Inter- and Intra-observer Variability in Assessment of Femoral Head Alpha-Angle: A Comparison Between CT and MRI 3D Modeling

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Author(s): Ramzy Meremikwu¹, Nicholas Beckmann¹

Institutions:
¹McGovern Medical School - University of Texas Health Science Center Houston, Houston, TX

Presenting Author:
Ramzy Ike Meremikwu, Medical Student
Houston, TX

Purpose:
Objectives

Primary Purpose: What is the inter-observer variability for measurement of femoral head alpha-angle on MRI vs CT?

Secondary Purposes: 1) What is the intra-observer variability of alpha-angle measurements between MRI and CT. 2) Determine the absolute difference in alpha-angle measurements in MRI compared with CT. 3) Compare imaging quality of 3D modeling between MRI and CT.

Materials/Methods Used:

Retrospective review of all patients with both CT and MRI 3D modeling of the femoral head performed during a four year period between 4/1/2013 and 4/1/2017. List of patients will be obtained by searching the PACS system for all patients with both MRI hip arthrogram and hip CT performed at Memorial Hermann TMC hospital or its three associated outpatient imaging center locations (TMC, Upper Kirby, and Bellaire). Patients with both MRI hip arthrogram and hip CT performed will have images reviewed. It is estimated that approximately 50 patients will meet inclusion criteria.

The 3D femur images on both CT and MRI will be reviewed independently by both the principal and co-investigator. The principal and co-investigator will independently measure alpha angles over the 9 images that cover the anterosuperior quadrant of the femoral head on MRI and CT. Both the principal and co-investigator will also use the MRI and CT 3D models for imaging quality using a subjective visual grading analysis (VGA) scale (Fig 3).

Results:

Results showed that the alpha-angle degree differences between 3D CT and 3D MRI were not clinically significant with a 95% confidence interval. Compared to 3D CT modeling, MRI exhibited statistically significant resolution and bone modeling, with a P value < 0.05. An interobserver correlation coefficient (ICC) was calculated to determine the amount of agreement between the two observers. ICC values
were designated as Poor-Fair-Good-Excellent with 80% of ICC values rating as Fair (Fair = ICC from 0.4 - 0.59)

**Conclusions:**

3D CT is the gold standard for Femoroacetabular Impingements of the CAM (FAI-CAM) deformity, but 3D MRIs can offer a great alternative when patients may also suffer from radiation sensitivity, associated labial tears, or chondromalacia along with their FAI-CAM diagnosis.

**Primary Category:**

Training and Education

**Secondary Category:**

Informatic Innovations

**Area of Focus:**

Diagnostic Radiology

Interventional Radiology

**Attachments:**

![Table 1: Comparison of the image readings (the averages of two readers) between CT and MRI (degrees)](image)

*P-values are obtained by paired t-test*
Figure 1: Example of alpha-angle measurement.

Alpha-angle is obtained by drawing a best-fit circle around the femoral head circumference. Lines are then drawn from center of this circle down the shaft of the femoral neck and from the center of the circle to the point the femoral head leaves the circle in the anterosuperior quadrant. In general, >55 degrees is indicative of CAM-deformity.