

Chapter 21

Knee Pain

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Introduction

The knee has the largest articular surface of any joint in the body. By convention, musculoskeletal pain lasting less than 6 weeks is defined as acute, whereas pain lasting longer than 6 weeks is chronic.

Important elements of the history are whether acute knee pain began following recent trauma or overuse during regular activity and if the pain increases with activity. If the pain developed after trauma, the presentation is likely caused by the specific activity or traumatic injury.

Key History and Physical Exam

First, ask patients if the knee pain is acute or chronic. A detailed history should be asked to assess if acute knee pain developed following recent trauma or overuse. If the knee pain is unrelated to acute trauma or overuse during regular activity, ask if the knee pain occurs with activity. The patient

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is then instructed to pinpoint the location of the pain. If the knee pain is not related to activity, ask if any systemic symptoms or signs are present.

History

Knee pain is the tenth most common complaint in the ambulatory setting [1]. Knee pain is classified as acute (<6 weeks) or chronic (>6 weeks). Pertinent historical questions include the following.

- Did pain develop following an injury or increasing activity level?
- Did you twist the knee while your knee was flexed? (meniscus tear)
- Is the pain exacerbated by activity? Does the knee feel stiff?
- Which activity worsens the pain: while walking on uneven surface, walking up and down stairs, flexing the knee, or pivoting? (ligaments or meniscus tear)
- Where is the pain located (anterior, lateral, medial, or posterior)?
- Is the knee pain bilateral?
- Do you feel the knee is getting locked in place? Does the knee give way during walking or climbing stairs without pain?
- Are there any symptoms or signs of systemic illness? Are there any fever, chills, night sweats, weight loss, fatigue, or rash?
- Was the knee pain associated with swelling? Is there any other joint pain or swelling?

Knowing the details of the traumatic event is helpful. If the knee is twisted while in a flexed position, meniscus tear is suggested [2]. Patellofemoral pain is common among active females in the second and third decade of life. The knee pain is anterior around or under the patella, and worsens with squatting, running or prolonged sitting [3]. Pain from degenerative osteoarthritis tends to be accompanied by stiffness

and is worse with exercise or activity. Knee pain of osteoarthritis (OA) can be anteromedial or more generalized on the medial side of the tibiofemoral joint, or anterior in the patellofemoral joint [4]. Joint swelling following trauma indicates bleeding or ligamentous/ meniscus injury. Knee swelling unrelated to trauma may suggest infection, inflammation secondary to crystal or rheumatic diseases. Bilateral knee pain suggests osteoarthritis or rheumatoid arthritis. Unilateral pain is often due to injury, meniscus tear, septic arthritis, or crystal induced arthritis.

Past Medical and Surgical History

Systemic conditions including rheumatic diseases, thyroid disease, hyperparathyroidism, hemochromatosis, or sarcoidosis could be causes of knee pain. Sickle cell disease increases the risk of septic arthritis and osteomyelitis. Hemophilia or other bleeding disorders can cause hemarthrosis from minor trauma. Patients should be asked about any prior injury surgery to the lower extremities.

Medications

History of prior treatment with analgesics, nonsteroidal anti-inflammatory drugs, intra-articular injections of corticosteroids, or hyaluronic acid should be asked. Side effects of systemic glucocorticoids could be linked to avascular necrosis of the bone (AVN), especially in patients with systemic lupus erythematosus. AVN is characterized by insidious onset of unilateral or bilateral knee pain exacerbated by weight bearing activity.

Social History

The clinician should explore the patient's history of exercise tolerance and daily activity including ambulatory assist device use and walking capability.

Physical Examination

The knee is examined using a systematic approach. First compare the affected and unaffected joints. Inspection, palpation, range of motion, strength, assessment of joint stability, and special tests to detect focal conditions should be included.

When inspecting the knee, assess gait, swelling, ecchymosis and other signs of injury, muscle atrophy, alignment, and skin changes.

Palpation of the knee includes skin temperature, medial and lateral joint lines, bursae, and the posterior knee. Joints are normally cooler than surrounding skin. If the patient can pinpoint localized pain, attention should be paid to specific structures in that location (Fig. 21.1). If there is tenderness over the medial anterior aspect of the tibia below the knee, pes anserine bursitis is suggested [5]. Diffuse tenderness along the joint line is often caused by degenerative, inflammatory, or infectious pathology. Evaluation for a joint effusion should be determined. Effusion is seen as fullness or swelling in the suprapatellar pouch. Ballottement of the patella can confirm the knee effusion. In the case of small effusions, milking of the fluid from the suprapatellar pouch to the patella and expressing it with examiner's finger (causing a fluid wave) can identify an effusion.

