

Differences In Acetabular Rim Thickness Between The Symptomatic And Asymptomatic Hip In Patients With Unilateral Femoroacetabular Impingement

Alexander E. Weber MD

Asheesh Bedi MD

Benjamin Kuhns MD

Gregory Cvetanovich MD

Nozomu Inoue MD, PhD

Gift Ukwuani MD

Richard C. Mather MD, MBA

Shane J Nho MD, MSc



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Introduction

- Femoroacetabular impingement (FAI) comprises of abnormal osseous morphology at the femoral head-neck junction (Cam) and acetabular rim overcoverage (Pincer).¹
- Acetabular overcoverage is managed arthroscopically with rim trimming.²
- Appropriate resection is critical to avoid residual acetabular overcoverage or iatrogenic undercoverage.

Purpose: To Identify the location and magnitude of difference in acetabular rim morphology between the symptomatic and asymptomatic acetabula in a cohort of patients with symptomatic unilateral pincer-type or mixed FAI

Methods

- 33 patients with unilateral hip pain that underwent acetabular rim trimming for femoroacetabular impingement.
- Radiographic Inclusion Criteria: Increased anterior or lateral center edge angle (LCEA) >39 degrees OR an LCEA >30 degrees with a 5 degree increase compared to the asymptomatic side.
- Image Analysis: Preoperative CT data was segmented using 3D reconstruction software (Figure 1).

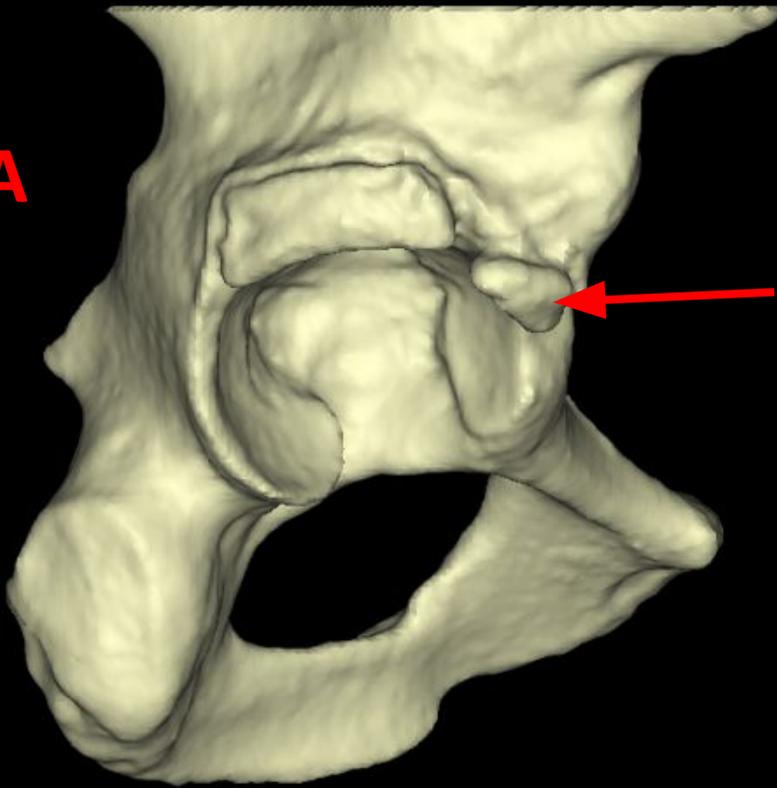
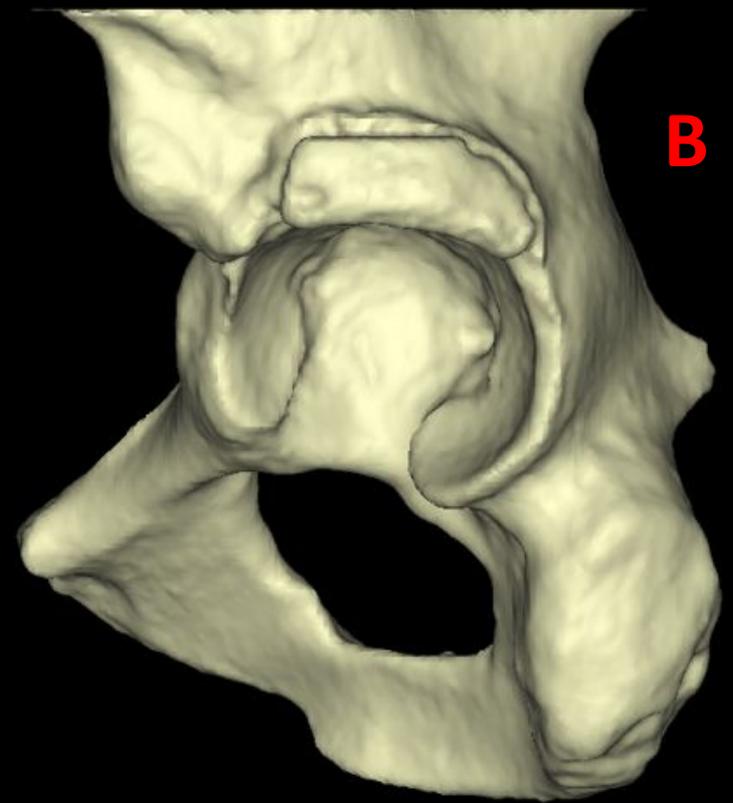
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Figure 1 (A) Bilateral three-dimensional computed tomography demonstrating the lateral view of the acetabula a patient with a unilateral symptomatic pincer lesion (arrow). (B) Asymptomatic hip of the same patient with no evidence of a pincer lesion.

