Quadriceps Strength Symmetry and Not Absolute Strength Predicts Movement Patterns During Drop Vertical Jumps After ACL Reconstruction

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Summary:
After undergoing ACL reconstruction, individuals have movement impairments related to re-injury risk. Identifying factors that impact these movement impairments is important for safe return to play. In this cohort, quadriceps strength symmetry was predictive of movement quality during a drop vertical jump whereas absolute quadriceps strength was not. Assessing bilateral quadriceps strength may pro

Data:
Objective: Anterior cruciate ligament reconstructions (ACLR) have increased in incidence year over year since 2002. The primary goal for many patients is returning to sport. Unfortunately, 30% of individuals have a second knee injury within 2 years of returning to sport, which has been associated with abnormal movement patterns. Monitoring between limb comparisons of strength is recommended to understand readiness for return to sport. It is unknown if absolute involved limb quadriceps strength may provide additional information to activity performance or re-injury risk. The purpose of this study was to examine the relationship between absolute quadriceps strength and interlimb ratios of quadriceps strength with performance of a bilateral drop vertical jump (DVJ) after ACLR. Methods: 51 individuals who were 9.9 ± 2.4 months post-ACLR, 49% female, 17.2 ± 2.7 years old, had a BMI of 24.6 ± 4.0 kg/m2 passed a clinic testing battery that included >90% limb symmetry during isometric quadriceps strength, 1-rep max from 90° to 0° of extension, and 4 single-legged hop tests, as well as >90% on the Global Rating Scale and IKDC 2000. Individuals then completed a laboratory assessment. Quadriceps strength was bilaterally assessed isometrically (90° of knee flexion) and isokinetically (60°/second) (Biodex System 4 Pro. Shirley, NY, USA). Peak isometric knee extension, isometric rate of torque development (RTD), and peak isokinetic knee extension were measured and normalized to body weight. Individuals then performed 5 instrumented bilateral DVJs. Kinematic (240 Hz) and kinetic (2160 Hz) data were collected using an 8-camera system (Qualysis, Goeteborg, Sweden) with two embedded force plates (Bertec Corp., Columbus, OH, USA). Peak external knee flexion moment (KFM) and peak vertical ground reaction force (vGFRF) during the first landing phase as well as peak knee extension power (KEP) during the propulsion phase during the first ground contact phase for each limb were calculated. Interlimb ratios (ILR, involved/uninvolved) were calculated for all strength and biomechanical variables. Three separate backwards stepwise linear regressions were used to identify strength predictors of DVJ biomechanical ILRs. Six strength indexes (ILRs and injured limb values normalized to mass) were entered as independent variables with a set to 0.05 a priori. Independent variables with a p-value <0.05 were removed from the model. Results: ILRs of KFM, KEP, and vGFRF were predicted by models including ILR of quadriceps strength but not with absolute strength values of the involved limb. A higher isokinetic quadriceps strength ILR predicted a higher KFM ILR during the landing phase of bilateral DVJ (R² = 0.120, p = 0.013). Both higher ILR of knee extension RTD and isokinetic strength predicted higher KEP ILR. (R² = 0.340, p < 0.001). Higher ILR of knee extension RTD predicted higher vGFRF ILR. (R² = 0.307, p < 0.001).

Conclusion: ILRs of quadriceps strength provide more insight into biomechanical symmetry during a bilateral DVJ than absolute strength values on the involved side. When deciding on return to sport readiness to minimize re-injury risk, having bilateral measurements may provide the medical team with information that will better predict biomechanical variables associated with re-injury.

Higher Return to Sport with Patellar Tendon Autograft Versus Hamstring Tendon Autograft Following Anterior Cruciate Ligament Reconstruction: Results from the New Zealand ACL Registry

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Summary:
The use of a BTB autograft in primary ACL reconstruction was associated with higher return to sport when compared to the hamstring tendon autograft.

Data
Introduction: Studies have reported a lower rate of graft failure but a higher rate of contralateral anterior cruciate ligament (ACL) injury in patients undergoing primary ACL reconstruction with a bone-patellar tendon-bone (BTB) autograft. Some clinicians may view subsequent contralateral injury as a marker of success of the BTB graft, but it is unclear whether the type of graft influences the rate of return to sport. The aim of this study was to compare the rate of return to weekly sport and the rate of return to preinjury activity levels between the BTB and hamstring tendon autografts following primary ACL reconstruction. Methods: Prospective data recorded in the New Zealand ACL Registry was analyzed. Primary ACL reconstructions performed between April 2014 and November 2019 were included to allow for a minimum follow-up of two years. Preinjury and post-operative Marx activity scores at 6-month, 1- and 2-year follow-up were collected by the Registry. The primary outcome was return to weekly sport, defined as a Marx activity score of 8, at 2-year follow-up. The secondary outcome was return to preinjury activity level, defined as a post-operative Marx activity score that was equal or greater to the patient’s preinjury Marx activity score. The rate of return to sport was compared between the BTB and hamstring tendon autografts via univariate Chi-Square test and multivariate binary logistic regression with adjustment for patient age, sex, time-to-surgery and preinjury activity levels. Odds ratios (OR) with 95% confidence intervals (CI) were computed. Results: A total of 4259 patients were analyzed, of which 50.3% were playing weekly sport in the BTB group and 28.4% had returned to their preinjury activity level (n = 1211) at 2-year follow-up. A higher rate of return to weekly sport was observed in patients with a BTB autograft compared to patients with a hamstring tendon autograft (58.7% versus 47.9%, adjusted OR = 1.23, 95% CI 1.05 – 1.44, p = 0.009). In addition, patients with a BTB autograft had a higher rate of return to preinjury activity levels compared to patients with a hamstring tendon autograft (31.5% versus 27.5%, adjusted OR = 1.21, 95% CI 1.03 – 1.44, p = 0.025). Male sex and younger age were patient factors that were associated with a higher rate of return to sport. Discussion and Conclusion: Patients with a BTB autograft had a higher rate of return to sport compared to patients with a hamstring tendon autograft at short-term follow-up. The higher return to sport may explain the higher rate of contralateral ACL injury in patients with a BTB autograft.