Rehabilitation of Persistent Quadriceps Muscle Weakness in a Female Collegiate Basketball Player Post-ACL Reconstruction: A Case Report

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**Background:** A 21 year old, female, division II basketball player suffered an anterior cruciate ligament (ACL) rupture and a lateral meniscus tear on October 26, 2013. The athlete underwent ACL reconstruction with a patellar tendon autograft December 10, 2013. The athlete completed a standardized ACL rehabilitation protocol throughout 2013-2014 season and had minimal complications with post-surgical patellar tendinitis, possibly due to graft site harvesting. Isokinetic testing on 9/23/2014 revealed a 21% quadriceps deficit of the involved compared to the uninvolved. Accordingly, a more vigorous rehabilitation program was implemented focusing on quadriceps strength. The athlete was then isokinetic tested again three weeks later revealing a 33% deficit of quadriceps strength. Despite the significant quadriceps deficit, she was cleared by the team physician for full return to play on October 16, 2014. The athlete suffered from visible atrophy, persistent knee pain, and quadriceps strength deficits of her affected knee eleven months postoperative. **Differential Diagnosis:** Iatrogenic patellar tendinitis, cartilage degeneration, chondromalacia, arthrogenic muscle inhibition. **Treatment:** Traditional rehabilitation protocols and exercises were not showing the necessary gains in quadriceps strength. Therefore, it was decided to treat the athlete with cryotherapy combined with traditional strengthening. For six weeks the athlete immersed her affected leg into a cold whirlpool set at 50 degrees for about 15 minutes (or until numbness occurred) prior to rehabilitation. Ice bags were then placed on the anterior and posterior aspect of her affected knee throughout rehabilitation, which included some quadriceps strengthening exercises from her traditional strength training and rehabilitation protocol (e.g., single leg knee extension, single leg lunges, squats). Three days per week, the athlete performed five sets of eight repetitions for each exercise at a high load with two minutes of rest between each set. The athlete was retested isokinetically after performing the new cryotherapy in conjunction with rehabilitation protocol on December 8th 2014. The results revealed a 12% deficit in quadriceps strength, an improvement of 21%. The athlete reported improvements in symptoms and function. She was instructed to resume normal strength training and a maintenance protocol over the summer. Upon return for the Fall 2015 season, she was 22 months postoperative with a 0% deficit and denies any symptoms or dysfunction. **Uniqueness:** Despite completion of aggressive rehabilitation protocols, this athlete had quadriceps weakness that persisted one year post reconstruction and resulted in relatively poor patient reported outcomes. Many athletes will have difficulty breaking through certain rehabilitation progressions and certain strengthening exercises with an unknown reason. Several postoperative ACL cases have persistent quadriceps deficits as a result of arthrogenic muscle inhibition (AMI). AMI is a reflex response to damaged joint structures that decrease motor unit recruitment resulting in strength deficits in the surrounding musculature. Using cryotherapy in conjunction with exercise can cause disinhibition and provide a time period where there is increased quadriceps motor neuron recruitment, helping to facilitate strength gains. **Conclusion:** AMI may be a cause of significant quadriceps strength deficits in athletes many months or years postoperative ACL. As an athletic trainer using cryotherapy in conjunction with exercise may be a rehabilitation protocol that could be very beneficial in addressing AMI. **Relevant Evidence:** AMI is an ongoing reflex response to an injured joint. This reflex can affect the sensory information from joint mechanoreceptors and decrease motor unit recruitment and input to the quadriceps muscle. This causes the quadriceps to be unable to completely activate. Cryotherapy application to the injured joint provides a time period in which there is a quadriceps motor neuron pool “distribution” which can allow more motor unit recruitment. This can enhance muscle function, strength, and help to break through rehabilitation plateaus. **Word count:** 597