

Annotated Bibliography

Gerber JP, Marcus RL, Dibble LE, Greis PE, Burks RT, LaStayo PC. Effects of early progressive eccentric exercise on muscle structure after anterior cruciate ligament reconstruction. *J Bone Joint Surg Am.* 2007;89:559-70.

Does early eccentric exercise in post ACL reconstruction patients increase quadriceps strength greater than regular rehabilitation protocol? The problem is post ACL reconstruction patients usually have deficits in strength of the quadriceps, which are essential to lower extremity function. The purpose is to find the best strengthening method for the quadriceps in post ACL reconstruction patients. Patients included in the study had been diagnosed with an ACL rupture at the University Sports Medicine Center between January 2004-June 2005 and were between the ages of 18-50. 2 surgeons performed all the reconstructions use either a bone-patella tendon-bone graft or a semitendinosis-gracilis graft. Patients were matched by age, graft type, and sex, then randomly assigned to the eccentric or normal rehabilitation group by coin flip. For the first 3 weeks all patients completed exercises to increase ROM, decrease swelling, and increase quadriceps function. For the next 12 weeks the eccentric group performed eccentric exercise on an eccentric ergometer. The control group used a concentric ergometer for the next 12 weeks of rehabilitation. Magnetic Resonance Imaging was taken at 3 weeks post ACL reconstruction and at 15 weeks following the strengthening protocol to determine cross sectional area. 40 patients started and finished the program with 20 in each group. A significant increase in quadriceps and gluteus maximus muscle volume and cross sectional area for both groups, but there was also a significant increase in volume and CSA for the eccentric group when compared to the standard group. A significant increase in volume and CSA was not seen in the hamstrings or the gracilis. No significant difference was seen in the KT-1000, hamstring strength index, knee outcome survey, Lysholm scale between groups. There was a significant difference in quadriceps strength index and hop index in favor of the eccentric group.

The article is therapeutic and has an AAOS level of evidence of 1. It is a high quality randomized trial with a 100% follow up and had blinding of the surgeons who performed the ACL surgery, because neither surgeon knew which group each patient would be placed in. The groups were randomized properly as each group had similar variables since people and types of grafts were matched and then randomized by a coin flip.

The bottom line is that eccentric exercise is the best exercise for increasing strength, volume and CSA of the quadriceps and gluteus maximus in post ACL reconstruction patients who often have deficits in strength following reconstruction. Athletic trainers should incorporate eccentric training in their ACL patients rehabilitation to strengthen the quadriceps and gluteus maximus, but it does not increase the hamstrings, so other exercises need to be used for hamstring strength. The patient needs to know that hamstring strength is needed to support the ACL graft, so eccentric training is not the cure all for rehabilitation even though it should be used for increasing quadriceps strength.