

DIFFERENCES IN ACL RECONSTRUCTION TECHNIQUES: EMG STUDIE

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INTRODUCTION

Current methods of ACL reconstruction replace the ligament with a graft - two most commonly used types are patellar tendon and hamstring tendon graft. The objective of our study was to determine differences in knee biomechanics with respect to the used graft thus allowing more informed choice of reconstruction type.

METHODS

SEMG signals were recorded (according to SENIAM protocol) on muscles rectus femoris, vastus medialis, vastus lateralis and biceps femoris while subjects were performing one-legged vertical jump test. Vertical jump test was divided into five phases: stand in place (1-16%), take-off (17-45%), flight (46-51%), landing 1 (52-61%) and landing 2 (62-100%).

Subjects were divided in three groups: patellar tendon reconstruction patients (PAT), hamstring tendon reconstruction patients (STG) and a group of healthy individuals.

The SEMG signals were recorded prior to reconstruction, one and two years after the reconstruction. Recorded signals were analyzed in the following way: filtered to remove noise and artifact, envelopes were calculated (both individual and group) and activation levels were determined.

RESULTS AND DISCUSSION

The results show that m. biceps femoris is more active in all groups (prolonged preparation for movement and stabilization after landing), two years after reconstruction both groups show difference in movement pattern when compared to healthy subjects, two years after the reconstruction hamstring tendon group shows smaller differences and finally one year after the reconstruction hamstring tendon group shows bigger differences when compared to healthy subjects (it can be assumed that rehabilitation of m. semitendinosus and m. gracilis – where graft was removed from - was inadequate – m. biceps femoris took part of their function - this could lead to repeated ACL tear). Also, the results have shown that the m. biceps femoris is activated in almost all phases above 30% activation of healthy group in STG group (Table 1 and Figure 1).

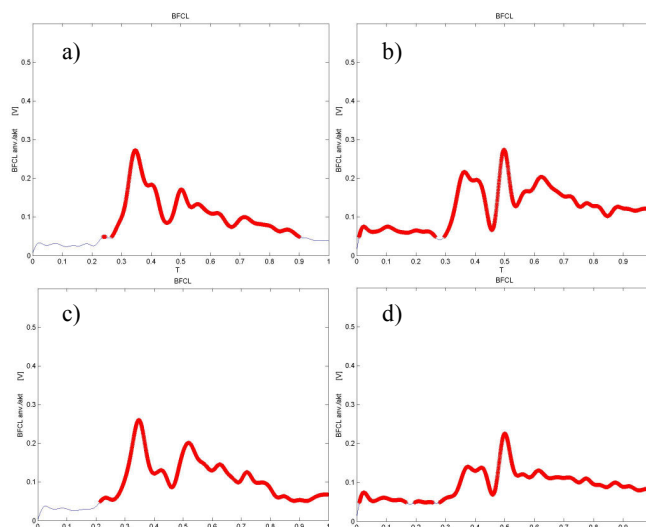


Figure 1: SEMG of m. biceps femoris over 30% of maximum values of healthy group. Muscular activity of group PAT after one (a) and two (c) years after reconstruction and activity of group STG after one (b) and two (d) years after reconstruction.

CONCLUSIONS

For this reason, the conclusion can be that hamstring tendon graft is more suitable for our subjects but additional attention is needed during rehabilitation due to increased risk of recurring injury.

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Table 1: Percentage of phase in which is muscles activation of biceps femoris above 30% maximum value of healthy group.

Time period after reconstruction		Percentage of phase (%)				
		1. stand in place	2. take-off	3. flight	4. landing 1	5. landing 2
PAT	one year	0	66	100	100	75
	two year	0	81	100	100	100
STG	one year	95	90	100	100	100
	two year	94	83	100	100	100