Harvest of the Ipsilateral Hamstrings Does Not Result in Tibial Internal Rotation Strength and Endurance Insufficiencies for Patients 12 to 36 Months Post-Anterior Cruciate Ligament Reconstruction

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Introduction: Ipsilateral hamstrings tendons harvest as a primary autograft for anterior cruciate ligament (ACL) reconstruction has become increasingly prevalent among orthopaedic surgeons. Though, limited evidence exists detailing ensuing knee joint performance capacity. Previous authors have reported that ipsilateral semitendinosus and gracilis (STG) harvest results in significant tibial internal rotation strength deficiencies for related patients (1,2). However, prior data in regards to this measure have been reported as absolute as opposed to relative indices of strength and have not produced endurance results. Therefore, our objective was to profile relative tibial internal rotation strength and endurance responses to STG harvest in ACL reconstructed patients 12 to 36 months following surgery. Based on prior research findings, we hypothesized STG harvest would elicit tibial internal rotation strength and endurance deficits.

Methods: A retrospective cohort (level 2b evidence) posttest-only control group true experimental design was implemented for this research study, which was conducted in a controlled laboratory setting. The independent variable was the operative technique. Dependent variables were peak moment and total work, normalized to body mass, as well as time to peak moment. Fifteen (1 man, 14 women) physically active patients (age = 21.2 ± 2.6 years, height = 1.7 ± 0.1 m, mass = 68.7 ± 12.6 kg, Tegner Level = 6.9 ± 1.6) 27.5 ± 10.9 months post-surgery were matched to 15 (1 man, 14 women) healthy matched control participants (age = 21 ± 1.1 years, height = 1.6 ± 0.1 m, mass = 67.4 ± 10.3 kg, Tegner Level = 6.3 ± 1.3). Isokinetic strength and endurance were assessed at 60 °/s and 240 °/s respectively using the Biodex System 2 dynamometer (Biodex Medical Inc., Shirley, NY, USA) per manufacturer specifications. Measurement of strength was based upon three maximal reciprocal repetitions of tibial internal and external rotation. Endurance measures were based upon completing as many tibial internal and external rotation reciprocal repetitions as possible in a 45 s time period. Means and standard deviations were calculated as descriptive statistics. Normal probability plots were computed to determine data met assumptions for t-test analyses. One-tail dependent and independent t-tests were calculated to determine within patient and between participant differences respectively. Statistical significance was denoted by $P \leq 0.05$ a priori.

Results: All data were normally distributed. Patients demonstrated no significant tibial internal rotation strength and endurance differences when comparing the involved to uninvolved leg as well as when comparing the involved to healthy matched control leg. Descriptive and inferential statistics are exhibited in Table 1.

Table 1. Tibial Internal Rotation Strength and Endurance Comparisons

Within Group			
Strength Measures	**Involved**	**Uninvolved**	***P*-value**
Peak Moment (Nm/kg)	0.24 ± 0.08	0.25 ± 0.08	0.229
Time to Peak Moment (s)	0.38 ± 0.06	0.44 ± 0.15	0.059
Endurance Measure			
Total Work (J/kg)	3.63 ± 1.30	3.79 ± 1.42	0.298

Between Group			
Strength Measures	**Involved**	**Matched**	***P*-value**
Peak Moment (Nm/kg)	0.24 ± 0.08	0.23 ± 0.06	0.629
Time to Peak Moment (s)	0.38 ± 0.06	0.38 ± 0.16	0.430
Endurance Measure			
Total Work (J/kg)	3.63 ± 1.30	4.09 ± 1.29	0.169

Discussion: Our findings indicate STG harvest does not decrease tibial internal rotation strength and endurance output. These results contrast those of previous findings reported as absolute (1,2) and relative (3) measures. Differences between our and prior findings may be attributed to preceding authors (1,2) omitting data normalization techniques for isokinetic indices and variations in testing protocols. Our protocol tested participants in 60 ° of knee flexion as opposed to 90 ° (1,2,3). Thus, the influence of hamstrings muscle length-tension relationships may underpin these phenomena. Continued research is warranted to determine the implications of tibial internal rotation strength and endurance for knee joint performance capacity in STG ACL reconstructed patients.

References:

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