Rehabilitation of a lateral meniscus repair of a USMAPS Soccer Athlete: A case-report and Literature Review

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Abstract

Background: This Level-4 case report identifies an 18 year old, Soccer Center-Defensive Midfielder who is 175 cm tall and 74.8 kg. The athlete had prior history of meniscus tear in his left knee. Athlete was participating in a match and attempted a pass in the air. The athlete fell immediately to the ground and stopped participation. Initial, on-field evaluation of the athlete indicated potential meniscus injury. McMurray's and Thessaly's meniscus tests were both positive. **Differential Diagnosis**: Meniscus Tear, Posterior-Lateral Instability, Lateral Collateral Ligament. Initial Treatment: Athlete was removed from play, given ice to reduce pain and inflammation. Athlete was given crutches to avoid axial load on the joint which would increase pain. MRI was scheduled and showed tear to lateral meniscus of the right knee and referred to team physician where surgical intervention was recommended. Athlete then began a post-operation rehabilitation protocol. Phase 1: 0-6 weeks post operation, consisted of full knee extension and 90 degrees of knee flexion. Phase 2: 7-12 weeks post operation, consisted of normal gait and stair ambulation as well as full knee ROM. Phase 3: 13-26 weeks of post operation, consists of jogging at own pace without pain and equal leg strength compared to uninvolved leg. **Diagnosed Injury**: Lateral Meniscus tear of the right knee. **Uniqueness**: The lateral meniscus is essential to the tibio-femoral joint because it functions of load bearing, load transmission, shock absorption and joint stabilization. According to recent literature, the most common mechanism of injury to the menisci is through non-contact forces, usually in a cutting motion from changing directions. This deceleration and acceleration of different directions puts added stress to the menisci through entrapment between the tibia and femur causing a tear. The MOI presented in this case study does not involve a change in direction but an increase in forced extension from kicking the soccer ball along with internal rotation of the hip and knee to strike the ball with the outside of the athlete's foot. The combination of these actions caused an entrapment of the lateral meniscus, causing a tear. **Conclusion**: This case study highlighted the diagnosis of this injury as well as the treatment and rehabilitation process of a lateral meniscus tear. This case study also covered the uniqueness of this case, being its MOI. This athlete is still in recover however is well on his way to returning to play.

Introduction

Ankle injuries are among the most common injuries affecting athletes in all sports. "An estimated 28,000 ankle injuries occur in the United States each day." (Kaminski, 2013) Even though lateral ankle sprains are more common than syndesmotic injuries, syndesmotic ankle sprains result in a larger amount of missed playing time. Syndesmotic ankle sprains are more difficult to diagnose than a lateral or medial ankle sprain, and makes recovery complicated for the athlete and medical staff. The following information will explain the mechanism of injury, clinical assessments, radiographic findings, diagnosis, treatments and return to play to provide additional information to this athlete's unique injury.

Purpose

The purpose of this case report was to introduce an 18 year-old United States Military Academy Preparatory School soccer athlete who received a lateral meniscus tear during competition. In order for this athlete to continue playing soccer and continue education within the Academy, surgical intervention was needed. An overview of this unique injury is presented to obtain additional information and a better understanding regarding the principles of a meniscal rehabilitation protocol.