If the patient has diminished active but intact passive range of motion (ROM), it suggests a problem outside the joint. Common reasons are structural disruption of the muscle tendon unit, excessive pain, or motor nerve damage. Diminished ROM is often caused by a mechanical problem inside the joint such as a torn meniscus.

Vascular assessment includes palpating the lower extremity pulses of the dorsalis pedis, posterior tibial, and popliteal arteries.

Knee pain can present as referred pain. Referred pain to the popliteal space originates from the fifth lumbar (L5) nerve root and sacroiliac joint, and referred pain to the lateral aspect of the knee originates from the S1 nerve root, hip joint, trochanteric bursa, and femur. As a general rule, it is recommended to examine the contiguous joints.

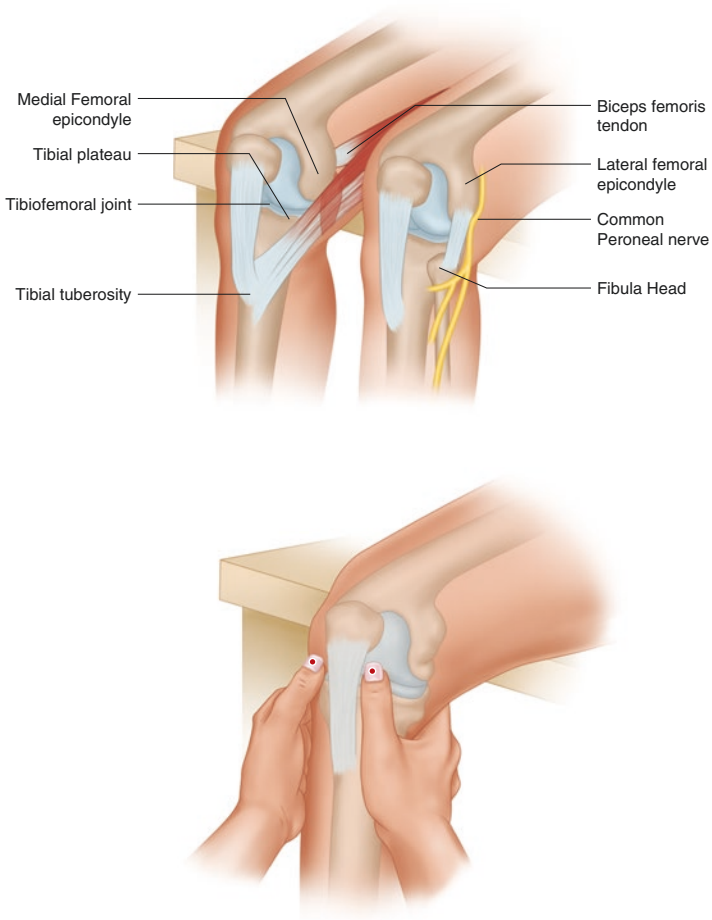


FIG. 21.1 Anterior knee

Provocative maneuvers are only tested when initial history and examination suggest specific conditions.

MCL (medial collateral ligament) valgus test is performed with the knee at 0 and at 30 degrees of flexion [6]. The knee is braced by placing one hand along the lateral aspect of the knee joint, and the examiner applies a valgus force to the knee while the ankle is held in a neutral position. The MCL

functions as the primary restraint at both flexion angles. At 30 degrees of knee flexion, the capsule and cruciate ligaments provide no secondary restraints to valgus stress. Thus, a positive valgus test at 0 degree suggests injury to both the MCL and cruciate ligament, but a positive test at 30 degrees suggests isolated MCL injury. Focal tenderness at the collateral ligament and opening of the joint line with this stress testing compared to the unaffected knee suggests collateral ligament injury. To perform the LCL (lateral collateral ligament) varus stress test, place one hand along the medial aspect of the knee joint and hold the ankle while applying varus force to the knee and keeping the ankle in a neutral position.

Anterior and posterior cruciate ligament (ACL and PCL) damage can be elicited by the drawer test. With the affected knee flexed 90 degrees, the examiner slides the proximal tibia anteriorly (testing the ACL) or posteriorly (testing the PCL) relative to the femur, parallel to the floor. If the amount of motion is greater on the symptomatic side, the test is considered positive.

