

ACL Anatomy and it's Injuries

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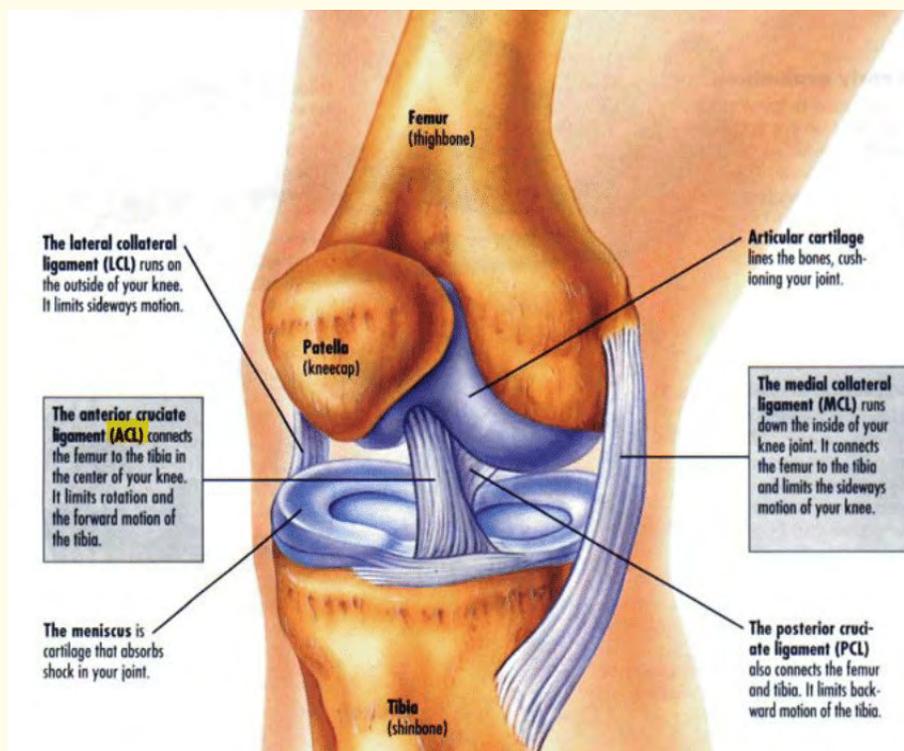
Received: March 18, 2018; Published: April 10, 2018

Abstract

ACL, known as anterior cruciate ligament, is one of the most common injuries in sport profession. For understanding further ACL injuries, a good pre-knowledge of knee anatomy has to be understandable. In the knee joint further movements are possible: flexion, extension and rotation. Rotation of a knee joint is possible, when the knee is flexed and stable on the ground. Those rotations are small. ACL represents one out of two cruciate ligaments, situated in knee. It runs from anterolateral tibial spine to lateral femoral condyle. ACL can be divided into two parts. The fibre of ACL, which are arising from the lateral side, extends farther dorsally than the one which comes from the medial side. ACL is important for preventing the tibia moving forward. Beside ACL, there is posterior cruciate ligament, known as PCL, which prevents tibia for moving backwards. Injuries that can happen for ACL are not graded with just one grade, which would imply for further surgery. The rupture of ACL, is actually divided into three grades, and for each of them there are specific insight of what it means. The causes of ACL injuries are some, but most common cause of ACL rupture is combined knee compression, flexion and internal rotation.

Keywords: ACL; acl Anatomy; Knee Anatomy; acl Injuries; Causes

What does ACL means, where is it situated, what is its anatomy, why is the ACL important, how does it lead to rupture? The answers will be given in this article. This is about to be a short review of the anatomy ACL, which is important to know for further understanding of rehabilitation (not mentioned in this article).



<http://sportskneetherapy.com/knee-ligaments/what-is-an-acl-pcl/> [1].

Short review of knee structure

In knee anatomy we know the following ligaments:

- 2 cruciate ligaments; anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL)
- 2 collateral ligaments; medial collateral ligament, lateral collateral ligament
- Transverse ligament
- Anterior meniscomfemoral ligament, posterior meniscomfemoral ligament

Knee is composed of three bones, which are: tibia, femur and patella. Besides mentioned ligaments, bones, the meniscus represents an important role as well [2].