Anatomy

The meniscus is connective tissue made of fibrocartilage. It is positioned on top of the tibia and is connected to the tibial plateau both anteriorly and posteriorly. The meniscus is made of two segments which consist of the medial and lateral meniscus. They are wedge-shaped because the outer border of the meniscus is thicker than the inner rim. This creates a concave surface of the tibia which allows the femur to articulate better within the joint. The medial meniscus is crescent shaped, semi-mobile and wider posteriorly than anteriorly. The lateral meniscus is more circular in shape and more mobile compared to the medial meniscus. The lateral meniscus will move and shift with the lateral articulation of the femur during extension and flexion of the tibio-femoral joint. According to Higgins (2011), the function of the meniscus is to deepen the articulation of the tibio-femoral joint throughout its motion, increase load transmission over a greater period of time, provide nutrients, improve lubrication of the articulating surfaces, provide shock absorption, and increase passive joint stability. The attachment sites for the meniscus include the articulation between the tibia and femur, as stated previously. However, according to Starkey (2015), both menisci are attached to the peripheries of the tibia by the coronary ligament. The transverse ligaments attach the anterior horns of both menisci together and the patellomeniscal ligament attaches the meniscus to the patellar tendon. Starkey and Brown also state that the lateral meniscus attaches to the lateral aspect of the medial femoral condyle by the two menicofemoral ligaments, ligaments of Wrisberg and Humphrey. The lateral meniscus also attaches to the popliteus by the joint capsule and coronary ligaments. The medial meniscus attaches to the dep layer of the medial collateral ligament. The meniscus is poorly vascularized making it very hard to heal on its own. Both the medial and lateral meniscus are slightly vascularized around the outer portion. The outer portion of the lateral meniscus is approximately ten to twenty-five percent vascularized and the medial meniscus is ten to thirty percent vascularized.. The inner portion of both meniscus for an avascular zone. Because of the presence of an active blood supply by the medial, middle, and lateral geniculate arteries, tears that occur in the vascular zone have a greater chance of healing compared to tears in that avascular zone that rely solely on nutrients delivered through the synovial membrane

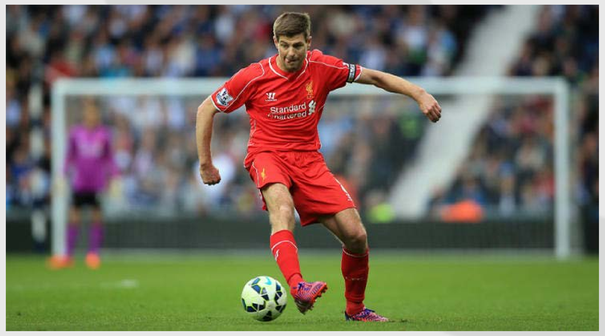
Case Report

Patient: This United states Military Academy Preparatory school Soccer Athlete is an 18 year-old (74.8 kg and 175 cm) athlete that received a high ankle sprain during the third quarter of competition. The following information will explain the mechanism of injury, clinical assessments, radiographic findings, diagnosis, treatments and return to play to provide additional information to this athlete's unique injury.

Mechanism of Injury: With this particular case. The mechanism of injury was unique in that it was an open chain meniscal tear with no axial load and change in direction. The USMAPS soccer athlete passed the soccer ball in the air with the outside of his foot during a game and because of his fatigue levels, he was unable to correctly control the actions and proprioception of his knee. Since the lateral meniscus is more mobile and shifts on the tibial plateau through flexion and extension with the lateral femoral condyle, the extension of this action caused a mechanical tear in the lateral meniscus. The athlete continued to play on his injury for the rest of the game so it is unclear to how severe the tear was from the initial mechanism of injury and if the athlete could have injured the meniscus further during completion of the game.

Radiographic Findings: The athlete had an MRI scheduled . The MRI was used to take an image of the athletes involved knee. Upon examination of the MRI, it was found that the athlete had a tear of his lateral meniscus. No involvement of other ligaments were found with this injury. An x-ray shows no bone deformities in the involved knee.

Clinical Evaluation: Athlete reported of his left knee giving out on him periodically with a noticeable clunking feeling during active motion. Athlete had moderate diffuse anterior swelling. Athlete was tender to palpation on the lateral joint line at 90 degrees. Strength in the left knee was 4/5 in flexion and extension when compared bilaterally. Positive special tests include McMurray's meniscus test, Apley's Compression test and Thessaly's meniscus test.



Rehabilitation and Results

When creating a rehabilitation program after meniscus repair, there are a few things a clinician must consider. A clinician must consider the pre-injury status before the surgery. For instance, an elite level soccer athlete may have a more aggressive rehabilitation process due to their level of strength in the lower limbs, whereas a recreational athlete may have a more conservative rehabilitation process post-operation. Cavanaugh (2012) states that clinicians need to consider the axial alignment of the patients when creating a rehabilitation plan. Patients with varus or valgus deformities may need to take a more conservative approach to their rehabilitation because of the different compression loading in their respective compartments. Fortunately, the athlete in this case does not have any varus or valgus deformity. The clinician must create a safe environment while the athlete is doing their rehabilitation, must be aggressive with their rehabilitation without hurting the athlete by maintaining the safe environment, must follow a functional progression, which involves and order sequence of activities that require acquisition or reacquisition of skills required for return to activity. The clinician must also follow the evidence-based guidelines. One of the most important aspects to rehabilitation is providing clear communication with the rehabilitation team and with the athlete. This is to establish all pre-cautions, goals, progressions and limitations to the rehabilitation program. According to Spang (2018), accelerated rehabilitation protocols have been advocated by many investigators. These protocols have slightly different timelines in functional and therapeutic progression. Patients have returned to play in four months post-operation compared to six months post-operation with no difference in healing rates after second-look arthroscopy.