Patellofemoral pain is experienced with squatting. In the apprehension test, quadriceps are relaxed and the knee flexed to 30°, then the examiner puts pressure to the patella from the medial side to laterally, and the patient attempts to straighten the knee as the patella is maximally displaced. Meniscus tear is suspected when joint line tenderness, abnormal smooth passive ROM, or inability to fully extend the knee is appreciated. The McMurray test is used to evaluate the menisci. The knee is flexed to the maximum pain-free position with the patient in the supine position. While externally rotating the foot, the knee is gradually extended while maintaining the tibia in external rotation. This stresses the medial meniscus and elicits a localized medial compartment click and/or pain. The Thessaly test incorporates weight bearing on the knee. The patient stands on one leg with his knee flexed 30° and rotates the knee and body while maintaining knee flexion. Pain or a locking/catching sensation during rotation of the knee considered a positive test.

Differential Diagnosis

See Fig. 21.2 for a visual representation of differential diagnoses.

Causes of acute knee pain following acute trauma or recent overuse:

- Medial or lateral collateral ligament tear—after medial or lateral force trauma
- Anterior/posterior cruciate ligament tear—after anterior or posterior force trauma
- Meniscus tear—twisting trauma
- Intra-articular fracture
- Patellar dislocation
- Patellar tendon tear

Knee Pain Associated with Activity

Diffuse Pain

- Knee osteoarthritis—progressive, long-standing pain. Commonly seen in overweight patients

Anterior Knee Pain

- Osgood-Schlatter disease—tibial tubercle pain seen mostly in growing children and teens
- Quadriceps and patellar tendinopathy—overuse injury seen in avid exercisers
- Bursitis (prepatellar and infrapatellar)—overuse, from working on knees (setting tile or scrubbing floors or praying)
- Patellofemoral pain—common in female distance runners

Medial Knee Pain

- Degenerative meniscal tear—chronic in presentation
- Saphenous nerve entrapment

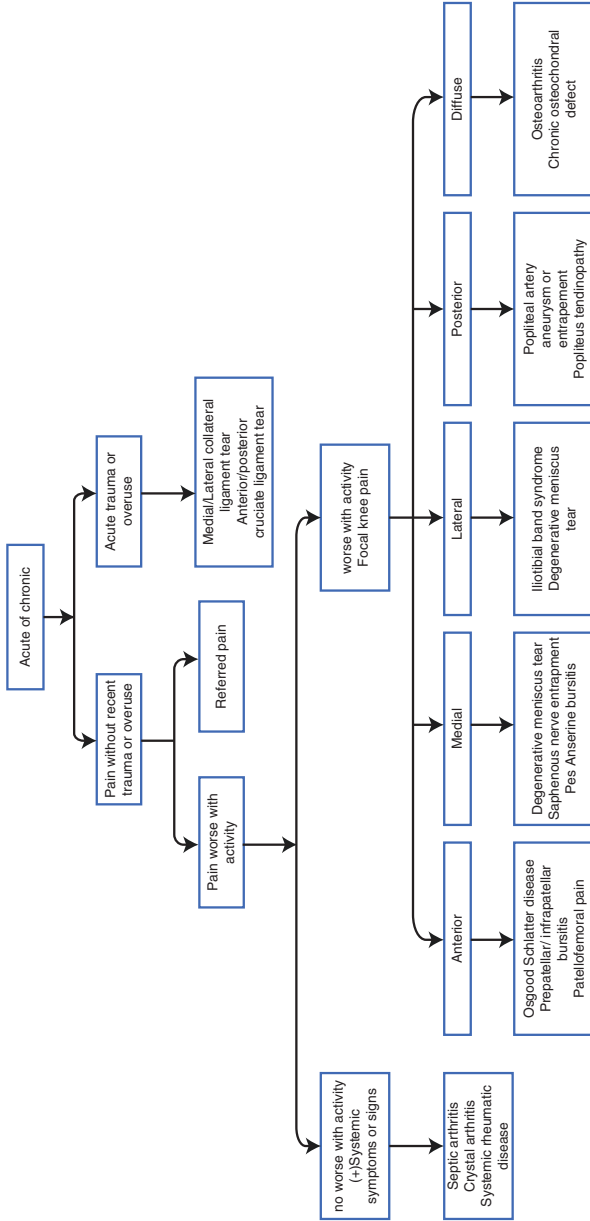


FIG. 21.2 Knee pain algorithm

- Pes anserine bursitis—distal to the joint

Lateral Knee Pain

- Iliotibial band syndrome—seen in runners, palpable at the joint or lateral thigh
- Degenerative meniscus tear

