Early Effects of Arthroscopic Treatment for Cam-type FAI on Patient Outcomes and Articular Cartilage Health

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Femoracetabular Impingement (FAI)

- Morphological abnormality of the hip joint that causes abnormal contact between the femur and acetabular rim during hip joint motion
- Common in young athletic population
- If not treated or managed properly, FAI may lead to degenerative effects of hip joint cartilage
Quantitative Cartilage Imaging

- Cartilage loss and OA symptoms are preceded by damage to the collagen-proteoglycan matrix.
- Proteoglycan content increases while collagen content decreases during degeneration.
- $T_{1\rho}$ and $T_2$ mapping are QMRI sequences used to probe proteoglycan content and collagen network integrity.
  - Utilize variations in proteoglycan response to detect early cartilage injury.
Use of QMRI in FAI Patients

- QMRI used in both healthy and FAI cohorts from UCSF
- Differences in femoral and acetabular cartilage composition in the anterior superior region of the hip detected for FAI patients
- $T_{1\rho}$ also able to detect acetabular cartilage changes in FAI patients
Effects of Hip Arthroscopy for FAI

- **Purpose**
  - To evaluate acute changes in articular cartilage biochemical composition after arthroscopic treatment for FAI using QMRI
  - To correlate results with patient reported outcomes (PRO) and arthroscopy findings
Methods

- Patients undergoing arthroscopic surgery for cam-type FAI without cartilage degeneration recruited prospectively
- All patients received femoroplasty and labral repair by single surgeon (ALZ)
- Patients received QMRI hip prior to surgery (baseline) and 6 months after treatment
- Hip disability and Osteoarthritis Outcome Score (HOOS) surveyed at baseline and 6-month follow-up
Results

- 14 patients (10 male, 4 female, mean age=40, BMI=24.2)
- Average pre-op alpha angle= 61, avg post-op alpha angle= 46
- At 6-month follow-up after surgery, all patients showed significant improvements in HOOS
  - Pain (+22.7, p=0.001)
  - Symptoms (+14.2, p=0.021)
  - Activities of daily living (+25.6, p=0.001)
  - Sports (+38.0 p<0.001)
  - Quality of life (39.6, p<0.001)
QMRI Results

- Baseline QMRI findings demonstrated increased $T_1p/T_2$ relaxation times to be correlated with lower HOOS subscores.
- Arthroscopic findings of acetabular chondral degeneration/delamination correlated with areas of greater $T_1p/T_2$ relaxation time.
- Acetabular articular cartilage demonstrated no significant changes in biochemical composition between pre- and 6 month post-op scans.
- Articular cartilage at the anterosuperior aspect of the femoral head (zone 2) at 6 months showed:
  - Increased $T_1p$ times (mean change $2.4 \pm 3.0$ ms, $p=0.02$)
  - Increased $T_2$ times ($2.3 \pm 2.2$ ms, $p=0.003$)
  - No significant correlation between change in cartilage relaxation times and changes in HOOS subscores after surgery.
Sagittal plane view. Increased cartilage signal in anterosuperior femoral head shown on QMRI is labeled with red arrow
Discussion

- Quantitative cartilage imaging may indicate an acute increase in stress to articular cartilage at the anterosuperior aspect of the femoral head.

- This may be a result of increased loading to this region after femoroplasty of the head-neck junction.
  
  • Joint kinematics may be altered by removal of mechanical impingement from Cam lesion.
  
  • May give rise to increase load in the femoral head.

- QMRI findings post-op do not correlate with patient reported scores.

- Further analysis is needed to evaluate changes with prolonged follow-up.
Conclusion

- Patient reported outcomes improved significantly 6 months after arthroscopic surgery for cam-type FAI

- Quantitative cartilage imaging may indicate an acute increase in stress to articular cartilage at the anterosuperior aspect of the femoral head that did not correlate with early patient outcomes
References


