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AGE- AND SEX-DEPENDENCE OF FEMOROTIBIAL CARTILAGE CHANGE AFTER ANTERIOR CRUCIATE LIGAMENT (ACL) TEAR - 5 YEAR FOLLOW UP IN THE KANON STUDY

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Purpose: Anterior cruciate ligament (ACL) tear is known to increase the risk of OA, and is associated with acute joint trauma and chronically altered joint mechanics. An increase in medial femorotibial cartilage thickness (ThC) has been described within 1-2 years after ACL tear. However, whether this increase depends on age or sex, whether it represents an early pathological event (caused by trauma), and/or whether it persists (due to a chronic alteration in joint mechanics) is unclear. Hence, we studied ThC change between 2 to 5 years follow-up (Y2→Y5) and between baseline and 2 years (BL→Y2).

Methods: 121 young active adults with an acute ACL tear in a previously uninjured knee were included in a randomized control trial, comparing rehabilitation plus early ACL reconstruction (ACLR; n=62) with rehabilitation plus the option of delayed ACLR (n=59). Sagittal MRIs (3D/WATSc) were acquired within 5 weeks of the tear (BL), and at Y2 and Y5 (n=107; 81men, 26 women; median age 25.6y; age range 18-36). ThC in the medial (MFTC) and lateral (LFTC) compartment was measured after segmentation of femoral and tibial cartilages, with blinding to acquisition order and treatment group. Regression analysis (Pearson) and unpaired t-tests were used to explore the relationship of post-tear cartilage changes with age and sex.

Results: The increase in MFTC ThC from Y2→Y5 was +1.8% (mean±SD [95% CI]: +70±130µm [45, 95]) compared with +1.3% from BL→Y2 (+49±165µm [17, 80]). The Y2→Y5 MFTC ThC increase did not differ significantly (p=0.94) between men (69±134µm; [40, 99]) and women (71±120µm; [23, 120]), but was significantly (p=0.017) greater in those younger than group median age of 25.6y (99±137µm [62, 137]) than in those older than group median (40±117µm [7, 72]). The correlation (r) of MFTC ThC change from Y2→Y5 with age (Fig. 1) was -0.35 [-0.51,-0.17]. For comparison it was -0.26 [-0.43,-0.07] for BL→Y2, and -0.44 [-0.58, -0.27] for BL→Y5. No significant increase in LFTC ThC was observed and no significant relationship of LFTC change with age. Baseline cartilage thickness in MFTC (but not LFTC) correlated positively with age in men (+0.27 [0.05; 0.46]) and women (+0.30 [-0.10; 0.62]). The annual increase in MFTC ThC (from age 18) estimated from the regression equations was +25µm/y in men and +22µm/y in women.

Conclusions: Our findings suggest that the MFTC ThC increase in young adults continues during Y2→Y5 after ACL tear. This increase is stronger in younger than in the more mature adults, with age explaining 12% of the Y2→Y5 and 19% of the BL→Y5 variability. The (baseline) cross sectional findings indicate that there may exist a physiological increase in MFTC ThC with age in early adulthood that correspond in magnitude with those observed

after ACL tear, but longitudinal studies will have to confirm this hypothesis. Hence we recommend that young healthy controls be studied longitudinally to differentiate pathological ThC change after ACL tear from physiological maturation. Further, we recommend that analyses comparing ThC changes after early ACLR vs. the option of delayed ACLR adjust for age.

Figure 1: