Neuromuscular training optimises knee function after arthroscopic ACL reconstruction

Synopsis


Question: Does neuromuscular training improve knee function more than traditional strength training following anterior cruciate ligament (ACL) reconstruction? Design: Randomised controlled trial. Setting: Two outpatient rehabilitation clinics in Norway. Patients: 74 adults aged between 16 and 40 years (mean: 28 years), scheduled for arthroscopic reconstruction of the ACL using an autogenous bone-patellar tendon-bone graft. Exclusion criteria included age of ACL injury more than 3 years, meniscal damage requiring repair, or previous injury or surgery to either knee. Participants were allocated to one of two rehabilitation programs using concealed allocation. Interventions: A 6-month rehabilitation program was commenced during the second week after surgery following a home program to restore knee range of movement and reduce swelling. Exercises were supervised by physiotherapists during clinic visits twice per week. Knee braces were not used at any time. The neuromuscular training group performed balance exercises, plyometric exercises, agility drills, and sport-specific exercises. The strength training group performed mainly strengthening exercises of the lower extremity (quadriceps femoris, hamstring, gluteus medius, and gastrocnemius muscles) based on the American College of Sports Medicine guidelines. Outcomes: Participants were assessed preoperatively and at 3 and 6 months postoperatively. The primary outcome measure was the Cincinnati Knee Score (CKS) which has a scale of 0 to 100 (100 = normal knee). Secondary outcome measures included pain intensity (100 mm VAS where 0 = no pain, 100 = worst imaginable pain), global knee function (100 mm VAS where 0 = worst possible knee function, 100 = pre-injury knee function), isokinetic muscle strength, the 36-Item Short-Form Health Survey, hop tests, proprioception, and balance tests. The outcomes assessor was unaware of treatment allocation. Results: 89% of participants underwent the 6-month assessment. At this time the CKS score was higher in the neuromuscular training group compared with the strength training group by 7 points (95% CI 2 to 13). Similarly, global knee function VAS scores at 6 months were higher in the neuromuscular training group by 13 mm (95% CI 2 to 24). The groups did not differ significantly on the pain VAS or other outcomes. Adherence to the rehabilitation program was higher in the strength training group (91% adherent) compared with the neuromuscular program (71%). Conclusion: Neuromuscular rehabilitation results in superior knee function at 6 months after ACL reconstruction compared with standard strength training.

Commentary

ACL injuries are common with an annual incidence of about 1 per 1000 inhabitants aged 10 to 64 years (Frobell 2007). Training is normally included in the treatment after injury or reconstruction of the ACL.

Previously, training programs focused mainly on restoration of muscle strength. In the 1990s, the sensory function of ligaments in relation to functional joint stability was recognised as important in training (Johansson 1991). Therefore, training programs including exercises that facilitate compensatory functional joint stabilisation have been advocated. However, there is a lack of studies evaluating the effects of neuromuscular training compared with more traditional training programs (Risberg 2004).

In this well-conducted RCT, the neuromuscular training (NT) group perceived better knee function compared with the traditional strength training (ST) group. However, there were no differences between the groups in observed knee function (hop tests, knee muscle strength, balance, proprioception). There were some similarities between the training programs, which may explain the few and small differences between the groups. The ST group performed mainly strengthening exercises for the lower extremity muscles, but also exercises that are included in neuromuscular training, such as core stability, balance, and functional exercises, where the quality of the performance of movements is emphasised (eg, accurate position of the knee in relation to adjacent joints). Another reason may be that too few patients were included to detect differences between groups. An interesting finding is that the ST group did not achieve better muscle strength than the NT group. This has also been reported by others (Zätterström 1992). Thus, training isolated muscles selectively may not be needed.

This study gives further support to the use of neuromuscular training after ACL injury.

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References