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A Randomized Clinical Trial Comparing Patellar Tendon, Hamstring Tendon and Double-Bundle ACL Reconstructions: Patient-Reported and Clinical Outcomes at Five-Year Follow-Up

Nick Mohtadi, MD, MSc, FRCSC, CANADA
Denise S. Chan, MBT, MSc, CANADA
Rhamona Barber, BKin, CAT(C), CANADA

University of Calgary Sport Medicine Centre
Calgary, Alberta, CANADA

Summary:
This is the largest clinical trial in ACL surgery with 95% follow-up. At 5-years, no difference in disease-specific Q of L, between: patellar tendon (PT), hamstring (HT) and double-bundle hamstring (DB) reconstructions. 11.1% suffered a traumatic graft injury, higher in the HT and DB groups; 8.9% of patients required a repeat arthroscopy and 8.9% suffered a contralateral ACL rupture.

Abstract:
PURPOSE:
To compare anterior cruciate ligament reconstruction using patellar tendon (PT), quadruple hamstring tendons (HT) and the double-bundle hamstring tendons (DB) graft options, by measuring patient-reported disease-specific quality of life outcome in patients with isolated ACL deficiency of the knee at a minimum five-years post-operative follow-up.

METHODS:
In this prospective double-blind randomized clinical trial, 330 patients (183 males, 147 females) aged 14-50 years were randomly allocated and equally distributed to one of three ACL autograft reconstruction techniques: 1) Anatomic Patellar Tendon (PT; mean age 28.7 years), 2) Anatomic Quadruple-stranded Hamstring Tendon (HT; mean age 28.5 years), or 3) Anatomic Double-Bundle using hamstring tendons (DB; mean age 28.3 years).
Outcomes were measured pre-operatively at baseline, and post-operatively at 3 and 6 months, 1, 2 and 5 years. The 2-year results have been previously published. The primary outcome was the Anterior Cruciate Ligament Quality-of-Life (ACL-QOL) measure. Secondary outcomes included the International Knee Documentation Committee (IKDC) subjective score and objective grades, pivot shift, Tegner score, the Cincinnati Occupational Rating Scale, and re-injuries. Radiographic evaluation was performed at baseline, 2 and 5 years; this analysis is ongoing.

RESULTS:

315 randomized patients (95%) completed a minimum five-year follow-up. There was no difference in any baseline characteristics. There were no differences in mean ACL-QOL score at five-years (p=0.548): PT = 82.9 (SD 17.4, 95% CI 79.5 – 86.3); HT = 83.7 (SD 18.4, 95% CI 80.1 – 87.3); DB = 81.8 (SD 18.6, 95% CI 78.2 – 85.4); in the proportion of patients with a Pivot Shift grade 2 or greater (p=0.573): PT = 11/103 (14%); HT = 16/105 (18%); DB = 20/107 (19%); mean IKDC subjective scores between groups (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), and IKDC objective grades Normal/Nearly Normal knees PT = 85/98 (87%); HT = 82/99 (81%); DB = 75/103 (76%), p=0.093. Tegner activity levels and Cincinnati Occupational Scores were not statistically different between the groups (p=0.874 and p=0.813, respectively).

The frequency of complete traumatic graft ruptures was higher in the Hamstring and Double Bundle groups (PT = 4/103; HT = 11/105; DB =11/107; p=0.145). Revision ACL reconstructions were performed on 22/26 of these patients.

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There were an additional 11 partial graft re-ruptures (PT=0; HT=5; DB=6) with the total re-injuries much less in the patellar tendon group (Total re-injuries: PT=4; HT=16 and DB=17 p=0.010).
Twenty-nine additional arthroscopic procedures were required in 28 patients (9.2%) PT=7, HT=10, DB=11. Contra-lateral ACL ruptures occurred in 28 patients (8.9%). Kneeling pain remained more common the PT group (PT=10/98; HT 4/98; DB 2/91; p=0.029).

CONCLUSIONS:
At five-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 re-injuries in the HT and DB groups compared to the PT group. Contralateral ACL tears and repeat surgery, increased form the 2-year follow-up.