DOES CARTILAGE THICKNESS CHANGE DIFFER BETWEEN ACL DEFICIENT KNEES WITH AND WITHOUT RECONSTRUCTION SURGERY?

W. Wirth¹, F. Eckstein¹, M. Hudelmaier¹, L.S. Lohmander², R.Frobell²

¹Paracelsus Medical University, Salzburg, Austria & Chondrometrics GmbH, Ainring, Germany; ²Orthopedics, Clinical Sciences Lund, Lund University, Lund, Sweden
Disclosures

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Anterior cruciate ligament (ACL) tears

- ACL tear is a serious and common injury
- Surgical ACL reconstruction is frequently performed in ACL deficient knees
- ACL injuries associated with elevated risk of developing knee OA
The KANON trial

- Comparison of surgical vs. non-surgical treatment in young, active adults with rotational trauma to previously uninjured knee
- Randomization to either:
  - early ACL reconstruction and structured rehabilitation or
  - structured rehabilitation with optional delayed ACL reconstruction
- Primary objective: Patient reported outcomes (Knee injury and Osteoarthritis Outcome Score, KOOS)
- No significant differences in patient reported outcomes after 2 (Frobell et al. N Engl. J. Med. 2010) and 5 years (Frobell et al. BMJ 2013).
Objectives

- Does the treatment of the initial injury influence change in femorotibial cartilage thickness over the first five years after injury?
  - Change in cartilage thickness in the initial two-year period
  - Change in cartilage thickness in the subsequent three-year period
Study participants

- 106 of 121 participants with complete MRI and clinical data
- Demographics at baseline (BL):
  - 26 female and 80 male participants
  - Age: 26.4 ± 4.8 years
  - BMI: 24.2 ± 2.9 kg/m²
- Image acquisition at visits:
  - Recruitment (BL = baseline)
  - Year 2 (Y2) follow-up
  - Year 5 (Y5) follow-up
- Sagittal FLASH (1.5T, 0.29mm IPR, 1.5mm slice spacing)
Cartilage segmentation & computation

- Manual segmentation of cartilages:
  - Medial and lateral tibia (MT/LT)
  - Central 75% of the medial and lateral femoral condyle (cMF/cLF)

- Computation of cartilage thickness in cartilage plates and subregions
Statistical analysis

- Primary outcome: Change in medial femorotibial compartment (MFTC)
- Secondary outcomes: Ordered values 1 (subregion with the most negative change within each knee) and 16 (subregion with the most positive change within each knee)
- Observation periods:
  - Baseline → Year 2 (BL→Y2)
  - Year 2 → Year 5 (Y2→Y5)
- As-treated analysis:
  - Early ACL reconstruction: N=57
  - Delayed ACLR: N=25
  - Rehabilitation only (no ACL reconstruction): N=24
- T-test (crude analysis)
- Analysis of covariance (analysis with adjustment for age, sex & BMI)
Medial femorotibial compartment (MFTC)

- Increase in cartilage thickness observed in both periods
- No significant differences between treatment groups in the initial and the subsequent observation periods (crude/adjusted $p \geq 0.18$ / $p \geq 0.16$)

Mean change $\pm$ 95% confidence intervals
- OV 1 significantly greater for early ACLR than in knees without ACLR between BL and Y2 (crude/adjusted p=0.02/0.02)
- OV 1 tended to be greater in knees with delayed ACLR than in knees without ACLR in both periods (crude/adjusted p>=0.08/0.09)

Mean change ± 95% confidence intervals
- OV 16 significantly greater for early ACLR than in knees without ACLR between BL and Y2 (crude/adjusted p=0.04/0.03)
- OV 16 tended to be greater in knees with delayed ACLR than in knees without ACLR in both intervals (crude/adjusted p>=0.07/0.04)

Mean change ± 95% confidence intervals
Conclusions

- Increase in MFTC cartilage thickness observed over both periods
- No significant differences observed for primary outcome between treatment groups
- Greater magnitude of subregional change in knees with early ACLR than in knees without ACLR in initial 2 year period
- Somewhat greater magnitude of subregional change in knees with delayed ACLR than in knees without ACLR in both periods
- ACL reconstruction surgery may induce elevated magnitude of subregional cartilage thickness change in the period following the surgery but not in later periods.
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Contact

- Wolfgang Wirth: wolfgang.wirth@pmu.ac.at