

Knee Muscle Strength Recovery in the Early Period After ACL Reconstruction

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Objectives: The aim of this study was to investigate quadriceps and hamstrings isometric strength at 4, 8 and 12 week time points following ACL Reconstruction (ACLR) and to document the strength changes of these muscles over time. The primary hypothesis was that there would be significant increases in quadriceps and hamstring muscle strengths between the 4th, 8th and 12th weeks following ACLR. The secondary hypothesis was that the quadriceps index would be higher than hamstring index at 12th week after ACLR.

Methods: Thirty patients (Mean \pm SD [age, 29.1 \pm 2.3yrs; weight, 77.3 \pm 13.2kg; height, 172.1 \pm 7.1cm; BMI, 21.2 \pm 3.5kg/m², time to surgery: 7.1 \pm 7.2 months]) who underwent ACLR with Hamstring Tendon Autograft (HTG) were enrolled in this study. The isometric strength of quadriceps and hamstring muscles was measured on an isokinetic dynamometer at 60° knee flexion angle at 4th, 8th and 12th weeks after surgery. The recovery of quadriceps and hamstring muscles strength following rehabilitation was expressed as a Quadriceps Index (QI) and Hamstring Index (HI) and calculated with the following formula: [(maximum voluntary isometric torque of the involved limb / maximum voluntary isometric torque by uninvolved limb) \times 100]. Torque output of the involved and uninvolved limbs and quadriceps and hamstring indexes were used for the statistical analysis. A repeated measures of ANOVA was used to determine the strength changes of quadriceps and hamstrings over time.

Results: Quadriceps and Hamstrings strengths significantly increased over time for both involved (Quadriceps: F (2,46)=58.3, p<0.001, Hamstring: F (2,46)=35.7, p<0.001) and uninvolved limb (Quadriceps: F(2,46)=17.9, p<0.001, Hamstring: F(2,46)=56.9, p=0.001). Quadriceps strength was higher at 12th week when compared to the 8 and 4 week time points for the involved limb (p<0.001), and it was higher at 8th week when compared to 4 week time point for the involved limb (p<0.001). For the uninvolved limb, quadriceps strength was also higher at 12th week when compared to the 8 (p=0.02) and 4 week time point (p<0.001), and higher at 8 week when compared to the 4 week time point (p=0.02). Hamstring strength was higher at 12 week when compared to the 8 and 4 week time points (p<0.001) and it was higher at 8 week when compared to 4 week time point for the involved limb (p<0.001). For the uninvolved limb hamstring strength was also higher at 12 week when compared to 4 week time point (p=0.01). There was no significant difference between the 4 and 8 week time points (p>0.05) or between the 8 and 12 week time points (p=0.07). Quadriceps and hamstring indexes significantly changed from 4th weeks (QI:57.9, HI:54.4) to 8th weeks (QI:78.8, HI:69.9) and from 8th weeks to 12th weeks (QI:82, HI:75.7) (p<0.001); however, there was no difference between indexes at the 12-week time point (p=0.17).

Conclusion: Isometric strength of quadriceps and hamstring muscles for the involved and uninvolved limb increased during the early period of ACLR. The results of this study could be a baseline for clinicians while prescribing a rehabilitation protocol for ACLR patients with HTG to better appreciate expected strength changes of the muscles in the early phase.

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