Common sports injuries. Part 1: testing the knee and ankle

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Some targeted tests for soft tissue injuries to the knee can be highly sensitive and specific and are therefore valuable, noninvasive, diagnostic tools. Testing on the ankle is less sensitive, but it can be useful in combination with other physical examination findings.

Physical examination has a time-honoured role in the evaluation of sports injuries, often providing the basis of a diagnosis. The self-limiting nature of many soft tissue injuries, and their response to conservative interventions, means that there is often no justification for complex imaging or surgical intervention. Consequently, for many sports injuries there is no gold standard against which to determine the sensitivity, specificity and accuracy of a particular physical examination technique. The other important characteristic of any diagnostic test, including physical examination, is reliability. This measures the degree to which either the same examiner on different occasions or different examiners make the same finding.

This is the first of two articles that will consider several targeted tests that either have known reliability, sensitivity, specificity or accuracy or have apparent clinical utility. This part will consider general principles in assessing sports injuries and feature the knee and ankle, and part 2, in the following issue, will discuss specific tests of the shoulder.

Principles of examining for sports injury

It is axiomatic that history taking is essential in considering any medical problem. However, consideration of key historical features in sports injury is beyond the scope of this article, which will consider only examination findings.

Before considering special tests and manoeuvres, there are a number of generic considerations that pertain to the assessment of a potentially injured part. These are:

- observation of the injured part, especially for swelling, bruising and deformity
- palpation of the injured part for tenderness, swelling and deformity
- assessment of range of movement of any injured part
- challenging the normal restraints (e.g. testing for excessive movement in suspected ligamentous injury)
- exclusion of neurological, tendon or vascular injury
- evaluation of the function of the injured part (e.g. weight bearing in ankle injuries).

Figure 1. Lachman's test for anterior cruciate deficiency. The tibia is briskly translated upwards, attempting to translate the tibia anteriorly relative to the femur. The examiner feels for the endpoint and any excessive movement.

Figure 2. The posterior drawer test for posterior cruciate ligament injury. The tibia is translated posteriorly with the knee in 90° of flexion. The examiner feels for excessive movement and observes the position of the tibia relative to the femoral condyles.

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The information derived from this screen will provide valuable clues as to the site and nature of any injury. Often, it will enable a definitive diagnosis. Otherwise, it may lead the examiner to formulate a diagnostic hypothesis that can be tested by one of the special examinations or manoeuvres that have been developed for common injuries. These are the focus of the rest of this article.

Testing the knee

Anterior cruciate ligament

The most reliable and simple clinical test for anterior cruciate ligament deficiency is Lachman's test. In experienced hands, it has a sensitivity and specificity in excess of 90% when compared with arthroscopic findings.[1-3]

It is performed with the knee flexed at 30° and all the leg muscles relaxed. This can be achieved by supporting the patient's knee over the examiner's flexed knee and passively moving the patient's knee, encouraging the patient to relax. The examiner then grips around the proximal tibia with one hand and fixes the femur with the other. The tibia is then translated briskly anteriorly (Figure 1).

In normal knees, the anterior cruciate restrains anterior translation of the tibia relative to the femur, and the normal Lachman's test results in a definite abrupt or 'hard' endpoint as the ligament tightens to prevent further translation. In knees where the anterior cruciate ligament is deficient, there is a soft endpoint and excessive translation, constituting a positive test result. Comparison between the two knees is essential.

Posterior cruciate ligament

The posterior drawer test is used to diagnose injuries to the posterior cruciate ligament. It has a demonstrated sensitivity of 90% and specificity of 99% for the detection of isolated posterior cruciate injury.[4]

The test is performed with the knee flexed to 90°, with the patient's foot fixed – which can be achieved by the examiner sitting on the patient's foot. The leg is maintained in neutral rotation. The patient is encouraged to relax while the examiner grasps the upper tibia. The tibia is then pushed backward relative to the femur, and the position and excursion of the tibia relative to the femoral condyles are noted (Figure 2). The degree of movement is noted relative to the uninjured side.

