



Tricks and tips for physical examination of the multiligament injured knee: what we can not forget

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Abstract: The multiligament knee injury may present some challenges in its evaluation during the physical examination. Due to the wide range of lesion patterns and instabilities, a systematic approach to physical examination is essential in such cases. The initial evaluation by inspection and palpation, followed by with the specific tests for each structure, with the evaluation of the cruciate ligaments, then the lateral and medial ligaments in an organized way allows a more accurate diagnosis. It is very important the ability to recognize the meaning of the result of each physical examination test and its variations, to avoid common misinterpretation. This article aims to present the physical examination of the multiligament injured knee in an organized way, pointing out the tips and tricks for the best diagnosis and correct treatment.

Keywords: Knee; ligament injury; physical exam

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Introduction

The multiligament knee injury may present some challenges in its evaluation during the physical examination. The association of multiple ligament lesions makes it obvious that there is some instability, but the identification of the exact structures involved in the trauma becomes more difficult (1,2).

There is also an important difference in the evaluation of acute lesions and chronic lesions. Patients in the acute phase, usually victims of high energy trauma, present significant pain and therefore resist more physical examination with muscle contractions that make it difficult to identify ligament insufficiencies. In the acute phase, magnetic resonance imaging may show many changes in ligament structures, and physical examination is fundamental to identify which changes in the imaging exam actually correlate with

instabilities that must be addressed (1,3).

On the other hand, patients with chronic injuries bring another type of challenge. The knee already presents without edema and almost no pain. Therefore, the patient is much more collaborative with the physical examination. However, the gross instability at this stage may lead to a lack of diagnosis of injury to secondary structures. Chronic lesions will also be much more difficult to identify on magnetic resonance imaging, with physical examination being the main parameter for surgical planning (4,5).

It is important to remember that in the acute phase all patients diagnosed with a knee dislocation should undergo a thorough physical examination for vascular and neurological injuries (6-8). However, this is not the focus of this article, which will focus on the assessment of knee ligament structures.

Cruciate ligaments

The evaluation of the integrity of the cruciate ligaments during the physical exam of the multiligament injured knee is usually easier than in the isolated lesions, since they present greater instabilities. Higher energy trauma frequently presents concomitant lesion of the anterior cruciate ligament and posterior cruciate ligament.

The classic tests for the evaluation of these ligaments are the anterior and posterior drawer tests, Lachman test and pivot shift test. With drawer testing in cases of multiligament injuries particular attention is needed to the initial position of the tibia before performing the anterior and posterior movements. It is important to verify that the tibia is reduced at the beginning of the examination. This can be verified by palpating the position of the tibial plateau in relation to the femoral condyles. The anterior border of the tibial plateau should be approximately one centimeter in front of the femoral condyles, with the knee at 90 degrees of flexion. Without this detail, in the presence of a posterior cruciate ligament injury, the tibia may be posteriorized, causing a false positive in the anterior drawer test or even a false negative in the posterior drawer test.

The Lachman test requires the same attention as the drawer tests. It is important to reduce the tibia in the anatomical position before beginning the movements of stress. It is also important to have a sensitivity when performing the stresses to try to identify the characteristic of the end of the movement. The presence of an intact ligament will generate a firm and abrupt endpoint. Meanwhile in the ligament injury it will be more difficult to identify an endpoint, and the end of the movement will be smoother.

Peripheral lesions

The identification of the lesions of the different peripheral structures can be more challenging. The association of lesions, with different changes in the rotational and coronal stability patterns of the knee, may be confusing during the physical examination, so it is important to associate different tests.

Physical examination begins with visual inspection of the knee in which localized edema or ecchymosis can be identified, suggesting the pattern of injury. Next, the palpation of the origin and insertion of the collateral ligaments should be performed, which helps in identifying the lesion site of each structure and guides the next steps of

the physical examination.

The medial knee complex includes different structures, but the main stabilizers are the medial collateral ligament, with its deep and superficial portions, and the posterior oblique ligament (5,9). The medial ligament evaluation of the knee during the physical exam has classic tests such as valgus stress. Valgus stress should be performed with both the knee extension and the knee at 30 degrees flexion. The flexed knee test decreases the tension of the posterior capsule and the posterior cruciate ligament, isolating the restraining action to the fibers of the medial collateral ligament. During valgus stress, it is essential to palpate the medial joint line to measure the opening between the medial femoral condyle and the medial tibial plateau, thus measuring the degree of the lesion. This palpation also ensures that the movement observed during the valgus stress is due to the medial opening and not the lateral closure resulting from a lateral complex injury.

Another maneuver described is the Slocum test to evaluate the posteromedial complex, in which the anterior drawer test is performed with the tibia at 15 degrees of external rotation. The external rotation of the tibia stresses the posteromedial complex, which if intact will diminish the anterior excursion of the tibia. However, in the presence of an injury, a greater anterior tibial translation is observed with a rotational tendency of the tibial plateau (10).

