

## Regeneration of Semitendinosus Tendon after Harvesting for ACL Reconstruction

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### Introduction

A decrease in deep knee flexion torque after ACL reconstruction using hamstring tendon has been reported. On the other hand a potential of the extirpated hamstring tendon regeneration has also been reported. The purpose of this study is to assess the anatomical, functional feature in the knee flexor muscle and the histological feature of the regenerated tendon.

### Material and Methods

Muscle length and fiber length of the semitendinosus (ST), gracilis (G), semimembranosus (SM) and biceps femoris (BF) were measured and fiber arrangement was observed in 6 cadavers.

Isometric knee flexion torque at 45, 90 degrees in prone position was measured in 19 patients who had undergone ACL reconstruction with ST. Regeneration of ST tendon was confirmed using MRI. The position of the musculotendinous junction (MTJ) was observed and proximal shift of the MTJ was calculated. Biopsies were performed in 6 patients at the time of screw removal.

### Result

The ST and G were parallel fibered muscle. On the other hand, the SM and BF were unipennate muscles with pennation angle. The ST and G fiber length was three times longer than the SM and BF.

Isometric flexion torque of the reconstructed limbs was significantly lower than that of the normal side. MRI showed the position of the MTJ shifted proximally in the reconstructed side compared with the normal side. As the difference of the MTJ position increased, the flexion torque at 90 degree decreased.

In the macroscopic findings, the regenerated tendon had a smooth appearance like a normal tendon. In the histological examination, collagen bundles were similar in orientation and dimension like the normal tendon.

### Conclusion

The ST and G were parallel fibered muscle with long fiber length, which suggest that they have an eminent potential to shorten at long distances. On the other hand, the SM and BF are unipennate muscles with short fiber length and pennation angle, which are insufficient to produce the knee flexion torque at deeper angle. Therefore, the SM and BF cannot compensate for the loss of the ST and G.

Though the knee flexion torque decreased at deep knee flexion angle, the regenerated tendon was observed. The anatomical and histological regeneration would not correlate with functional regeneration because of the proximal shift of the MTJ.

**Key word:** ACL reconstruction, Semitendinosus tendon regeneration, Knee flexion torque