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Post-surgical Rehabilitation for the Anterior Cruciate Ligament

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Hypothesis

We hypothesize that this post-surgical anterior cruciate ligament (ACL) rehabilitation protocol can help increase the strength of the surrounding musculature using proprioceptive techniques to help decrease the likely hood of reoccurrence.

Introduction

Soccer is one of the most popular sports world wide. Soccer related injuries are found to occur within 10 to 35 per 1000 hours in a adult males.¹ 60-80% of the injuries that occur are lower extremity. Most commonly the knee, at 29%.¹ ACL injuries occur when there is a forward translation of the tibia from the femur. Typically, the ACL requires surgical intervention, especially with the younger population that is involved in soccer. ACL surgery typically consists of two options; you can replace your ACL with a cadaver (allograft), or you can use a tissue graft. If you choose to do a tissue graft they often take from the patellar tendon, hamstring tendons, or the quadriceps tendon. Predisposed anatomical factors that can increase an athletes likely hood of tearing their ACL are lack of muscle strength, laxity, large q-angle, and a narrow intercondylar notch.² External factors that predispose an athlete for tearing their ACL are inadequate shoes and training surface.²

Purpose

The purpose of this project was to construct a rehabilitation protocol using therapeutic exercises carried out to return to play. The protocol was for a soccer player in the college setting who has sustained a torn ACL. The sources that we use include databases from EBSCO, physiopeia, hindawi and google scholar. ACL injuries are common in soccer players. It is important that the sports medical field has a good understanding on how to preform a rehabilitation protocol for athletes that are recovering from ACL reconstruction. Injuries to the ACL can occur with direct contact or non-contact. A cut-or-plant movement is typically the mechanism that causes an ACL tear. A description of the treatment strategy can include therapeutic exercises such as; passive range of motion (PROM) machine, range of motion exercises, strength exercises, massage and proprioception exercises. These exercise are effective because they will stabilize the surrounding musculature which will decrease the reoccurrence of an ACL injury.

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<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2953314/>

Figure 1. Towel Stretching to Increase Range Of Motion


http://accessphysiotherapy.mhmedical.com/data/books/960/hoo002_fig_11-11.gif

Figure 2. Terminal Knee Extensions With Surgical Tubing


<https://i.ytimg.com/vi/WvV9ZZXrCjk/maxresdefault.jpg>

Figure 3. Bosu Ball with Sport Specific Drill

Exercise Protocol

When working with post-surgical ACL athletes it is important to evaluate their full range of motion. It is also important to note at what degree causes the athlete pain. The exercises should be completed in a pain free range of motion (ROM). The exercises that were provided are meant to help with strength and neuromuscular control.³ Incorporating modalities such as thermotherapy or cryotherapy can help decrease the pain the athlete could experience during the exercises.³

Results

After surgery ROM is an important part of the rehab process. The athlete should be doing flexion and extension exercises about four times per day. Knee extension exercises could be a heel prop, a towel stretch (figure 1) or active hyperextension. Knee flexion exercises could be active or active-assisted heel slides. The only limitation on returning to full ROM should be athlete tolerance.⁴ In figure 1, the athlete is performing a towel stretch. This will help reestablish ROM.

Weeks six-nine post surgery usually consist of cardio exercises and open and closed kinetic chain exercises. The goal is for the athlete to retain ROM of 0-130 degrees.² Closed kinetic chain (CKC) exercises help improve proprioception, place functional stresses and compressive forces on the knee, and helps improve stability. CKC are used more often than open kinetic chain (OKC) in ACL rehab. Although, athletes treated primarily with CKC have trouble in gaining sufficient muscle torque for return to play (RTP) activity in six months.² OKC exercise provide a shear force across the joint which is not always ideal for rehab. A combination of CKC and OKC is best for maximal training effect.² In figure 2, the athlete is preforming a terminal knee extension with surgical tubing. This is an example of an CKC exercise. In this exercise, the greatest anterior tibial translation occurs between 0-30 degrees of flexion. Performed in 0-30 degrees of flexion minimizes knee flexion movement, which reduces tibial anterior shear force. Once the athlete is comfortable and pain free with exercises the clinician can make the exercises harder by changing the surface or making the athlete close their eyes. Not only would this make it more difficult, it would also help improve proprioception.

During the end phase of rehab, the athlete could perform single leg maneuvers in dynamic movements along with reaction to and decision making in unexpected situations.⁵ This helps the athlete work on foot position and pay more attention to playing surface. Another component that dynamic movements enhance is neuromuscular components such as fatigue, proprioception, muscle activation and inter-joint coordination.⁵ In this case, we would have the athlete stand on a Bosu ball, like in figure 3, on the affected leg while they pass the ball back with the uninvolved leg. This helps the athlete work on knee stability and proprioception while getting some sport specific work in to help the athletes RTP.

Conclusions

It is felt that if the exercises were used for ACL rehabilitation, the likely hood of a reoccurring injury is diminished. The protocol will increase the athletes strength to the surrounding musculature, and will decrease the athletes chances of re-injuring their ACL. The literature suggest that with a training program that incorporates proprioceptive training the number of ACL injuries in soccer will decrease.⁶ The exercise that were provided are easily used in a home exercise program. This will allow the athlete to perform their exercises at home making it more convenient.