CARTILAGE THICKNESS CHANGE WITHIN 5 YEARS AFTER ANTERIOR CRUCIATE LIGAMENT TEAR, WITH AND WITHOUT RECONSTRUCTION SURGERY

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An anterior cruciate ligament (ACL) tear involves serious trauma and chronic alterations in knee joint biomechanics. The risk of developing knee osteoarthritis after an ACL tear is elevated and surgical ACL reconstruction is commonly performed with the idea of restoring normal biomechanics and of preventing (further) structural damage. In this study we explore whether surgical ACL reconstruction impacts femorotibial cartilage thickness changes during an "acute" phase (within 2 years) and during a more "chronic" phase (year2→5) after ACL tear.

121 young active adults (mean age 26.1 years) with an acute ACL tear in a previously un-injured knee were included in a randomized controlled trial (the KANON-RCT). Patients were randomized to either rehabilitation plus early ACL reconstruction (n=62) or rehabilitation plus the option of having a delayed ACL reconstruction if needed (n=59) [1]. During 5-year follow up, 30 (51%) of those randomized to the latter group requested a delayed ACL reconstruction. 106 participants had complete sets of sagittal MR images at all time points. Cartilage thickness was computed after manual segmentation of the femorotibial cartilages with blinding to time point and treatment group. Mean change in cartilage thickness in the medial femorotibial compartment (MFTC) was considered the primary, and in subregions with the largest decrease (ordered value 1 = OV1) or increase (OV16) secondary outcomes. An 'as-treated' analysis approach was used (57 early and 25 delayed ACL reconstructions; 24 rehabilitation alone) using t-tests (crude) and analysis of covariance (adjustment for age, sex and BMI).

Within 2 years after the ACL tear, an increase in medial femorotibial cartilage thickness was observed. This increase tended to be smaller in knees treated with rehab alone than in those with early ACL reconstruction, but the difference did not reach statistical significance (crude/adjusted p=0.18 / p=0.16). The increase in knees with delayed ACL reconstruction also did not differ significantly from that in knees with early reconstruction or from knees without ACL reconstruction. Between year 2 and 5 follow-up, the increase in MFTC cartilage thickness continued and no significant difference was observed between the three groups (crude/adjusted p>=0.42/0.55). Within the first two years after ACL tear, OV 1 was significantly more negative (i.e. greater loss: crude/adjusted p= 0.02/0.02) and OV 16 significantly more positive (i.e. greater thickening: crude/adjusted p= 0.04/0.03) in knees with early ACL reconstruction than in knees treated with rehab alone. These differences did not remain significant in the subsequent (year2→year5) period (crude/adjusted p>=0.09/0.14). No significant differences for OV1 and 16 were observed between knees with delayed ACL reconstruction vs. those treated with rehab alone, or between knees with delayed vs. early ACL reconstruction.

Medial femorotibial (MFTC) cartilage thickness increased after acute ACL tear; this increase did not differ significantly between knees treated with (early or delayed) ACLR or knees treated with rehab alone. However, early ACL reconstruction may induce elevated rates of subregional cartilage thickness change. This occurs during a phase within 2 years after trauma/surgery but not in later follow-up periods.

[1] Frobell RB, Roos EM, Roos HP, Ranstam J, Lohmander LS. A randomized trial of treatment for acute anterior cruciate ligament tears. N Engl J Med. 2010;363(4):331-42.