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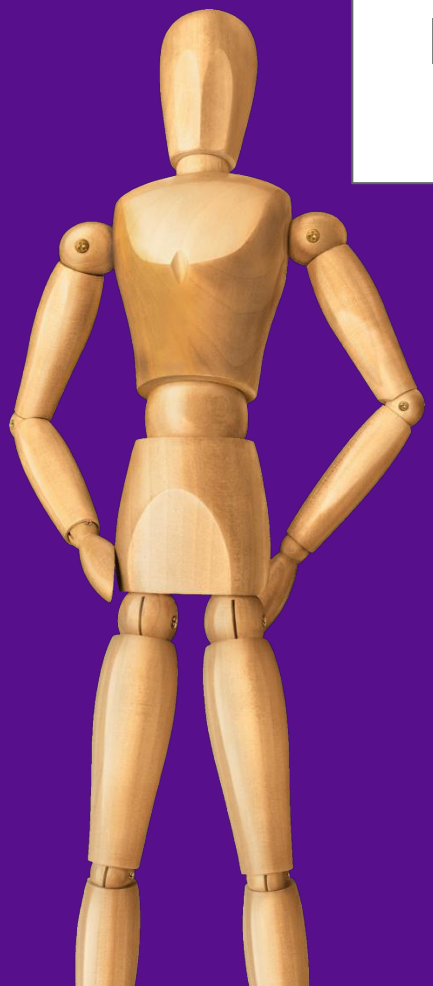
Preoperative CT Imaging with Multiplanar Reformatting of the Hip Does Not Improve Clinical Outcomes in Patients With Femoroacetabular Impingement Treated With Hip Arthroscopy



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DISCLOSURES

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BACKGROUND

A complete appreciation and understanding of the bony abnormalities that contribute to femoroacetabular impingement (FAI) is necessary to consistently achieve successful clinical outcomes following hip arthroscopy. Plain radiography is typically used to assess bony deformity and to plan operative correction.

With plain radiographic assessment, identification of the magnitude of head-neck asphericity is dependent on patient positioning and the radiographic technique.[1] Osteochondroplasty is frequently performed in cases of FAI surgery to correct asphericity of the head-neck junction, and is associated with improved outcomes after hip arthroscopy.[2,3] Head-neck asphericity and increased alpha angle is typically not located to a single region, which can be accurately assessed and quantified by CT imaging.[4,5]

In addition to abnormal bony prominences that may be located to the femoral head-neck junction, or about the acetabular rim, acetabular and femoral version abnormalities are important anatomic considerations that frequently impact diagnosis and treatment of FAI. CT imaging is a valuable tool to accurately characterize abnormalities of acetabular and femoral version.[6]

PURPOSE

To compare the clinical outcomes of those patients who did or did not have preoperative CT imaging of the hip with multiplanar reformatting, in a cohort of patients treated arthroscopically for femoroacetabular impingement.

METHODS

A prospective database of patients diagnosed with femoroacetabular impingement and treated with hip arthroscopy at our institution was reviewed. 404 available patient cases were examined over the study period from 08/2009 to 03/2016. There were 311 patient cases included in the final analysis that met the inclusion and exclusion criteria.

Clinical outcomes were assessed using patient-reported outcome tools that consisted of the modified Harris Hip Score (mHHS) and the Nonarthritic Hip Score (NAHS). Scores were recorded preoperatively, 1 year postoperatively, and at a minimum final follow-up of 2 years.

A comparative analysis of clinical outcomes was performed between those patients who underwent preoperative CT imaging of the hip, and those who did not. A comparative subanalysis examined the association of preoperative CT imaging in patients who underwent primary and revision hip arthroscopy.