In grade 1 posterior cruciate injury, there is increased posterior tibial displacement but the anterior border of the tibia remains anterior to the femoral condyles. In grade 2 injury, there is increased posterior tibial displacement with the anterior aspect of the tibia remaining flush with the femoral condyles. In grade 3 injuries, the excessive posterior displacement allows the anterior border of the tibia to move posteriorly beyond the femoral condyles.

Figures 3a to d. McMurray's screw test. The tibia is held in external rotation and adduction while the knee is passively extended from flexion (a, top left) to extension (b, top right). This is then repeated with the tibia held in internal rotation and abduction (c and d, below left and right). The examiner's other hand palpates the knee for a click.

Meniscal injuries

The principle underlying tests of meniscal injury or tear is to attempt to trap the damaged components of menisci between the tibia and femur, reproducing pain and possibly a click. McMurray's and Apley's tests rely on axial tibial rotation and lateral or medial force on the tibia, under either static or dynamic pressure, to attempt to reproduce symptoms.

McMurray's screw or grinding test is performed by grasping the knee on

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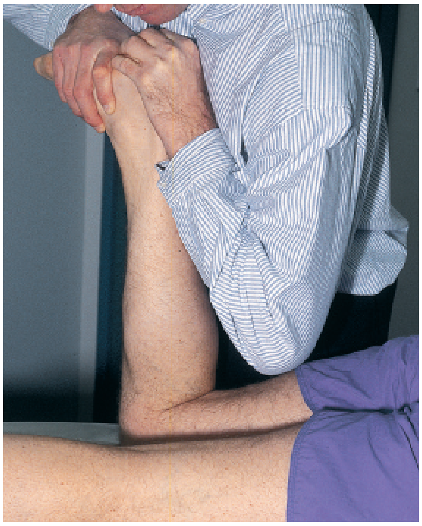
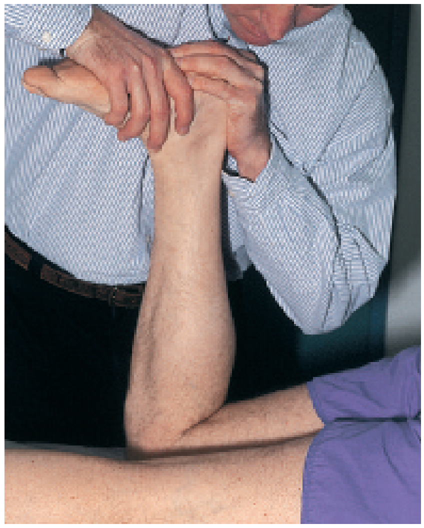

Figures 4a and b. Apley's test. The tibiofemoral joint is compressed via a load through the foot while the tibia is axially rotated from (a, left) external rotation to (b, right) internal rotation. The knee is in approximately 90° of flexion.

either side of the joint line in one hand while holding the foot under the arch in the other hand. The knee is flexed, a varus force is applied to the tibia, and external tibial rotation is achieved by rotating the foot outward (Figure 3a). The knee is then passively extended (Figure 3b) – symptoms reproduced by this manoeuvre are more indicative of medial meniscal pathology. The procedure is then repeated with internal rotation and a valgus force applied to the lower leg (Figures 3c and d) – a positive response to this manoeuvre is more indicative of problems with the lateral meniscus. A response is positive if there is reproduction of pain with or without a palpable click at the site of the torn meniscus. McMurray's test has been found to have a sensitivity of about 25% and a specificity of up to 94%; therefore, it is useful for ruling in, but not ruling out, meniscal tears.[5]

Figure 5. Applying a valgus force to the knee to assess the medial collateral ligament. Note that the knee is held in approximately 20° of flexion.

Figure 6. Applying a varus force to the knee to assess the lateral collateral ligament. Note that the knee is held in approximately 20° of flexion.

Apley's grinding test involves lying the patient prone. The knee is then flexed to 90° and the examiner applies downward pressure with one hand, with the tibia externally then internally rotated (Figures 4a and b). Pain on either side of the joint line constitutes a positive test. Apley's test has generally been reported to be less accurate than McMurray's test.

