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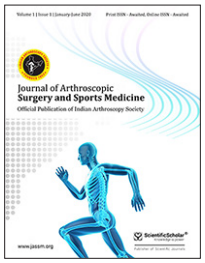

Arthroscopic Techniques

The pushed quadriceps active test – A modification of the quadriceps active test to diagnose PCL deficiency

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ABSTRACT

Quadriceps active (QA) test has been described and well known for the diagnosis of posterior cruciate ligament (PCL) deficiency. We describe a modification of the QA test to diagnose PCL deficiency. Pushed QA test consists of two components where the examiner pushes the proximal tibia posteriorly with the knee flexed <90° in the first part of the test translating the tibia posteriorly like in the posterior drawer test while the patient reduces the translation actively by contracting the quadriceps in the second part like in the QA test.

Keywords: Quadriceps active test, PCL deficiency, PCL injury, Pushed quadriceps active test

INTRODUCTION

Quadriceps active (QA) test is a well-known useful test to diagnose posterior cruciate ligament (PCL) deficiency. Diagnosis of PCL deficiency is difficult even in experienced hands in some instances. The key to diagnose is eliciting a clear clinical sign. Often, it is difficult to differentiate an anterior cruciate ligament (ACL) and PCL ruptures in inexperienced hands due to subtle signs. It is more difficult in a combined ACL and PCL deficiency. The sensitivity of QA test has been found to be 54%.

A modification of the QA test is presented here to diagnose PCL deficiency which would improve the accuracy of diagnosing PCL ruptures and also would improve the sensitivity of the classical QA test.

THE TEST

With the patient supine [Video 1], the affected knee is flexed to slightly <90°, similar to the position for the posterior drawer test, and the patient relaxes his muscles around the knee. The examiner stabilizes the foot and then applies a posteriorly directed force over the tibial tuberosity to push the proximal tibia posteriorly as in the posterior drawer test [Figure 1]. With an absent PCL, the tibia is displaced posteriorly. Some patients may also feel pain at maximal displacement, especially in the acute setting. At the point of maximum posterior displacement, the patient is instructed to contract the quadriceps actively. At the same time, the examiner reduces the amount of posterior force applied to the tibia to almost but not nil. This draws the proximal tibia anteriorly as we see in the QA test [Figure 2], although in that test, the position of the knee is in higher amounts of flexion, and there is an active component only.

DISCUSSION

Clinical tests for PCL deficiency are listed in [Table 1]. A detailed description of these tests may be found in the article by Feltham.[1]

Table 1: Clinical tests for the PCL.

Clinical tests for PCL deficiency	
Posterior Drawer Test of Clancy (1976)[2]	
Muller test[3]	Part 1: Hip 45° flexion, Flex knee to 90°, inspect for lost prominence of the proximal tibia Part 2: Raise foot off the table
QA test (termed by Daniel *et al.*)[4]	The second part of the Muller test
Godfrey test[1]	Hip in 90° flexion
Trillat test[1]	A type of reverse Lachman Test done at 20–30° flexion
Shelbourne test (1989)[5]	Dynamic Posterior Shift test
Posterior Functional Drawer Test[1]	Hamstring create posterior drawer at 90 flexion in prone position causing pain, reduced at 20–30 flexion
Posterior Tibial Percussion Test[1]	Percussion over proximal tibia elicits pain in the acute setting

PCL: Posterior cruciate ligament

The accuracy of clinical examination tests in the diagnosis of PCL deficiency has been found to be 96%.[6] The same authors found the sensitivity and specificity of the QA test to be 54% and 97%, respectively. The posterior drawer test was the most reliable with values of 90% and 99%, respectively.[6] One drawback of the posterior drawer test is that sometimes it is difficult to differentiate between an ACL and a PCL deficiency, and the result may be difficult to assess with a concomitant deficient ACL.

In the Pushed QA (PQA) test, there is a passive component displacing the tibia maximally posteriorly from where the active component restores the displacement to the normal position. This has the added advantage of the examiner perceiving the posterior movement like in the posterior drawer test as well as perceiving the anterior translation during the QA component visually as well as by tactile feedback from the hand. It is best appreciated when the examiner stands by the side of the knee at the position of the camera, as shown in the [Video 1], to detect the movement. Hence, the examiner's visual and tactile feedbacks are used to detect a positive test. In very obese patients, translation of proximal tibia may be missed by visual feedback but tactile feedback of the examiner could pick it up. This should be established with larger studies.

With the PQA test, any anterior slide of the tibia as in ACL deficiency will be eliminated by the posterior force of the examiner, and any amount of movement occurring by active contraction of the quadriceps after posterior displacement will be due to correction of the posterior displacement alone. The test will not be positive for ACL deficiency. In the acute setting it may not be possible to do this test in some cases due to limited flexion and hemarthrosis.

With the QA test, the posterior sag of the tibia is dependent on gravity. In some instances, where the quadriceps is contracted due to spasm or an increased tone, the magnitude of the posterior translation will be reduced. Whereas with a posteriorly applied force and a deficient PCL, the applied force would neutralize the resting or increased tone or spasm of the quadriceps, and the posterior translation would be significantly higher than the conventional QA test. This is demonstrated in the accompanying [Video 1]. However, this may need further tests to quantify in larger trials.

Figure 1: Initial passive posterior force applied to proximal tibia by the examiner.

Figure 2: Active quadriceps contraction by the patient after the first step then restores tibia to original position. Note the sagging of the patellar tendon in first image is corrected in the second image.

A QA test has been recently described where the test becomes positive even without the action of the quadriceps. This is due to the contraction of the gastrocnemius muscle, which draws the femur posteriorly, reducing the translation of the proximal tibia rather than the quadriceps drawing the tibia anteriorly. This effect, called the "string of a bow effect" by the authors,[7] is neutralized by the passive posterior push by the examiner in the PQA test.

It may be said that at up to 30° of flexion of the knee, the posterior displacement of the tibia may be restricted or blocked by the anterior menisci limiting the sensitivity of posterior forces testing the PCL. In the PQA test, at slightly <90° and posteriorly directed force, the influence of menisci is completely eliminated, such as in the QA test, and the PQA test combines the advantages of both the posterior drawer test and the QA test. At 90° of flexion, the quadriceps force component is not optimal, and hence we recommend using slightly <90° of flexion at the knee, at which angle the gravitational force on the proximal tibia is also higher and the test easier in very obese patients. The optimal angle for testing QA test has been recommended as 70–90° flexion.[4]

We believe that the sensitivity of the QA test, which is at 54%, may be increased with this modification. Further studies are required to assess the sensitivity and specificity of this test in relation to the standard clinical tests for PCL deficiency and also in cases with associated PLC and multi-ligament injuries.

CONCLUSION

PQA test is a useful test to diagnose PCL insufficiency accurately. Further studies are required to establish its sensitivity and specificity and its role in the clinical assessment of PCL and other injuries.

Video demonstration

The accompanying 2-min [Video 1] clearly demonstrates the technique. The foot of the patient may be stabilized, if required, by the examiner sitting with his/her thigh on the distal part of the foot. First part of the [Video 1] demonstrates the test in a slightly obese patient where it can be seen that the QAT in not clearly seen. However, the PQAT shows a clear demonstration of PCL deficiency. The test is also repeated with two positions of the knee at and slightly <90°. Last case was a grade 3 PCL deficiency, clearly demonstrated by PQAT.

It can be seen from the scenarios that where the QAT was equivocal or weakly positive, PQAT clearly demonstrates deficiency of PCL. However, further studies are required to establish its role in the clinical practice.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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