

THE ASSOCIATION BETWEEN CLINICAL OUTCOME AND CHANGE OF CARTILAGE THICKNESS AND TOTAL AREA OF SUBCHONDRAL BONE OVER TWO AND FIVE YEARS IN A TREATMENT RCT OF PATIENTS WITH ACUTE ANTERIOR CRUCIATE LIGAMENT INJURY

R.Frobell¹, W. Wirth², L.S. Lohmander¹, M. Hudelmaier², F. Eckstein²

¹ Orthopedics, Clinical Sciences Lund, Lund University, Lund, Sweden

² Paracelsus Medical University, Salzburg, Austria & Chondrometrics GmbH, Airming, Germany

INTRODUCTION: An ACL tear is a serious and common knee injury, mainly affecting young active adults. Little is known about early morphologic changes in the injured knee and we are not aware of any previous work on the relation between such changes and patient-reported outcomes in this group of patients.

OBJECTIVE: 1) To investigate the association between patient relevant outcomes and changes in cartilage thickness (ThC) and total area of subchondral bone (TAB) of the total femurotibial joint at 2 and 5 years follow-up in patients with an acute ACL injury to a previously uninjured knee, and 2) to explore these associations in subgroups of treatment actually received.

METHODS: 121 young (mean age 26.1 years) active adults with an acute ACL tear in a previously uninjured knee were included in an RCT comparing rehabilitation plus early ACL reconstruction (ACLR, n=62) and rehabilitation plus the option of having a delayed ACLR if needed (n=59). A complete set of sagittal MR images for baseline, 2, and 5 year follow-up was available for 107 of the 121 participants (57 treated with early ACLR, 25 treated with delayed ACLR and 24 treated with rehabilitation alone). Cartilage thickness (ThC) and total area of subchondral bone (TAB) were assessed by manual segmentation in the medial (MFTC) and lateral (LFTC) compartments of the femorotibial joint (FTJ) with blinding to time points. We calculated the 2 and 5 year changes of ThC and TAB of the total FTJ and compared these measures to the primary outcome of the original RCT (an average score computed from four of the five subscales of the Knee Injury and Osteoarthritis Outcome Score [KOOS₄] at 2 and 5 years using the Pearson correlation coefficient).

RESULTS: No statistically significant correlations were found between the 2 and 5 year change of ThC and KOOS₄ at 2 and 5 years for the full analysis set or for the treatment actually received subgroups. There was a significant correlation between the 5 year change of FTJ TAB and KOOS₄ at 2 ($r=-0.2$, $p=0.04$), but not at 5 (-0.1 , $p=0.38$), years in the full analysis set. This was predominantly driven by the change among those treated with early ACLR where the latter correlations were -0.29 ($p=0.03$) and -0.21 ($p=0.12$) for KOOS₄ at 2 and 5 years respectively. In the early ACLR group, there were also significant correlations between the 2 year change in FTJ TAB and KOOS₄ at 2 (-0.33 , $p=0.01$) and 5 years (-0.27 , $p=0.04$). No significant correlations were found between the 5 year change in FTJ TAB and KOOS₄ in this group at 5 years (-0.21 , $p=0.12$) or in those treated with delayed ACLR (-0.19 , $r>0.12$, $p\geq0.35$) or rehab alone (0.05 , $r>0.32$, $p\geq0.12$).

CONCLUSION: We did not find a relation between the 2 and 5 year change in cartilage thickness in the total FTJ and the clinical outcome at 2 and 5 years after acute ACL injury. However, our results indicate that increasing total areas of subchondral bone in FTJ over the first 5 years after injury may be related to a worse clinical outcome at 2 years. This may be especially true for those treated with early ACL reconstruction where increasing FTJ TABs over the first 2 years after injury were related to worse clinical outcome at both 2 and 5 years.

SPONSORS: The KANON study received funding from the Swedish Research Council, the Medical Faculty of Lund University, Region Skåne, Thelma Zoegas Fund, Stig & Ragna Gorthon Research Foundation, Swedish National Centre for Research in Sports, Craford foundation, Tore Nilsson research fund, and Pfizer Global Research. Image analysis was funded by NanoDiana (NMP4-LA-2009-228929)
DISCLOSURE STATEMENT: See affiliations.
CORRESPONDENCE ADDRESS: richard.frobell@med.lu.se