Collateral ligaments of the knee

The collateral ligaments of the knee are both tested with the knee in 20° to 30° of flexion. The lateral aspect of the knee is stabilised with one hand and a valgus force is applied with the other hand at the distal tibia (Figure 5). This stresses the medial collateral ligament. Similarly, a varus force is applied to test the lateral collateral ligament (Figure 6). The degree of movement produced and any reproduction of pain are noted. As usual, it is essential to compare the two sides.

Partial tears (grade 1 and 2) will have pain reproduced, with some excessive movement or gapping detectable in grade 2 tears. Complete (grade 3) tears will result in excessive movement with gapping or opening up of the joint. The test may be painless if all fibres of the ligament have been torn.

Femoral internal and external rotation at the hip must be avoided during the tests to prevent false positive results from being recorded. Several series suggest that the valgus stressing of the medial collateral ligament described above is highly sensitive (>90%) for the detection of major injuries.[6,7] Lateral collateral ligament tears are relatively rare, and often occur in association with other major ligamentous injuries. The accuracy of varus stress testing of this ligament is not known.

The iliotibial band

The iliotibial band is a condensation of fascia that originates from the iliac crest, with its main insertion into the lateral

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Figure 7. Ober's test. The amount of adduction of the leg is restricted; therefore the patient's knee does not drop down to rest on the examining couch, indicating a tight iliotibial band.

Figure 8. Anterior drawer test at the ankle. The examiner is attempting to pull the foot forwards with the ankle in a neutral position and feeling for excessive anterior displacement of the talus relative to the tibia and fibula. The reliability and accuracy of this test are poor when it is used in isolation.

aspect of the proximal tibia at Gerdy's tubercle. Tightness of the band is thought to be associated with greater trochanteric bursitis, patellofemoral pain and the iliotibial band friction syndrome. The friction syndrome occurs typically in runners, and presents as pain over the lateral aspect of the knee, proximal to the joint line, as the tight band rubs across the lateral femoral condyle during flexion and extension.

The tightness of the iliotibial band can be assessed with Ober's test or manoeuvre. This is performed with the patient lying on his or her side with the contralateral (lower) hip flexed. This can be accomplished by having the patient grasp the knee with both hands, which flattens the lumbar lordosis and allows the leg being tested to adduct freely. The examiner passively adducts the upper leg at the hip while maintaining hip extension and knee flexion (Figure 7). Patients with a tight iliotibial band will have restricted adduction, being unable to rest their knee on the examining table. The same position can be used for stretching of the iliotibial band.

The lack of a gold standard has made determinations of the accuracy of this test impossible. A further test of the friction syndrome is to palpate the femoral condyle for tenderness as the patient flexes and extends the knee while in Ober's position.

Testing the ankle

Ligamentous injuries of the ankle are among the commonest of sports injuries. The ligament most commonly injured is the anterior talofibular ligament, which originates from the anterior part of the lateral or fibular malleolus and attaches through horizontally orientated fibres to the talus. It has been suggested that its integrity can be assessed by the anterior drawer test at the ankle (Figure 8).

In the anterior drawer test, the examiner attempts to translate the foot fowards with the ankle in a neutral position while feeling for excessive anterior displacement of the talus relative to the tibia and fibula. Formal assessment of the reliability of this test in an emergency room environment has shown that it has very poor inter-rater reliability, with agreement between emergency physicians being less than that which might be expected by chance.[8] The same study found that the bony tenderness at sites of ligament attachment are far more reliable signs with high levels of agreement between observers. Moreover, the sensitivity of the anterior drawer test is only 72% compared with arthrography or surgical findings.[9]

The test may be more useful when combined with other physical examination findings. The accuracy of combinations of physical findings including the anterior drawer test has been assessed. At examination five days after injury, the combination of a positive anterior drawer test, discolouration from bruising and tenderness over the anterior talofibular ligament identified 95% of talofibular ligament tears.[10] Conversely, the combination of a negative anterior drawer test and no discolouration was always associated with an intact anterior talofibular ligament.

Conclusion

Careful clinical examination and the application of targeted physical tests can be useful in the assessment of knee injuries. Knowledge of their sensitivity, specificity and reliability enables them to be used with confidence and improved utility. MT

In the next issue of Medicine Today, part 2 will cover tests for sports injuries of the shoulder.

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