METHODS

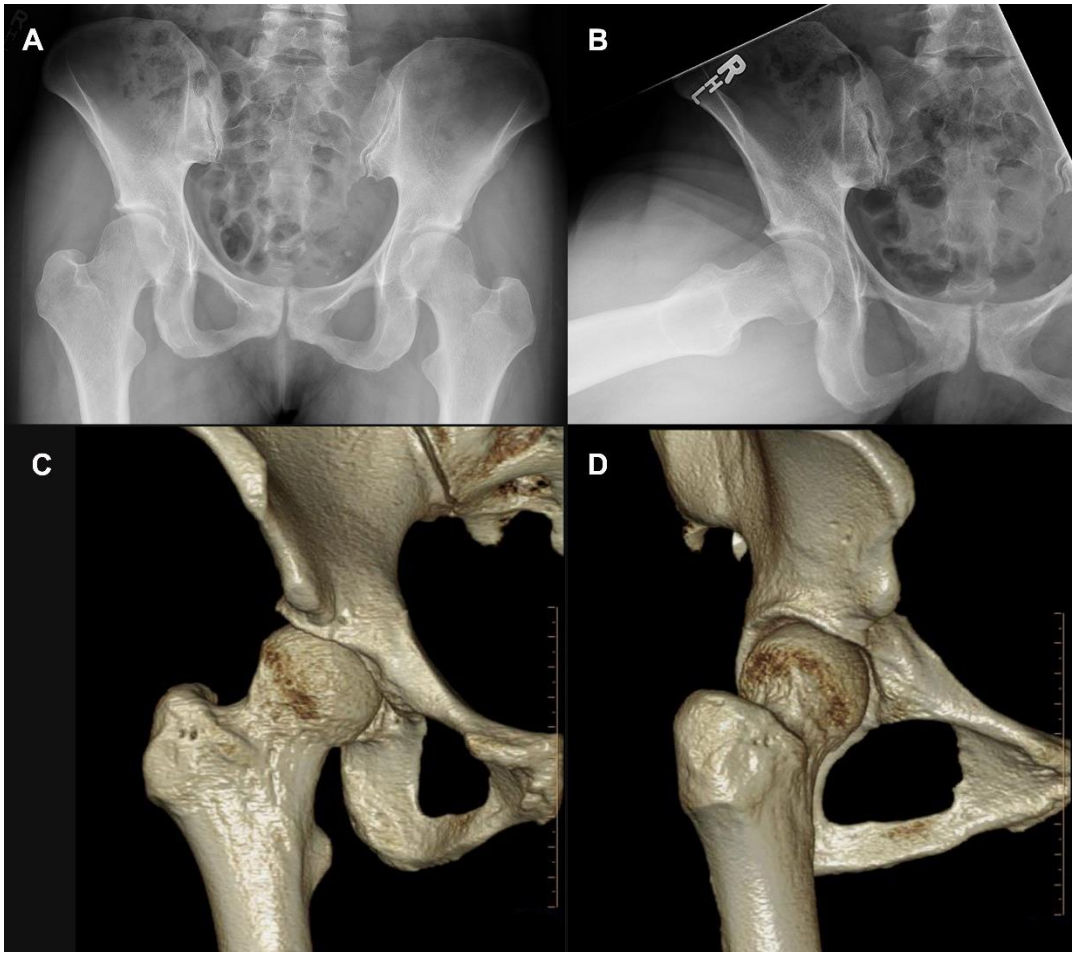

Figure 1. Comparison of plain radiograph and 3D CT characterization of bony deformity in a case of femoroacetabular impingement. (A) Plain radiograph AP pelvis; (B) Elongated-neck lateral radiograph in position of 90˚ hip flexion; (C) CT hip with multiplanar reformatting, anteroposterior view of pelvis and femoral head-neck junction; (D) CT hip with multiplanar reformatting, anterolateral view of pelvis and femoral head-neck junction.

RESULTS

Table 1. Patient Demographic Parameters for Patients Undergoing Hip Arthroscopy With or Without Preoperative Hip CT Imaging & Multiplanar Reformatting

	No Preop CT (n=293)	**Preop CT** (n=18)	**P value**
Mean Age (years ± SD)	39.8 ± 12.6	38.8 ± 10.0	0.726
Male/Female (n)	110/183	9/9	0.323
Mean BMI (kg/m^2)	25.7 ± 4.8	26.6 ± 4.0	0.778
Revision Surgery (%)	4.0	28.6	0.008*
Mean Follow-up (months ± SD)	24.3 ± 2.0	24.7 ± 2.8	0.494

(*) statistically significant.