Posterior Knee Pain

- Popliteal artery aneurysm or entrapment
- Popliteus tendinopathy
- Popliteal (Baker's) cyst—non-pulsatile fullness, may mimic deep vein thrombosis

Acute knee pain with intense inflammation, onset not associated with activity:

- Septic arthritis
- Crystal arthritis
- Inflammatory arthritis (systemic rheumatic diseases)

Decision-Making

If the knee pain began following acute trauma, plain radiography is necessary. If knee pain was unrelated to trauma but is worse with activity, magnetic resonance imaging (MRI) may be required for the diagnosis of soft tissue knee injury such as meniscus tear or ligament problems. MRI should be considered for any patient with knee instability, or in other words, when the knee gives out and the patient falls.

If a patient reports systemic symptoms or signs when arthritis of the knee presents with local erythema, warmth, joint pain, and an effusion, septic arthritis and crystal arthritis are in the differential diagnosis. If septic arthritis is entertained in the differential diagnosis, joint aspiration and fluid analysis including cell count with differential, gram stain, culture, and crystal analysis are warranted.

Treatment

If acute knee pain and effusion occurs immediately after trauma, the clinician should suspect injury to the collateral and anterior cruciate ligaments and the menisci and send the patient to the emergency room.

If the knee pain is worse with activity but there is no inciting trauma, changing of the patient's exercise pattern may be required.

If atraumatic knee pain is unrelated to activity and especially if acute knee pain and swelling are associated with constitutional symptoms along with signs of intra-articular infection on arthrocentesis, antibiotics need be administered to treat suspected septic arthritis.

Anti-inflammatory medications are used for osteoarthritis and chronic tendon/ligament pain. For cost reasons, nonsteroidal anti-inflammatory drugs (NSAIDs) such as naproxen 500 mg twice daily or ibuprofen 400–600 mg three times daily are first-line medications. These medications should be taken with food. Analgesic effects of NSAIDs are rapid, but the anti-inflammatory effects require time and repeated dosing. For this reason, it is sensible to remind patients to take these meds on a set schedule—not “as needed”—for 1–2 weeks. Relative contraindications for the use of these agents include active peptic ulcer, chronic kidney disease, and anticoagulant use. A key long-term strategy for treatment of most knee problems is weight loss.

In the treatment of knee OA, physical therapy and exercise improve flexibility and strengthen muscle around the affected joints, which lead to improvement of pain and functional outcome. The guideline on the treatment of knee osteoarthritis by the American Academy of Orthopedic Surgeons (AAOS) emphasizes exercise-based therapies and weight loss [7]. For degenerative medial meniscal tears without osteoarthritis, the use of physical therapy to strengthen quadriceps muscle and lower extremity function is recommended.

Referral to an orthopedic surgeon is needed for MCL/LCL injury with the unstable knee suggesting multiple ligament involvement.

Clinical Pearls

- Knee pain could be referred from the lower back or hips.
- Septic arthritis could present with absence of fever, normal CBC, or unremarkable erythrocyte sedimentation rate.
- Simple maneuvers (drawer, McMurray, valgus, and varus tests) can isolate the source of an injury.

Don't Miss This!

- The presence of crystals in the joint fluid analysis does not exclude concurrent septic arthritis.
- Examine the joint above and below the knee to identify referred pain.

References

1. Cherry DK, Woodwell DA, Rechtsteiner EA. National Ambulatory Medical Care Survey: 2005 summary. *Adv Data.* 2007;387:1–39.
2. Jackson JL, O'Malley PG, Kroenke K. Evaluation of acute knee pain in primary care. *Ann Intern Med.* 2003;139:575–88.
3. DeHaven KE, Lintner DM. Athletic injuries: comparison by age, sport, and gender. *Am J Sports Med.* 1986;14:218–24.
4. Creamer P, Lethbridge-Cejku M, Hochberg MC. Where does it hurt? Pain localization in osteoarthritis of the knee. *Osteoarthr Cartil.* 1998;6:318–23.
5. Gnanadesigan N, Smith RL. Knee pain: osteoarthritis or anserine bursitis? *J Am Med Dir Assoc.* 2003;4:164–6.
6. Malanga GA, Andrus S, Nadler SF, et al. Physical examination of the knee: a review of the original test description and scientific validity of common orthopedic tests. *Arch Phys Med Rehabil.* 2003;84:592–603.
7. Jevsevar DS. Treatment of osteoarthritis of the knee: evidence-based guideline, 2nd edition. *J Am Acad Orthop Surg.* 2013;21:571–6.