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Review Article

Objective Tests after Anterior Cruciate Ligament Reconstruction Surgery: A Review Summary

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Abstract

Anterior Cruciate Ligament Reconstruction is a very common surgery performed around the globe and many studies have shown the specifics of this procedure, talking about the time to return to play we all are in some way in a position where many tests and studies are available helping us rule the precise return to play time, in this research we studied the most common ones and tried to discriminate between them in order to find the most objective ones so we can use them as a standard of documentation for all of the patients following a ACLR surgery.

ABBREVIATIONS

ACL: Anterior Cruciate Ligament; ACLR: Anterior Cruciate Ligament Reconstruction

INTRODUCTION

The reconstruction after an anterior cruciate ligament tear (ACL) is one of the most common procedures among orthopedic surgeons around the globe. The rehabilitation protocol of the patient with an anterior cruciate ligament reconstruction (ACLR) is very important for a successful return to play and the way we assess their improvement during this process is critical. This systematic review has its goal in finding the most appropriate objective data for a better assessment of the patients during their rehabilitation process using the existent literature. pedro.iturbide@me.com

We utilized two databases, PubMed and Embase, this two were searched from 1970 to 2015. The terms searched in the database were anterior cruciate ligament, anterior cruciate ligament tear, and rehabilitation. With these terms we gather 133 articles that were significant for our study. For the inclusion criteria we included English-language studies with ACLR rehabilitation information, the exclusion criteria was non-English language, and articles that had no pertinent information on ACLR rehabilitation information. After this criterion was implemented we ended up with a total of 87 articles that we used to get the appropriate background to form a protocol with objective exams to be reproducible and easy to adapt to the clinic environment, with little expense to the system so we can assess the rehabilitation process. In this study we included objective measurement exams in the rehabilitation protocols of an ACLR.

Objective measurement exams

In the world of rehabilitation protocols and the way we do the assessments there are several exams that are being performed by the athletic trainer McCullough,[1] the physical therapist and the physician, all these exams have been studied in separate and their positive and negative qualities had also been described in the literature. We found that the most used exams are the 90 degree cut to the right and to the left exam Ardern CL, [2] the drop landing test, the single leg squat the three star excursion balance test and the tuck jump exam, all this tests each one by themselves has their own way to give a result making that out first barrier.

We first included the star excursion balance test (SEBT), this test is focused in the control of dynamic postural task Gribble, P.A., [3,4] it has been used with notoriety since a decade ago, the purpose of this test is to objectively measure the improvements and also the deficits of the lower extremity control of patients that underwent ACLR surgery, Filipa, A., [5,6] during this test the patient is demonstrating since day one of physical therapy until the last day of it that the training is giving good results and also is one of the tests that encourages the patient to continue because the results change every week, Clagg S. [7] explain in his study that the management of the muscular groups that this test requires from the patient makes it one of the most valuable test because not only the observer can assess the strength of the patient but also the ability to use the different muscular groups all as one making it a good test to view the necessity to exercise something more specifically (Figure 1). It is important to consider that no study has determined if this exam is as scientifically accurate as the reviewed articles assure, it is important to considerate the fact that there is more than 10 years of research to validate the SEBT [8-11], that is why we found pertinent to consider it as part of our objective exams portfolio.

The next exam we evaluated was the 90 degree cut to the right and cut to the left exam, current literature has tried to prove that this exam is very accurate providing specific information with patients during their rehabilitation protocol measurement for ACLR surgery,

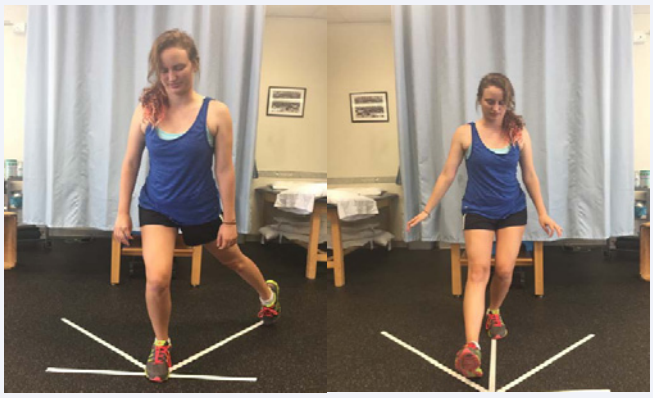

Figure 1 (A) – Balance Star Posterior (B) - Balance Star Anterior.

in this test the patient is asked to make cuts of 90 degrees making emphasis in making an appropriate plant leg and assessing the values of the knee with a knee flexion of 45 degree and the plant of the foot should be within the base of support, it means with no more than two foot outside the width of the shoulders. Some studies have suggested the clinical importance of this exam for the patient in recovery of an ACLR, but mainly the literature specifically states that this exam is difficult to grade in the same way to every patient, meaning that the inter observer differences in examine the results are to with to even consider it as an objective exam [12-14].

