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Relationship Between Lower Extremity Muscle Architecture and Knee Strength in Anterior Cruciate Ligament Reconstructed Males

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INTRODUCTION:
There is a known deficit in the structural and functional properties of knee-related muscles in individuals who undergo anterior cruciate ligament reconstruction. However, there is insufficient evidence regarding the relationships between these properties. The objective of this study was to investigate the correlation between the architectural features of the six lower extremity muscles and the strength of the knee flexor and extensor muscles in patients who had undergone anterior cruciate ligament reconstruction using hamstring autograft.
METHODS:
The study included 33 male participants (age: 24.06±4.37 years, height: 175.55±6.43 cm, weight: 77.88±10.81 kg, time after reconstruction: 14.55±6.21 months). Ultrasonography was used to assess the architectural characteristics of the vastus lateralis (VL), rectus femoris (RF), tibialis anterior (TA), biceps femoris longus (BFL), gastrocnemius medialis (GM), and gastrocnemius lateralis (GL). Muscle strength for knee flexion and extension was evaluated using an Isomed 2000 isokinetic dynamometer in concentric mode at 60 and 180°/s. All assessments were conducted on both the injured and uninjured limbs. The data was analyzed using Pearson and Spearman tests in the SPSS program.
RESULTS:
On the injured limb, a significant relationship was found between the VL thickness and peak torque extension at 60°/s (r=0.387; p=0.046). Similarly, there were significant relationships between GM thickness and peak torque extension (r=0.430; p=0.016), peak work extension (r=0.486; p=0.006), peak torque flexion/extension (r=-0.418; p=0.019), peak work flexion/extension (r=-0.457; p=0.010), peak work extension/weight (r=0.360, p=0.047) and total work extension (r=0.437, p=0.014). There was no significant relationship between muscle architectural characteristics and muscle strength parameters at 180°/s (p>0.05). According to the analysis of the differences between the limbs, there was a significant relationship between peak work flexion/extension at 60°/s and thickness of the RF and BFL (r=-0.414, p=0.036; r=-0.406, p=0.026, respectively). There was a significant relationship between GM thickness and peak torque flexion/extension at 60 and 180°/s (r=-0.381, p=0.034; r=-0.411, p=0.022, respectively). Similarly, there were significant relationships between TA thickness and peak torque flexion/extension (r=-0.514, p=0.005; r=-0.585, p=0.001, respectively) and peak work flexion/extension (r=-0.484, p=0.009; r=-0.554, p=0.002, respectively) at 60 and 180°/s.
CONCLUSION:
The muscle strengths of the knee flexors and extensors in anterior cruciate ligament reconstructed males are related to the architectural characteristics of these muscle groups, as well as the GM and TA. Therefore, post-operative rehabilitation should take a holistic approach to the muscles of the lower extremity.

Topic: **Sports Medicine and Orthopedics**

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