ACL anatomy

ACL, known as anterior cruciate ligament is one out of two cruciate ligaments in knee. Both of them are mainly composed of collagen fibres with only 10% of elastic fibre. It goes anterolateral from anterior tibial spine to lateral femoral condyle. Attachment of ACL to anterior tibial spine is stronger than the part of ACL that attaches to lateral femoral condyle. Anatomically ACL can be divided into two parts: anteromedial band and posterolateral band. Anteromedial band attaches anteromedial to the tibia. Posterolateral band constitute the rest of the ligament. In extension posterolateral band is taut/strengthened, while anteromedial band is lax. Constant length ratio with PCL (posterior cruciate ligament) is 5:3, which varies upon individuals. ACL provides around 86% of the restraint to anterior displacement, while PCL provides 94% restraint to posterior displacement of the tibia and femur. There is barely good blood supplies from middle genicular artery, with a small contribution from the inferior lateral genicular artery. Mechanoreceptors are located around the periphery where the maximum bending occurs. It is most probable they convey information regarding angular acceleration and may be involved in reflexes to protect the knee from potential injury [2]. Platzer [3] indicates that the fibers of ACL, arising from the lateral side extends farther dorsally than those from the medial side. ACL prevents tibia for moving forward, meanwhile posterior cruciate ligament prevents movement of tibia backwards.

Flexed knee and its rotation

Besides ACL and PCL, the collateral ligaments are also involved, Platzer says [3]. Platzer [3] continues with explanation of functionality of flexed knee. It is said lateral collateral ligament is completely relaxed, while medial collateral ligament is largely lax, but ACL and PCL are taut/strengthened. During flexion the slightly rotations are possible. The movement of rotation is supervised by ACL and PCL. Range of internal rotation is less than external.

ACL injury

Most common ACL injuries, happens in high demand sport discipline such as football, basketball, soccer. Ligament sprains are graded on three different level, depends on the stage of injury.

Such division is:

- Grade 1 sprain: ligament is mildly/slightly damaged, stretched, but the knee joint is stable
- Grade 2 sprain: ligament stretches to the point where it becomes loose. It refers to partial tear of ligament
- Grade 3 sprain: complete tear of ligament. It is most common. Ligament is split into two pieces. Knee joint is unstable [4].

ACL rupture increases very little in the anterior draw, while PCL in a posterior draw of up to 25 mm [2]. Most frequent causes of ACL rupture are combined knee compression, flexion and internal rotation. Taking into consideration maximal knee loading happens in response of repeated exercises in a short period of time. In professional athletes, ACL injury increases among limited internal axial rotation of a hip joint [5]. A reason for ACL injury often involves minimal or no contact, which represents $\frac{3}{4}$ of all ACL injuries. For non-contact ACL

injury axial compressive forces are critical. Interesting fact is female athlete gets from two to eight time greater rate of injuries than men. Further factors for causing ACL injuries are: impingement, quadriceps contraction, hamstring compression, axial forces [6].

Further suggestions

Since the ACL is one of the most talkative topic, especially in sport, I suggest to dig into the different researches. I wrote this short, understandable article for people to understand what it means, when the doctor says, your ACL has been injured and so they know where is it situated. There is so much to discover on its field, and as I said, my article is just a one percent of everything that there is happening with the ACL. For each information I pointed out, there are further explanations and also to confirm the literature researches on its topic are needed [7-9].

Conclusion

ACL plays a very important role in sport. For the ones, not being a professional sport person, the rupture of ACL cannot be so devastated. Understanding the knee anatomy is crucial for understanding ACL anatomy and it's ruptures. Besides anatomy, it is important to understand the biomechanics of knee. Since the topic of ACL has not been yet very developed, I suggest for doing a lot of researches. With understanding the basics, there are a lot of different fields that are needed for being researched, such as: reconstruction, rehabilitation, etc.

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Volume 9 Issue 5 May 2018

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