Methods

- The segmented data was then converted to a point cloud model using previously validated software¹ and the symptomatic side was mapped onto the asymptomatic side. (Figures 2 and 3).
- A 3D-3D registration method¹ was then used to determine points of focal protrusion (red) or indentation (blue) (Figure 3).
- Rim morphology was broken into quadrants using the clock face method² to analyze the location of rim differences between symptomatic and asymptomatic sides.

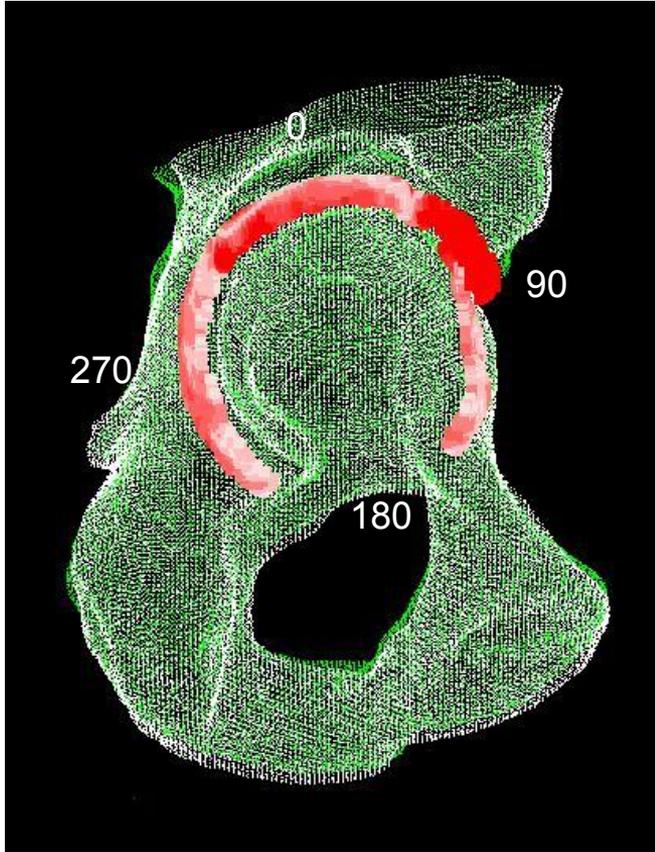


Figure 2. Symptomatic (green) and Asymptomatic (white) CT reconstructions of the same patient from figure 1 mapped on to each other. Areas of protrusion of the symptomatic hip are marked in red.

