td>0.87 (0.76-0.98)</td>
<td>0.93 (0.89-0.96)</td>
</tr>
<tr>
<td>Anterior drawer test (10 studies)</td>
<td>0.48 (0.38-0.59)</td>
<td>0.87 (0.83-0.91)</td>
</tr>
<tr>
<td><strong>Diagnosing Meniscal Injuries</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joint-line tenderness (3 studies)</td>
<td>0.76 (0.65-0.87)</td>
<td>0.29 (0.10-0.46)</td>
</tr>
<tr>
<td>McMurray test (4 studies)</td>
<td>0.52 (0.35-0.68)</td>
<td>0.97 (0.87-0.99)</td>
</tr>
</tbody>
</table>


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**Table 4. Indications for an X ray to Exclude a Knee Fracture**

- Age greater than 55 years
- Isolated patellar tenderness
- Tenderness at the head of the fibula
- Inability to flex beyond 90 degrees
- Inability to bear weight (4 steps)
- High-velocity collision
- “Pop” at the time of injury
- Suspected ACL injury

Note: The “Ottawa rules” refer to the first 5 bulleted indications. In patients presenting to the emergency departments, the “Ottawa rules” have 100% sensitivity and 49% specificity.2,13
DATA LIMITATIONS

Considering that knee pain is an extremely common cause of patient visits to primary care physicians, the data addressing the accuracy of diagnostic maneuvers for examining the knee are relatively limited in both quality and quantity. The broad range of results from studies found in the original literature likely reflects study design limitations. Inconsistencies in patient selection and in the experience of the examiners contribute to outcome discrepancies. In addition, no studies have involved primary care physicians and few studies have assessed interobserver agreement, or included normal controls or results of blinded trials. The physician performing the arthroscopy was often the same physician who performed the physical examination; furthermore, a patient with a clinical suspicion of mechanical damage was often more likely to undergo arthroscopy or an MRI. Despite these methodological flaws, one should avoid overreliance on MRIs to diagnose knee injuries, as MRIs have not been proven to be superior to the clinical examination of an experienced clinician.33

Finally, studies have only evaluated the utility of physical examination maneuvers that were studied either in isolation or as a composite physical examination. Data on the sensitivity and specificity of key elements of the history are lacking. Combining data obtained from the patient’s history with physical examination findings would likely enhance the accuracy of the physical examination and allow a more focused examination. More methodologically sound research is needed to determine the sensitivity and specificity of key historical features, as well as the accuracy of specific physical examination maneuvers in combination with historical elements.

CONCLUSION

Because the knee is one of the largest, most complex, and most stressed joints of the body, it is not surprising that it is a common site of injury. Though the primary data on the physical examination of the knee are somewhat limited methodologically, several well-designed literature reviews and meta-analyses support the utility of a careful physical examination of the knee. Until well-designed clinical trials are performed that include primary care providers and evaluate both relevant historical features, as well as physical examination data, one can only speculate at the ability of primary care providers to correctly identify knee injuries. In the meantime, primary care physicians should be skilled at performing a full range of test maneuvers that have been shown to diagnose ligamentous and meniscal knee injuries in an accurate and cost-effective fashion.

REFERENCES