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Comparison of Blood Flow Restriction Training Rehabilitation and General Rehabilitation Exercise after Anterior Cruciate Ligament Reconstruction: a Meta-Analysis of Randomized Controlled Trials

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Faculty Disclosure Information

- Nothing to disclosure

Anterior cruciate ligament (ACL) injury can result in prolonged quadriceps femoris atrophy and weakness even after ACL reconstruction and a comprehensive and progressive general rehabilitation exercise (GRE) protocol.

Objective: A novel rehabilitation protocol including blood flow restriction training (BFRT) has been proposed to mitigate post-operative atrophy and weakness by creating a low-oxygen environment in muscles in turn promoting muscle hypertrophy and enhancing strength. The clinical benefit of BFRT as compared to GRE alone remains uncertain. This study aimed to compare the effects of BFRT and GRE on ACL reconstruction rehabilitation through a meta-analysis of randomized controlled trials.

Methods: Several databases including PubMed, Web of Science, EMBASE, MEDLINE, Elsevier, and Biosis were queried for randomized controlled trials comparing BFRT and GRE following ACL reconstruction. Outcomes included muscle strength, Lysholm score, the International Knee Documentation Committee (IKDC) score, extensor muscle torque, muscle cross-sectional area (CSA), range of motion (ROM), pain, Y-balance, and the Patient-Reported Outcomes Measurement Information System (PROMIS).

Results: Thirteen randomized controlled trials involving 376 participants were included. The change in muscle strength (Mean difference, MD: 12.96, 95% confidence interval, 95%CI: 7.02 to 18.91, heterogeneity, I2=39%), Lysholm score (MD: 9.41, 95%CI: 8.93 to 9.88, I2=40%), and IKDC score (MD: 9.88, 95%CI: 0.57 to 19.19, I2=87%) of the BFRT group were superior to that of the GRE group at the time of last follow-up. However, no significant difference was found between the BFRT and the GRE groups regarding the change in muscle CSA, ROM, extensor muscle torque, pain score, Y-balance, and PROMIS.

Conclusion: Rehabilitation including BFRT can significantly improve muscle strength, Lysholm score, and IKDC score compared to GRE following ACL reconstruction. However, BFRT and GRE produce similar changes in muscle CSA, ROM, extensor muscle torque, pain, Y-balance, and PROMIS. Additional large-scale clinical trials are still needed to validate these results.