MR, CT, Dunn 45, Dunn 90 Comparison of Alpha Angle Measurements in FAI

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Introduction

- Femoroacetabular impingement (FAI) is common cause of hip and groin pain
- Cam FAI characterized by:
  - Asphericity, loss of offset
- Imaging (XR, MR, CT)
  - Alpha angle
  - Head-neck offset
  - Head-neck offset ratio
  - Triangular index
Purpose

• To determine if a significant difference exists between alpha angle measurements on the gold standard axial oblique MRI in patients with symptomatic cam FAI and labral tear and:
  • Axial oblique CT
  • Dunn 45° plain radiographs
  • Dunn 90° plain radiographs

  — Hypothesis: The Dunn 45° plain radiograph alpha angle measurement would be significantly greater than all three of the other imaging techniques
Methods

• Single-surgeon, prospective radiographic analysis of consecutive subjects with symptomatic FAI and chondrolabral injury who underwent hip arthroscopy
  – Sample size calculation required 30 subjects (80% power)
  – Non-arthritic
  – Non-dysplastic

• Alpha angle measured via Notzli technique
  – X-ray (Dunn 45°, 90°), MR axial oblique, CT axial oblique

• Cam morphology defined as alpha angle >50.5°
• Groups compared with ANOVA, $\chi^2$
Methods

Dunn 45°

Dunn 90°

MRI axial oblique

CT axial oblique
Results

- 31 subjects (16F, 15M; 33.5 +/- 10.5 years of age)
- Significant difference in alpha angle measurements ($F[3,120]=8.144; p<0.001$)
  - Dunn 45°: 66.3° +/- 11.4° vs
  - Dunn 90°: 57.5° +/- 10.7° (p=0.015)
  - MRI axial oblique: 53.3° +/- 11.5° (p<0.001)
  - CT axial oblique: 54.9° +/- 11.6° (p=0.001)
- Significant difference in the number of hips with cam morphology
  - $\chi^2$ 9.4; p=0.025
Limitations

• Selection bias – only surgical patients
  – Excluded subjects without correct imaging (axial oblique series on MR, CT) from outside institution – did not repeat

• Only analyzed two plain radiographs
  – Frog-leg, cross-table, false profile, Lauenstein

• No radial series on MRI, CT

• No calculation of femoral version

• Threshold for cam morphology 50.5°

• Single observer
Conclusions

• Dunn 45° radiograph yielded significant higher alpha angle than Dunn 90°, axial oblique MRI, and axial oblique CT

• Use of the Dunn 90°, axial oblique MRI, and axial oblique CT may result in untreated symptomatic cam FAI