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**Title:** A Randomized Trial Comparing Patellar, Hamstring and Double-bundle ACL Reconstruction at 5-yrs.

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**Objectives:** This prospective, double-blind RCT compares ACL reconstruction using patellar tendon, quadruple hamstring and double-bundle hamstring grafts, by measuring patient-reported disease-specific quality of life outcome in patients with isolated ACL deficiency of the knee at a 5-years post-op.

**Methods:** Patients (n=330; 183 males, 147 females) aged 14-50 years were randomly allocated and equally distributed to one of three anatomic ACL autograft reconstruction techniques: 1) Patellar Tendon (PT; mean age 28.7 years), 2) Quadruple-stranded Hamstring Tendon (HT; mean age 28.5 years), or 3) Double-Bundle using hamstring tendons (DB; mean age 28.3 years). Computer-generated allocation with varied block randomization was performed intra-operatively. Outcomes were measured at baseline, 3 and 6 months, 1, 2 and 5 years. Two-year results were previously reported. Primary outcome: Anterior Cruciate Ligament Quality-of-Life (ACL-QOL). Secondary outcomes: International Knee Documentation Committee (IKDC) subjective score and objective grades, pivot shift, range of motion, kneeling pain, Tegner activity level, and the Cincinnati Occupational Rating Scale. The proportion of re-ruptures, partial re-ruptures and the combined total traumatic re-injuries were compared. Radiographic evaluation was performed at baseline, 2 and 5 years; this analysis is ongoing. A 5% significance level was used for all outcomes.

**Results:** 315 randomized patients (95%) d 5-yr follow-up. There were 4 withdrawals and 11 patients lost-to-follow-up. Baseline characteristics between the groups were not different. ACL-QOL scores increased significantly from baseline over time for all groups (p=0.000). There was no difference in mean ACL-QOL score at 5-years (p=0.548): PT=82.5 (SD 17.9, 95% CI 79.0-86.0); HT=83.9 (SD 18.2, 95% CI 80.3-87.4); DB=81.1 (SD 19.3, 95% CI 77.4-84.8). At 5-years, there were no differences in the proportion of patients with a Pivot Shift grade 2 or greater (p=0.106): PT=11/98 (11%); HT=16/99 (16%); DB=23/103 (22%). Mean IKDC subjective scores were not different between groups at 5-yrs (p=0.770): PT=83.9 (SD 12.9, 95% CI = 81.4-86.5); HT=85.2 (SD 13.0, 95% CI = 82.7-87.7); DB=84.3 (SD 13.4, 95% CI = 81.7-86.9). Based on IKDC objective grades, the proportions of Normal/Nearly Normal knees at 5-years were not different between groups: PT=85/98 (87%); HT=82/99 (81%); DB=75/103 (76%), p=0.093. 5-yr Tegner activity levels and Cincinnati Occupational Scores were also not different between the groups (p=0.872 and p=0.813, respectively). Kneeling pain remained more common in the PT group (PT=10/98; HT 4/98; DB 2/101; p=0.029). More traumatic graft ruptures occurred in the HT and DB groups (PT=4/103; HT=11/105; DB=11/107; p=0.145). Revision ACL reconstructions were performed on 22 of these patients. There were an additional 11 partial graft re-ruptures (PT=0; HT=5; DB=6), with less total traumatic re-injuries in the patellar tendon group (PT=4; HT=16 and DB=17, p=0.010). Four patients had additional surgery to the index knee, not including the revision surgery between the 2 and 5-yr follow-up.

**Conclusion:** At 5 years, there was no difference in disease-specific quality-of-life outcome or IKDC grades between the PT, HT and DB techniques for ACL reconstruction. There were significantly more traumatic graft re-injuries in the HT and DB groups compared to the PT group.