Regeneration of hamstring tendons after ACL-reconstruction

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Introduction

Hamstring tendons are frequently used as autograft for anterior cruciate ligament reconstruction (ACLR). In 1982 Lipscomb et al. reported about hamstring muscle strength after ACLR using autograft hamstring tendons.[1] Regeneration of hamstring tendons after ACLR was first described by Cross et al. in 1992.[2] Later, several mostly retrospective studies have been published regarding regeneration of hamstring tendons or recovery of muscle strength after ACLR. A **prospective** MRI study, **comparing patients with and without tendon regeneration** in regard to isokinetic muscle strength, has only been performed by Eriksson et al.[3] They used a single hamstring tendon (semitendinosus) for ACLR. To our knowledge, no such study has been performed after harvest of **both semitendinosus and gracilis tendons** for ACLR.

Study objectives

1. **Analysis of hamstring tendon regeneration after ACLR using both semitendinosus (ST) and gracilis (G) tendons**
2. **Analysis of isokinetic muscle strength in relation to hamstring regeneration**

Methods

22 patients scheduled for ACLR underwent prospective MRI analysis of both legs preoperatively as well as at 2 weeks, 6 and 12 months postoperatively. MRI parameters were tendon regeneration and morphology, muscle retraction and muscle cross sectional area. A double blind, prospective analysis of isokinetic quadriceps and hamstrings strength was performed at 6 and 12 months postoperatively.

Results

Regeneration

All 22 patients demonstrated hamstring regeneration after harvest for ACLR:

- 14 patients (64%) both ST and G tendons
- 8 patients (36%) one tendon regenerated (all G tendon)

Cross sectional area

ST muscle cross sectional area of the operated leg at 12 months:

- 32% decrease compared to preoperatively (8.25 (±3.00) cm^2 vs. 12.19 (±3.25) cm^2, p<0.01)
- 41% decrease compared to the contralateral ST muscle (8.25 (±3.00) cm^2 vs. 14.01 (±4.07) cm^2, p<0.01)

G muscle cross sectional area of the operated leg at 12 months:

- 26% decrease compared to preoperatively (3.62 (±1.24) cm^2 vs. 4.91 (±1.17) cm^2, p<0.01)
- 29% decrease compared to the contralateral G muscle (3.62 (±1.24) cm^2 vs. 5.10 (±1.39) cm^2, p<0.01)

Decrease of cross sectional area of ST muscle without tendon regeneration compared to tendon regeneration distal to the joint line at 12 months:

- 5.98 (±2.05) cm^2 vs. 9.99 (±2.61) cm^2 (p=0.05)

Decreased cross sectional area of G muscle with tendon regeneration proximal to the joint line compared to tendon regeneration distal to the joint line at 12 months:

- 2.76 (±0.69) cm^2 vs. 4.80 (±1.09) cm^2 (p=0.01)

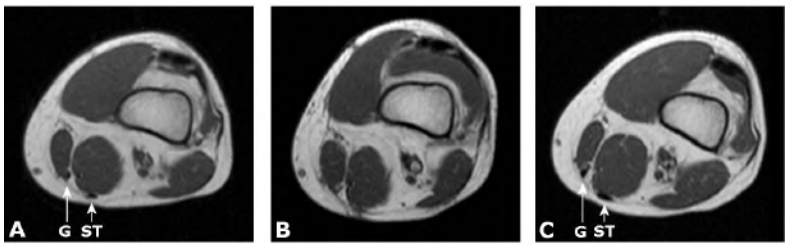
Retraction

Increased muscle retraction of ST muscles without tendon regeneration compared to tendon regeneration distal to the joint line:

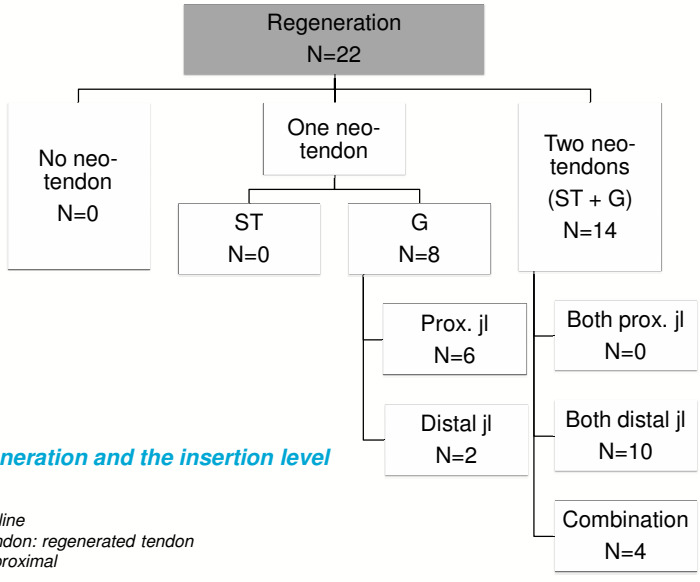
- 13.04 (±3.35) vs. 3.75 (±2.02) (p=0.02)

Isokinetic muscle strength

No significant relationship between isokinetic muscle strength and tendon regeneration.



A. Preoperative *B. 2 weeks postoperative* *C. 12 months postoperative*



Regeneration and the insertion level

jl: joint line
neo-tendon: regenerated tendon
prox.: proximal

Conclusion

Hamstring tendons regenerated after harvest of both semitendinosus and gracilis tendons for anterior cruciate ligament reconstruction. There was no relation between isokinetic flexion strength and tendon regeneration.

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References: [1]Lipscomb AB, et al. Am J Sports Med 1982;10:340-342. [2]Cross MJ, et al. Am J Sports Med 1992;20:221-223. [3]Eriksson K, et al. Arthroscopy 2001;17:808-817