

## Evaluation of the Meniscus

After completion of the exam for joint stability, the physician can evaluate the knee for evidence of meniscus injury. As previously described, the examiner can begin by evaluating for medial or lateral joint-line tenderness to palpation. Although joint-line tenderness may result from alternative knee pathology, focal tenderness over the medial or lateral menisci is often present in those with meniscus tears. Joint-line tenderness has been reported to have a sensitivity for detecting meniscal pathology ranging from 55 % to 85 % and a specificity ranging from 29.4 % to 67 % [21–23].

In addition to joint-line tenderness, several provocative maneuvers, summarized in Table 2.4,

can be performed to aid in the diagnosis of meniscus injury. The McMurray test is one of the most widely utilized clinical exam maneuvers to evaluate for meniscus tears. This test is performed with the patient supine (Fig. 2.2). The examiner first brings the knee into full flexion while grasping the patient's foot with one hand and stabilizing the knee with a second hand. The knee is then brought from full flexion to 90° of flexion first with full internal rotation of the tibia and then with full external tibial rotation. A positive test produces an appreciable click in association with a torn meniscus that reproduces the patient's previous painful sensations. Pain or clicking with internal rotation suggests the presence of a lateral meniscus injury while a positive test with external rotation is indicative of medial meniscus injury [26]. This maneuver has been shown to

**Table 2.4** Physical examination tests for the detection of meniscus injury

Physical exam test	Technique	Significance	Reliability
Joint-line tenderness	Direct palpation over medial and lateral joint line	Tenderness can indicate a meniscus tear, collateral ligament injury, or DJD	Sensitivity: 55–85 % [21–23] Specificity: 29.4–67 % [21–23]
McMurray test	Range knee from full flexion to 90° of flexion first with full tibial IR and then with full tibial ER	Positive test produces “click” in association with torn meniscus and reproduces patient's painful sensation	Sensitivity: 16–58 % [21–24] Specificity: 77–98 % [22–24]
Apley grind test	Strong ER force applied to knee flexed at 90° at rest, with distraction, and with compression	Joint-line pain with distraction is concerning for ligamentous injury. Joint-line pain with compression is concerning for meniscal pathology	Sensitivity: 13–16 % Specificity: 80–90 % [22, 23]
Bounce home test	Passive full knee extension from flexed position	Loss of terminal extension indicates mechanical block, such as a meniscus tear	
Finochietto test (jump sign)	Anterior proximal tibial translation with knee in 130°–140° flexion	Positive test produces “jump” of torn posterior horn of meniscus with anterior displacement	
Boehler test	Varus and valgus stress applied to knee in almost complete extension	Pain on side of compression is suggestive of meniscus injury	
Thessaly test	Patient internally and externally rotates his or her knee and body while keeping one foot planted with the knee flexed at 5° and then 20°	Joint-line pain with maneuver indicates possible meniscus tear	20° Thessaly test Sensitivity: 89–92 % [25] Specificity: 96–97 % [25]
Childress test	Patient “duck walks” by moving forward with maximal knee flexion	Joint-line pain with maneuver indicates possible meniscus tear	



**Fig. 2.2** Positioning for McMurray test

have a modest sensitivity for the detection of meniscus tears with reported values ranging from 16 to 58 % [21–24]. However, the McMurray test is highly specific for meniscus tears, particularly tears of the posterior horn, with specificity values ranging from 77 to 98 % [22–24]. Consequently, this provocative test has continued utility in combination with other physical examination maneuvers for the diagnosis of meniscus injury [26].

The Apley grind test involves a series of provocative maneuvers that also may be used to diagnose a meniscus injury. For this test, the patient is positioned prone (Fig. 2.3). The injured knee is flexed to 90° and a powerful external rotation force is applied to the tibia. This maneuver determines if external rotation of the knee elicits pain. With the thigh stabilized against the examining table, a distraction force is then applied to the lower leg with the knee flexed at a right angle and an external rotation force is again applied. During this test, the physician should note if pain is elicited with distraction and external rotation and if this pain is greater than without distraction. Increased pain with this maneuver indicates a positive distraction test and is concerning for a ligamentous sprain. Pain with distraction also decreases the likelihood that the meniscus is the etiology of knee pain since distraction decreases the compressive force on the meniscus. The examiner next applies a compression force to the knee while applying an external rotation force in 90° of knee flexion. Increased pain with this maneuver indicates a positive compression test



**Fig. 2.3** Positioning for Apley grind test

and is concerning for a medial meniscus injury. This series of provocative maneuvers can then be repeated with internal rotation to examine the lateral meniscus [27]. Similar to the McMurray test, the Apley grind test also has been shown to have a relatively low sensitivity (13–16 %) and high specificity (80–90 %) [22, 23].

The bounce home test assesses passive knee range of motion to aid in the diagnosis of meniscus tears. This test begins with the patient positioned supine with full knee flexion. The examiner cups the foot of the affected extremity and allows the knee to passively fall into full extension. When performing this maneuver, the knee should “bounce home” into full extension with a sharp end point. A loss of terminal extension or a rubbery end point to extension indicates a positive bounce home test and is concerning for a meniscus tear or some other intra-articular pathology that provides a mechanical block to extension [3].

The Finochietto test or jump sign can be used to aid in the detection of tears of the posterior horn of the meniscus. To perform this test, an anterior translational force is applied to the proximal tibia, similar to the anterior drawer and Lachman tests, while the knee is held in 130–140° of flexion. This test is positive when the examiner



**Fig. 2.4** Positioning for Thessaly test. (a) Thessaly test with external rotation of body. (b) Thessaly test with internal rotation of body

feels a “jump” when a torn posterior horn of the meniscus is displaced anterior to the tibiofemoral contact point [2].

The Boehler and Payr tests utilize the meniscal compression caused by varus and valgus stress testing to diagnose meniscus injuries. To perform the Boehler test, the examiner applies a varus force to compress the medial meniscus or a valgus force to compress the lateral meniscus with the knee in almost full extension. A positive test results from pain on the side of compression with this maneuver and is suggestive of meniscus injury, particularly in the anterior to middle section of the meniscus. The Payr test is similarly used to evaluate for medial meniscus tears by applying a varus force to compress the medial meniscus with the knee held in  $90^\circ$  of flexion [10].

The Thessaly and Childress tests are standing physical exam maneuvers that can aid in the detection of meniscus injury. These tests utilize the combination of axial load applied to the knee from standing to the rotational forces from designated maneuvers during the tests to elicit pain

due to a meniscus tear. To perform the Thessaly test, the patient is asked to stand flat-footed with all weight on one extremity. While holding the examiner’s hands for support, the patient is then asked to internally and externally rotate his or her knee and body three times while keeping the foot planted with the knee flexed at  $5^\circ$  and then with  $20^\circ$  of knee flexion (Fig. 2.4). The maneuver should first be performed on the patient’s uninjured extremity prior to the symptomatic extremity to educate the patient on the physical exam technique. A positive result is indicated by medial or lateral joint-line pain with this maneuver and is concerning for meniscus injury [25]. When the Thessaly test is performed at  $20^\circ$  of knee flexion, it has been shown to have a high sensitivity for the detection of both medial and lateral meniscus tears (89 % and 92 %, respectively) [25]. The  $20^\circ$  Thessaly test also has been reported to have high specificity rates, 97 % and 96 %, for the detection of medial and lateral meniscus tears, respectively [25]. This test has a lower sensitivity and specificity when performed at  $5^\circ$  of knee flexion.