Based on evidence-based guidelines, phase I guidelines post-operation includes week 0-6. The goals of this phase includes emphasis on full passive extension, control post-operative pain and swelling in the tibio-femoral joint, zero to ninety degrees of flexion, and regaining quadriceps control. A large aspect to this phase include pain management and overall comfort of the athlete. Bizzini (2018) states, in isolated meniscal repair, it has been advised that the athlete maintains partial weight bearing for four to six weeks while using a brace. Some precautions of this phase include; avoiding active flexion of the tibio-femoral joint, and lastly the athlete should avoid prolonged standing or walking.

Phase II guidelines of post-operation includes weeks 6-14. The goals of this phase include restoration of full active range of motion. The athlete should have normal, non-antalgic gait. The athlete should be able to ascend and descend 8 inch stairs with good leg control and no pain associated with the motion. The athlete should have improvements of activities of daily living with increased endurance. The athlete should improve in flexibility in the lower extremity. The precautions of this phase include avoiding descending stairs reciprocally until adequate quadriceps control and lower extremity alignment. The athlete should avoid pain with therapeutic exercises and functional activities. The athlete should avoid running and sport activity.

Phase III guidelines of post-operation includes weeks 14-22. The goals of this phase include demonstration of ability to run pain free. The athlete should maximize strength and flexibility. The athlete's hop test, a series of tests used to judge functional progression for return to play, should be greater than 85% of strength bilaterally. Isokinetic testing should be greater than 85% strength bilaterally. The athlete should have lack of apprehension of sport specific movements. The athlete should have independence with gym program with maintenance and progression. Precautions of this phase include; avoid pain during therapeutic exercises and functional activity. Avoid sport specific activities until adequate strength development and medical doctor clearance.

The athlete for this case is currently twenty-four weeks post-operation. The athlete is behind schedule due to regression in some functional activities during phase II of his rehabilitation protocol. This regression was due to non-compliance of the protocol. This athlete participated in a soccer practice and afterward reported increased pain levels and mechanical clunking in the involved tibio-femoral joint. The athlete was regressed to prioritize pain levels. The athlete is currently in a return to running protocol and will begin sport specific exercises at week twenty-five of his rehabilitation protocol.

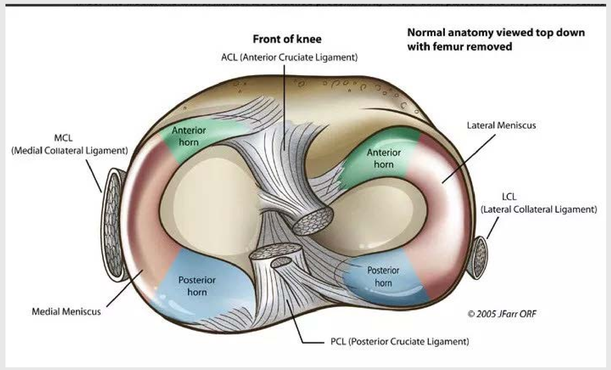


Figure 3a Figure 3b

Discussion and Summary

In summary, the meniscus is a vital structure within the tibio-femoral joint. It plays an important role is dispersing shock, providing a larger articulating surface, increasing load transmission, and providing nutrients inside the joint capsule. The rehabilitation process usually takes four to six months post-operation to fully return to play depending on the type of rehabilitation. Evidence based practice states that there should be three phases of rehabilitation each with progressive goals and precautions. In this particular case, the athlete is taking slightly longer due to implication with his compliance. Other than that aspect, he is progressing along with his protocol extremely well and should be back to sport activity within six to seven months post-operation.

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