Recent advances in the rehabilitation of anterior cruciate ligament injuries

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Approximately 200,000 ACL injuries occur annually in the United States, leading to nearly 100,000 ACL reconstruction surgeries. In regards to rehabilitation, surgical procedures are a main aspect of a successful outcome. However, a well designed rehabilitation program is a vital and key component to return to prior level of function. Current rehabilitation programs are now focused around a more aggressive approach than previously used. Programs have more emphasis on achieving full knee extension, immediate motion, immediate partial weight bearing status and functional exercises. Previous studies have reported improved clinical outcomes following an accelerated approach, showing better strength, range of motion, with fewer complications and fewer patellofemoral complaints and earlier return to sport.

The rehabilitation process should be started before surgery when possible. With a goal of reducing swelling, inflammation and pain, with emphasize on restoring normal range, normalizing gait and preventing muscle atrophy. It has been shown that those who participated in preoperative rehabilitation programs progressed more easily throughout post operative programs, particularly with regaining initial range. Key principles of ACL rehabilitation to ensure satisfactory outcomes include regaining full passive knee extension, restore patellar mobility, restore postoperative inflammation, regaining range of motion, re-establishing voluntary quadriceps control, restoring neuromuscular control and progressing to sport specific training.

The most common complication and cause of poorer outcomes following ACL reconstruction is due to loss of motion, particularly loss of terminal knee extension. Low-load long duration stretching for 15 minute sessions 4 times a day, or a total of 60 minutes a day has been proven to be beneficial in regaining range. Focusing on restoring patellar mobility is essential, a loss can lead to range of motion deficits and impaired quadriceps contraction. It is also thought that pain may play a role in inhibition of muscle activity. A recent study examined quadriceps activity in acutely swollen and painful knees by using local anesthesia. The control group had significant post operative pain and quadriceps inhibition (30-76%), while the treatment group had minimal pain and mild quadriceps inhibition (5-31%). Another study focused on effect of joint effusion on muscle activation. The threshold for inhibition of vastus medialis was found to be 20-30ml, and 50-60mL for rectus femoris and vastus lateralis inhibition. Recent studies have shown that using neuromuscular electrical stimulation in addition to exercises is most beneficial in re-establishing voluntary quadriceps control, compared to exercise alone.

Early on in the rehabilitation program it is also essential to restore neuromuscular control with proprioceptive training. In addition to exercise, the use of elastic bandage after surgery has a positive impact on proprioceptive and joint position sense. When addressing strengthening exercises, patients performing predominantly CKC weight bearing exercises tend to have less knee pain, more stability and more satisfaction with end results, with quicker return to sport. Initially performing squat training in approximately 25-30 degrees, allowing for the greatest amount of hamstring and quadriceps cocontraction. Studies have also been done to examine the efficacy of perturbation training and there have been more satisfactory outcomes and lower frequency of subsequent “giving-way” episodes. Last principle involves restoration of function throughout sport specific training for athletes. Gradual return to athletic competition occurs around 6 months after patient demonstrates at least 85% contralateral strength in quadriceps and hamstrings. Final goal is to restore full, unrestricted function and assist patient to return to 100% of preinjury level while achieving excellent long-term outcomes.

