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# Comparison of Laxity Match Pretension in Anatomic ACL Reconstruction: Twin Tunnel with Hamstring Tendon Graft vs. Rectangular Tunnel with Bone-Tendon-Bone Graft

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#### Summary:

The Laxity Match Pretension (LMP) of the anatomic double-bundle (ADB) ACL reconstruction with hamstring tendon graft was 6.9N, while the anatomic rectangular-tunnel (ART) ACL reconstruction with BTB graft was 1.8N. Therefore, the less initial tension should be applied to the graft in the ART technique compared to the ADB one, as the LMP in ART technique was significantly smaller.

## Abstract:

#### **INTRODUCTION**

To restore the normal knee kinematics, the anatomical graft placement has been advocated in ACL reconstruction. We also developed the following two novel techniques: (1) Anatomic double-bundle (ADB) ACL reconstruction with hamstring tendon (HST) grafts; (2) Anatomic rectangular tunnel (ART) ACL reconstruction with bone-tendon-bone (BTB) graft based on the ADB concept. However, it is not well known how much tension should be applied to ACL graft at the time of graft fixation, while the initial tension applied to a graft is considered one of the key factors for success in ACL reconstruction. The objectives of this study were to determine the Laxity Match Pretension (LMP) in ACL reconstruction using HST graft for ADB technique and BTB graft for ART one, and to compare these two techniques in the LMP.

## **MATERIALS & METHODS**

20 knees without any ligament injuries or severer articular cartilage damage were included. These knees were divided into the following 2 groups; ADB procedure was performed on 10 knees, while ART procedure was performed on the remaining 10 knees. In ADB procedure, two femoral tunnels were created behind the resident's ridge, while two tibial tunnels were made in ACL footprint. In ART technique, a femoral tunnel with a 5x10mm rectangular aperture was created behind the ridge, while a parallelepiped tibial tunnel with a 5x10mm aperture was made in the ACL attachment. After 2 doubled HST grafts were fixed with two EndoButton-CLs® on the femur or BTB grafts were fixed with interference screw, they were temporarily fixed to the tension-adjustable force gauge on the tibial cortex. The total tension of 0, 10, 20, 30, or 40N to the grafts was applied at 20 degree of knee flexion for each trial, and the anterior-posterior (A-P) tibial displacement was measured with Knee Laxity Tester by applying A-P load of 134N at 20 degree of flexion. The A-P displacement of the normal knees was also measured in the same manner. After the initial tension and A-P displacement were plotted on a graph, the LMP for each patient was estimated from the A-P displacement are exponential functions. For statistical analysis, Mann-Whitney's U-test was used, and a p-value less than 0.05 was considered significant.

## RESULTS



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The mean LMP of ART procedure was 1.8±0.9N, which was significantly smaller than 6.9±3.9N in ADB procedure.

## DISCUSSION

This difference is cause by the difference of graft materials and the difference of distance between fixations. According to a previous report, in situ force in the normal ACL was less than 10 N at 20 degree of flexion. Therefore, as the LMP was closer to the force in the normal ACL, the ART technique could be considered more efficacious in restoring stability of the knee.

#### CONCLUSION

The LMP in ADB procedure was 6.9N, while that in ART one was 1.8N. Therefore, the less initial tension should be applied to the graft in the ART technique compared to the ADB one.