RESULTS

Table 2. Clinical Score Comparison for Patients Undergoing Hip Arthroscopy With or Without Preoperative Hip CT Imaging & Multiplanar Reformatting

Scoring Instrument	No Preop CT (mean ± SD)	Preop CT (mean ± SD)	P value
Preoperative mHHS	50.1 ± 12.5	51.1 ± 10.3	0.748
Preoperative NAHS	47.2 ± 12.5	49.8 ± 13.3	0.420
1 Year F/U mHHS	82.0 ± 17.2	68.9 ± 14.2	0.019*
1 Year F/U NAHS	83.3 ± 17.6	72.6 ± 13.4	0.062
Final F/U mHHS	84.3 ± 15.4	75.7 ± 15.9	0.022*
Final F/U NAHS	85.3 ± 15.3	75.3 ± 16.3	0.008*

(*) statistically significant, mHHS – Modified Harris Hip Score, NAHS – Nonarthritic Hip Score, F/U – Follow-Up.

RESULTS

Table 3. Clinical Score Comparison for Hip Arthroscopy Patients Undergoing Primary Surgery With or Without Preoperative Hip CT Imaging & Multiplanar Reformatting

Scoring Instrument	No Preop CT (mean ± SD)	Preop CT (mean ± SD)	P value
Preoperative mHHS	50.1 ± 12.6	50.1 ± 10.7	0.983
Preoperative NAHS	47.3 ± 12.6	48.7 ± 14.0	0.669
1 Year F/U mHHS	82.0 ± 17.5	67.0 ± 13.7	0.012*
1 Year F/U NAHS	83.0 ± 17.9	71.5 ± 13.7	0.062
Final F/U mHHS	84.6 ± 15.5	76.7 ± 16.5	0.066
Final F/U NAHS	85.4 ± 15.5	77.1 ± 17.1	0.052

(*) statistically significant, mHHS – Modified Harris Hip Score, NAHS – Nonarthritic Hip Score, F/U – Follow-Up.

RESULTS

Table 4. Clinical Score Comparison for Hip Arthroscopy Patients Undergoing Primary or Revision Surgery

Scoring Instrument	Primary Surgery (mean ± SD)	Revision Surgery (mean ± SD)	P value
Preoperative mHHS	50.1 ± 12.5	48.5 ± 12.1	0.656
Preoperative NAHS	47.3 ± 12.6	46.8 ± 9.5	0.882
1 Year F/U mHHS	81.3 ± 17.6	84.2 ± 13.2	0.620
1 Year F/U NAHS	82.4 ± 17.9	89.2 ± 9.1	0.259
Final F/U mHHS	84.2 ± 15.7	77.7 ± 16.3	0.133
Final F/U NAHS	85.0 ± 15.7	78.9 ± 15.2	0.142

mHHS – Modified Harris Hip Score, NAHS – Nonarthritic Hip Score, F/U – Follow-Up.

