

## Anatomical Reconstruction of the Anteromedial and Posterolateral Bundles of the Anterior Cruciate Ligament

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### Introduction

The normal ACL consists of the anteromedial (AM) and posterolateral (PL) bundles. In conventional ACL reconstruction procedures, however, only one bundle that mimic the anteromedial bundle has been grafted. This may be one of the reasons why completely normal ACL function cannot be restored by current ACL reconstruction. To improve the results of one-bundle ACL reconstruction, two-bundle reconstruction procedures have been developed. In the two-bundle procedures reported previously, however, tunnel position, specifically concerning the PL bundle, is not located on the anatomical attachment. Based on our original studies, we developed a 2-bundle ACL reconstruction procedure, in which the AM and PL bundles were anatomically reconstructed using doubled hamstring tendon autografts, in 2000. The purpose of this presentation is to compare clinical outcome of this procedure with that of the conventional one-bundle and two-bundle reconstruction procedures using the hamstring tendons.

### Material and Methods

A prospective comparative study was carried out with 72 consecutive patients who underwent unilateral isolated ACL reconstruction in our hospital in 2001. The first 24 out of the 72 patients underwent ACL reconstruction with the conventional one-bundle procedure using a doubled hamstring graft (Group I). The next 24 patients underwent ACL reconstruction with the conventional two-bundle procedure using doubled hamstring grafts, which was reported by Rosenberg et al (Group II). The last 24 patients underwent ACL reconstruction with the anatomical two-bundle procedure using hamstring tendon grafts (Group III). In Group III, first, 2 tunnels were drilled in the tibia through the anatomical attachment of the 2 bundles, respectively, in order to reconstruct the AM and PL bundles. The position and direction of a guide wire for each tunnel were determined using a specially developed "wire-navigator" so that the tip of the wire was aimed at the anatomical attachments of each bundle. Then, 2 femoral tunnels for the Endobutton fixation were created through the center of the anatomical attachment of each bundle, using the trans-tunnel technique. All surgeries were performed by one senior surgeon (K.Y.) who had sufficient experience of each procedure. All 72 patients were evaluated at the time of 12 months after surgery. Subjective evaluation was performed using the modified Noyes scoring preoperatively and postoperatively. Objective evaluations involved a range of knee motion, the side-to-side anterior laxity measured at 30 degrees of flexion (KT-2000 arthrometer), and quadriceps and hamstring strength (Cybex II). Statistical comparison among the three groups was made using the analysis of variance (ANOVA) with a Bonferoni / Dunn correction for multiple comparisons. Significance level was set at  $p < 0.05$ .

### Result

There were no significant differences in the background factors among the 3 groups. No intra-operative and postoperative complications were experienced in this study. The postoperative side-to-side anterior laxity averaged 2.8, 2.2, and 1.6 mm in Groups I, II, and III, respectively. The ANOVA demonstrated a significant difference among the three groups ( $p = 0.006$ ). The post-hoc test showed that there was a significant difference between

Groups I and III ( $p = 0.002$ ). There were no significant differences in the subjective score, the ROM, and muscle torque among the 3 groups.

### **Conclusion**

This study demonstrated that the postoperative anterior laxity after the anatomical reconstruction is significantly less than that after the conventional one-bundle reconstruction. However, there were no significant differences between the conventional one-bundle and two-bundle reconstructions. These results suggested that the anatomical reconstruction of the AM and PL bundles using hamstring tendon autografts is useful in the treatment for the ACL-deficient knee.

**Key word:** Anatomical Reconstruction, Anterior Cruciate Ligament, Clinical Outcome

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