

Aaron Jay Yang and Nitin B. Jain

Introduction

- A thorough examination of the knee should include the hip and ankle joints as knee pain can be secondary to pathology from the surrounding joints. The knee contains two joints: the tibiofemoral joint and patellofemoral joint. The knee joint relies on the surrounding ligaments for stability and it is important to test the ligaments during examination. While the most common diagnosis encountered in the outpatient setting may be patellofemoral pain syndrome, any acute knee injury associated with a “pop” that is felt followed by immediate swelling should be considered to be an anterior cruciate ligament (ACL) tear until proven otherwise and require immediate medical attention.

Physical Examination

- **Inspection** of the knee should begin with the patient standing and varus and valgus alignment of the knee should be noted. Patellar position should be observed including whether it is rotated or tilted compared to the contralat-

eral knee as tightness in the quadriceps may change the positioning of the patella on the knee. Swelling of the knee associated with trauma may point to a ligamentous injury, fracture, or meniscal tear. Recurrent swelling without acute trauma may indicate an underlying arthritic process. Gait should be observed keeping in mind that knee hyperextension at heel strike may indicate weak hamstring muscles or weak quadriceps may cause excessive hip extension leading to knee hyperextension on heel strike to prevent knee buckling.

- **Range of motion** of the knee can be assessed in the neutral position which occurs when the femur and tibia are in a fully extended position. Symmetry of the knee during range of motion should be assessed while normal knee flexion ranges around 135° and extension of 5–10° [1]. Decreased range of motion of the knee can be due to an effusion within the knee joint, a meniscal tear that may limit or block end range knee flexion or extension, or osteoarthritis that typically limits full extension of the knee.
- **Palpation** of the knee can be divided into four sections based on their location. The presence of tenderness should be compared side to side and the presence of a knee effusion is best determined by palpation.
 - Medial structures that are palpated on examination include the medial tibial plateau and the medial femoral condyle. Joint line tenderness may lead to suspicion for

A.J. Yang, MD (✉) • N.B. Jain, MD, MSPH
Department of Physical Medicine and Rehabilitation,
Vanderbilt University Medical Center,
2201 Children’s Way Suite 1318, Nashville,
TN 37212, USA
e-mail: aaron.yang@vanderbilt.edu

- osteoarthritis or medial meniscal tear. Tears of the posteromedial portion of the medial meniscus are the most common type of meniscal tear. Medial meniscal tears are more commonly encountered due to its firm attachment to the medial collateral ligament and joint capsule. The medial collateral ligament as well as the tendons of the sartorius, gracilis, and semitendinosus cross the knee joint and insert on the lower tibial plateau. The pes anserine bursa is located near the common insertion of these muscle tendons and may cause pain when it is inflamed.
- Lateral structures that are palpated on examination include the lateral tibial plateau and lateral femoral condyle, fibular head, and Gerdy's tubercle. The iliotibial band attaches at Gerdy's tubercle distally and is commonly painful along the lateral femoral condyle in which the band can cause friction over this bone. The peroneal nerve courses around the fibular head and is a common location of injury that can subsequently cause a foot drop. The lateral collateral ligament runs between the lateral femoral condyle and attaches at the fibular head distally. The lateral joint line may be a source of tenderness if there is injury to the lateral meniscus.
 - Anterior structures that are palpated on examination include the patella and the trochlear groove of the femur which is located above the level of the patella. The patellar tendon should be palpated as it is a continuation of the quadriceps tendon.
 - Posterior structures that should be palpated on examination include the posterior fossa which is the common location of Baker's cysts as this often communicates directly with the joint space of the knee. The fossa is bordered by the hamstring tendons superomedially (semimembranosus tendon) and laterally (biceps femoris) while the medial and lateral heads of the gastrocnemius muscle borders it inferiorly. The popliteal artery passes through the fossa and palpation of this artery is best performed with the knee in flexion as this relaxes the calf and hamstring muscles.
 - There are multiple *special tests* of the knee that vary depending on the structure that is being tested. Only select tests will be specifically described here, while we recommend you refer to the suggested reading section below for discussion on how to perform these individual tests.
 - Ligaments
 - Anterior Cruciate Ligament: Anterior drawer test, Pivot shift test, Lachman test.
 - The Lachman test is performed with the patient supine while the knee is held at 15° of flexion. The femur is stabilized with one hand while the other hand applies pressure to the proximal tibia in attempt it to translate it anteriorly. Side-to-side comparison should be performed and a firm endpoint indicates an intact ligament.
 - Posterior Cruciate Ligament: Posterior drawer test, Posterior sag sign.
 - Medial Collateral Ligament: Valgus stress testing.
 - Lateral Collateral Ligament: Varus stress testing.
 - Meniscus
 - Joint line tenderness, McMurray test, Apley grind test, Bounce home test, Thessaly test.
 - McMurray test is performed with the patient lying supine with the knee flexed. One hand is placed along the joint line while the other hand cups the sole of the foot. The examiner stabilizes the lateral side of the knee while applying a valgus stress with the other hand as it rotates the leg externally while extending the knee. If there is pain or a click with knee extension, this indicates a positive test for a medial meniscal tear. The opposite motion of varus stress and internally rotating the leg while extending the knee tests the integrity of the lateral meniscus.

- Patella
 - Patellofemoral grind test, Apprehension test.

Questions

- What is the most common location for a meniscus tear? Posteromedial corner of the medial meniscus.
- What tendons insert at the pes anserine? Gracilis, Sartorius, Semitendinosus.
- What is the most common cause of anterior knee pain? Patellofemoral pain syndrome.

Reference

1. Magee DJ. Orthopedic physical assessment. Elsevier Health Sciences; 2013. p. 727–834.

Suggested Reading

Malanga GA, Nadler S, editors. Musculoskeletal physical examination: an evidence-based approach. Elsevier Health Sciences; 2006. p. 279–314.