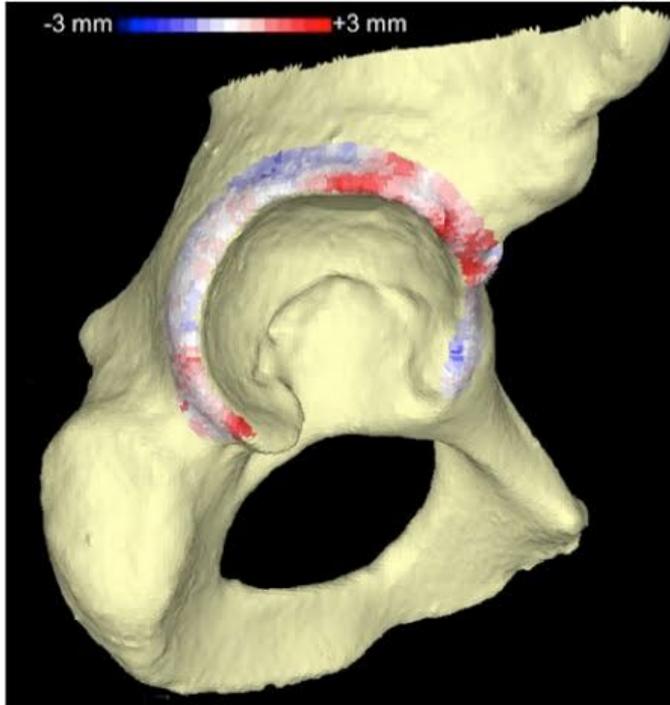


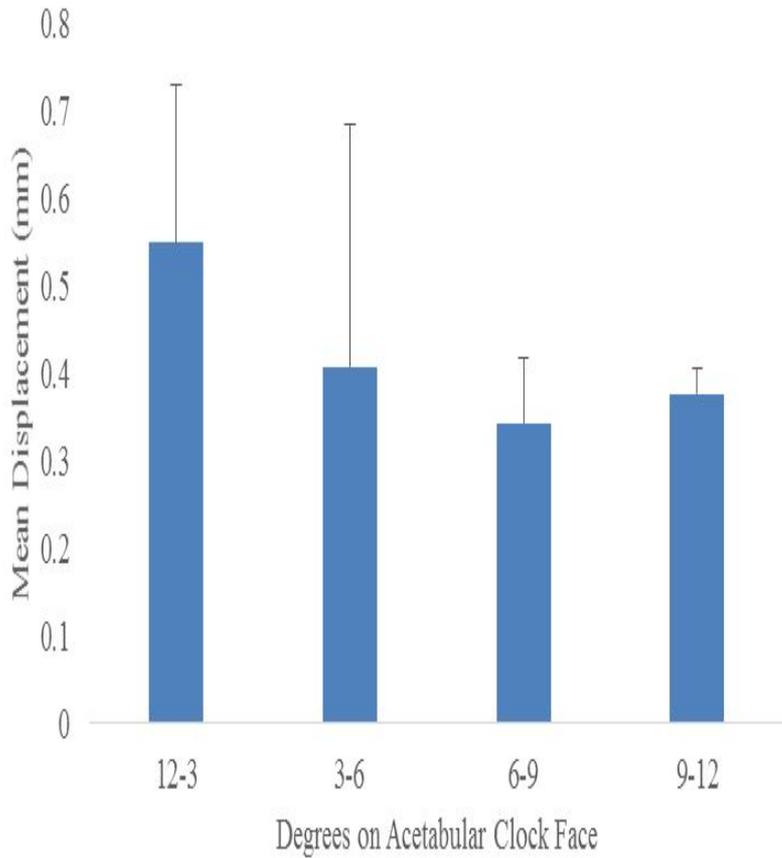
Figure 3. The Color map of the overlaid unaffected acetabulum onto the affected acetabulum (from same patients as in figures 1 and 2) The rim thickness comparisons are color mapped. Red indicates a protrusion of the affected, symptomatic acetabulum as compared to the unaffected, asymptomatic side.

Results

33 patients (16F/17M) with an average age of 35.7 and BMI of 24.3.

Preoperative LCEA on the symptomatic side was 37.5 ± 7.2 degrees compared to 29 ± 5.1 degrees on the asymptomatic side ($p < 0.001$).

On average, the acetabular rim was 0.43 ± 0.18 mm thicker on symptomatic side compared to the asymptomatic side.



The symptomatic acetabular rim was significantly thicker at the 12-3 position compared to the 3-6 ($p=0.005$), 6-9 ($p<0.001$) and 9-12 ($p<0.001$) positions.

Increasing age was positively correlated with the magnitude of rim protrusion in the 12-3 position ($p=0.04$).

Conclusion

- Significant differences exist in acetabular rim thickness between symptomatic and asymptomatic hips.
- Osseous acetabular rim thickening is present with pincer-type FAI.
- Based on the study results, the most significant area of the acetabular rim thickening is in the 12-3 o'clock position.
- Small differences in rim thickness on the order of 0.5 mm may be the difference between symptomatic FAI and an asymptomatic hip.

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