The single leg squat in the other hand is an exam that has the best inter observer result in similarity and assessment, it is a very simple test with very objective points Papannagari, R [15-20]. First the patient should be tested viewing him from the front and them from a lateral position, the criteria includes the patient being able to squat to 60 degrees of flexion, the patella viewed from the front should not cross over a vertical line that extends from the great toe [21,22], the patients should also be able to maintain a neutral spine without flexing it, and finally the patient needs to be able to control his or her posterior weight shift, this will tell the observer that the patient is properly using his or her extensor mechanism as well as the abductor and abduction group along with the flexion group [23-27], the importance of this biomechanically tells the observer that the patient has regain the ability to use his or her lower extremity in order to prevent another injury to the ACL (Figure 2). The single leg squat has been reported to have a very objective outcome in the ACLR rehabilitation patient because the variability is very limited between different testers, making it a good test [28-31].

There is another exercise that its being use as a standard in the rehabilitation of an ACLR, the tuck jump, the simplicity of it and the amount of neuromuscular information that gives to the trainer makes it one of the most common exercises to asses in order to be able to give a green light to the patient [32-37]. During this exercise the patient is asked to jump in its own place starting in a squat position with the thighs parallel to the floor, the patient should have a neutral alignment at takeoff and landing with no values at the knees, the thighs should start and end parallel to the floor [38-43], and the spine should maintain a neutral position [44-47]. The problem during the assessment of this exercise is that you need to be in the final part of your ACLR rehabilitation to be able to perform it, many patients will not be able to do this exercise during their rehabilitation and the failure rate of this exercise is high.

Drop and landing exercise is a very simple test to perform and virtually every patient in its early and late rehabilitation process after an ACLR is able to do it [48], it is performed by positioning the patient on top of a 18 inch platform and asking him or her to jump to the floor and land with control of their body (Figure 3). The simplicity and the amount of data that it gives out in conjunction with the fact that this exercise can be performed during the whole period of the rehabilitation process makes it one of the most valuable exercises that we have to objectively grade the progress of the patient and biomechanically we are demonstrating that the patient is able to control his or her upper extremity weight with a good neuromuscular management of the lower extremities, this will mean that the physical therapy is doing things right and is getting the patient to the goal of being able to participate in sport activities without any restriction [49].

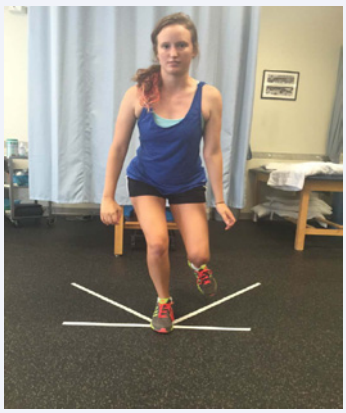

Figure 2 Single Leg Squat.

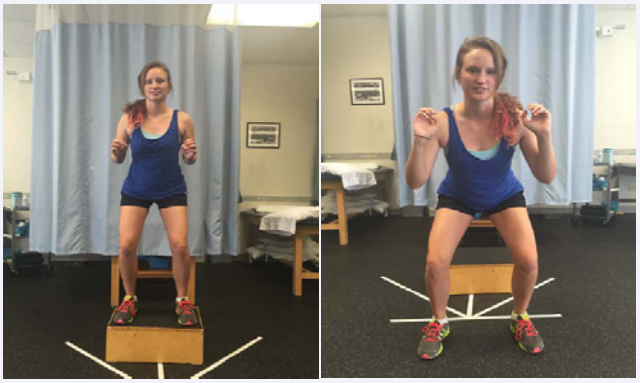

Figure 3 Double Leg Jump Down 18" Step.

Table 1: Objective measurement of the three types of tests.

Functional Tests	Knee Valgus/ Varus Angle		Knee Flexion Angle		Trunk Flexion Angle	
	(L)	(R)	(L)	(R)	(L)	(R)
Balance Star Anterior						
Balance Star Poster lateral						
Single Leg Squat						
Double Leg Jump Down 18" Step						

DISCUSSION AND CONCLUSION

After this review we found that the facts regarding ACLR rehabilitation objective tests are vast, and the use of all of them will not necessarily give more and better information to the trainer, in fact the use of many of these tests and exercises will only make it more difficult to objectively mark a return to play after an ACLR surgery [50]. That is why we recommend the use of only three of them on the basis of objectiveness and the simplicity to perform them Table 1, that will not only give more specific data but also it will reduce the cost of the therapy to the system. The tests that we selected are the single leg squat, drop landing off 18 inches and the star excursion balance test as we explained in the study.

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