Lesions of the lateral complex were extensively studied by the complex rotational instabilities caused by this lesion and due to the higher failure rates in reconstructions of anterior and posterior cruciate ligaments in the presence of non-identified posterolateral complex lesions (11).

The posterolateral complex of the knee includes different structures, but the main stabilizers are the lateral collateral ligament, the popliteus tendon and the popliteofibular ligament (12). Some classic tests and signs have been described to evaluate the lesions of the posterolateral complex as varus stress test, recurvatum and external rotation sign, posterolateral drawer test, reverse pivot shift test and the dial test (13,14).

The varus stress test should also be performed with both the knee in complete extension and the knee at 30 degrees flexion. The test performed with the knee at 30 degrees of flexion loosens the secondary stabilizers, increasing the sensitivity of the test. When stability is restored to knee stress in extension, there is probably an isolated injury of the lateral collateral ligament. However, if a lateral compartment opening is present in both extension and flexion, we presume an injury of the lateral complex with its



Figure 1 Posterolateral rotatory drawer test positioning. Left hand of examiner in the proximal part of the calf, with the thumb palpating the joint line. Right hand of the examiner holding the ankle to perform the external rotation of the leg.

secondary structures, as well as the cruciate ligaments.

The recurvatum and external rotation signs performed by raising the lower limb by the hallux, which will demonstrate a hyperextension of the knee associated with external rotation. In the posterolateral drawer test the knee is kept at 90 degrees of flexion and the foot at 15 degrees of external rotation. In this position, a posteriorizing force is applied to the proximal tibia, causing greater posteriorization of the lateral compartment compared with that of the undamaged limb.

The reverse pivot shift is performed with the knee at 70 degrees of flexion and the foot externally rotated. This leads to posterior subluxation of the lateral compartment of the posterolateral complex injured knee. The knee is then slowly extended to about 20° of flexion, at which point the force vector of the iliotibial band changes and the tibia is pulled forward, reducing the subluxation.

For the dial test the patient lies in a prone position with the knees at 30 degrees of flexion and both ankles are externally rotated simultaneously. An increase in external rotation of 10–15 degrees is considered a positive test for posterolateral complex injury (15). In the same maneuver performed with the knee bent at 90 degrees, the increase in external rotation is a sign of associated posterior cruciate ligament injury. It is important to observe that in lesions of the medial complex it is also possible to find an increase of the external rotation, due to the increase of the anterior translation of the medial plateau (5). The differentiation between the medial and lateral lesion in the dial test with the patient in the ventral decubitus position is quite difficult.

The performance and interpretation of the stability evaluation tests of the posterolateral complex of the knee is quite challenging. Even with so many tests and signs already described, 72% of these lesions are not diagnosed during the initial presentation. The difficulty increases significantly when central pivot and medial collateral ligament injuries are involved (16).

More recently, we have described a test that seeks to improve the sensitivity of the physical examination to the diagnosis of posterolateral complex lesions, the posterolateral rotatory drawer test. The test is started with the patient in dorsal decubitus with the hip flexed at 45 degrees and the knee at 90 degrees flexion. The examiner should position his or her contralateral hand on the lateral side of the proximal third of the calf of the knee to be examined, then pull the tibia anteriorly, reducing a possible posteriority of the tibia caused by ligament injury. With the other hand holding the ankle the examiner performs an external rotation movement (*Figure 1*). Using the thumb of the hand placed near the knee, the examiner palpates the joint line to evaluate the position of the anterior border of the tibial plateau in relation to the lateral femoral condyle. In this test, with an injury of the lateral posterolateral complex, there will be an increase in the external rotation associated to a posteriorization of the lateral plateau in relation to the femoral condyle. This maneuver facilitates the differentiation between the lateral and medial lesions, which can cause the external rotation of the tibia to increase (17).

Conclusions

Physical examination in the multiligament injured knee can bring great challenges, and for this reason there are so many tests and signs described. All tests should be performed bilaterally to compare to the uninjured knee (18). The best quality physical examination is the one with the patient anesthetized, so we should always repeat the complete physical examination and be ready for changes in the surgical plan in the operating room. Another feature that can be used in cases of diagnostic doubts is stress radiography. This may be more sensitive to some subtler ligament lesions.

Examination of the knee with a multiligamentous lesion should not fail to look for signs of associated cartilage or meniscus lesions, often present in these patients. Pain in the joint line, exacerbated joint effusion, cracks, pain on palpation of the femoral condyles, and even more

exacerbated instability are signs of possible intra-articular lesions associated with ligamentous lesions.

Even with all the care and attention during an assessment of the multiligament injured knee, wrong interpretations can occur. Therefore, it is essential that the physical examination be thoroughly trained and repeated at different times by the surgeon, seeking the right diagnosis for the patient.

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