RESULTS

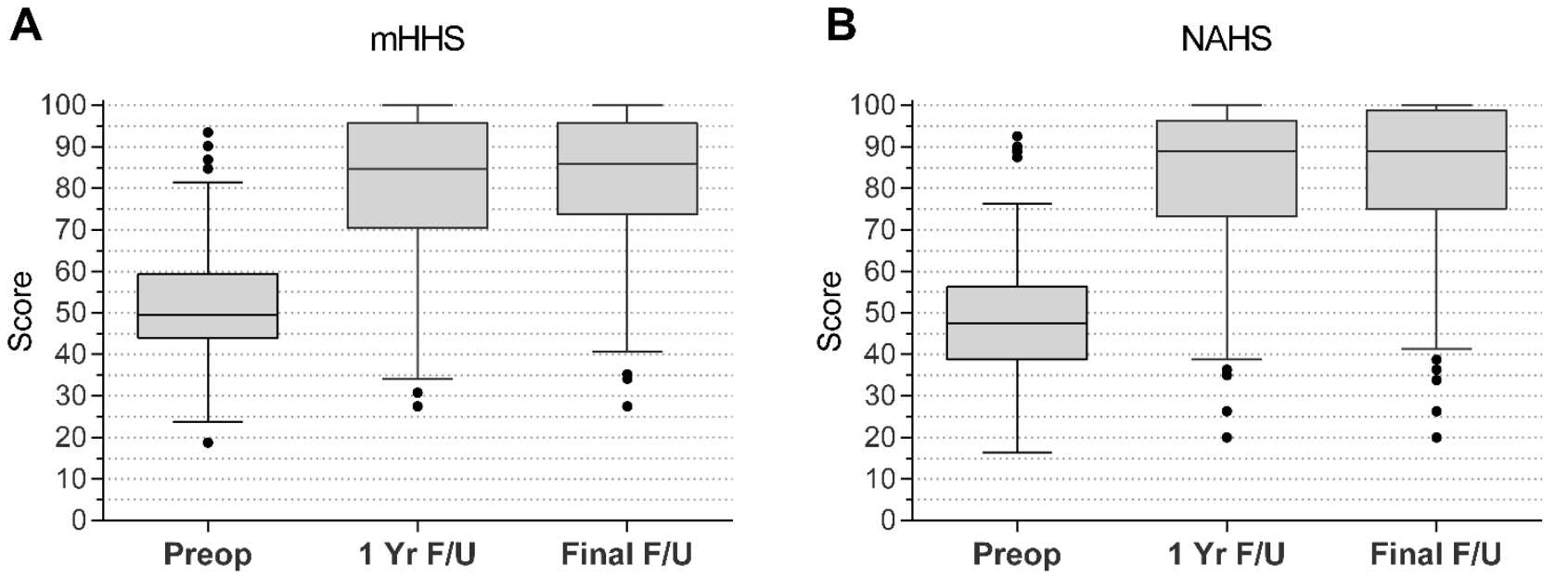

Figure 2. Box plot comparison of preoperative and postoperative modified Harris Hip Score (mHHS) and Nonarthritic Hip Score (NAHS) for patients undergoing hip arthroscopy to treat femoroacetabular impingement. Boxes depict 25th percentile, median, and 75th percentile scores. Whiskers depict Tukey fences of 1.5xIQR. Outlier data points are represented by solid circles. Significant increases in median scores at 1 year and final follow-up were demonstrated by each scoring instrument.

DISCUSSION

CT imaging with multiplanar reformatting enables a visual appreciation of bony abnormality, and quantification of bony parameters that may contribute to FAI. Increased femoral head-neck asphericity and alpha angle may be associated with chondral injury within the hip, and increased risk of osteoarthritis.[7–10] While good to excellent outcomes have been demonstrated with arthroscopic treatment of FAI, [11–13] and it is widely considered necessary to appropriately recontour all sources of bony impingement,[14] it has not been demonstrated that detailing bony anatomy on preoperative CT imaging has a significant impact on clinical outcomes.

This study has demonstrated that good to excellent clinical outcomes may be achieved in cases of FAI that undergo arthroscopic treatment, irrespective if there is preoperative CT imaging with multiplanar reformatting available. With respect to the magnitude of clinical improvement, preoperative CT imaging did not lead to superior outcomes at 1 year follow-up, or at final follow-up, in those patients followed for at least 2 years postoperatively. Subanalysis of those patients undergoing a primary hip arthroscopy procedure did not identify superior clinical outcomes in those who had preoperative CT imaging.

CONCLUSIONS

Preoperative CT imaging with multiplanar reformatting does not lead to improved short-term clinical outcomes in patients who undergo arthroscopic treatment of femoroacetabular impingement.

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