

Preoperative Differences in Joint Space Width Predict Early Conversion to Total Hip Arthroplasty following Hip Arthroscopy: 5-Year Outcomes

Zachary Logan Laporte¹, Nathan J Cherian, Christopher Thomas Eberlin², Kieran Dowley, Kaveh Torabian, Michael C Dean, Stephen Gillinov¹, Bilal Sohail Siddiq, Scott David Martin

¹Massachusetts General Hospital, ²Sports Medicine - MGB

INTRODUCTION:

Reduced joint space at the time of joint-preserving hip arthroscopy has been shown to be correlated with higher rates of eventual conversion to total hip arthroplasty (THA). However, there continues to be a subset of patients without previously studied risk factors that garner limited benefit from hip preservation surgery and require early conversion to THA. As such, there is a need to reassess preoperative variables and patient-specific characteristics that may portend minimal clinical benefit or early failure following hip arthroscopy. This study sought to determine if quantitative differences in joint space width (JSW) between the operative and nonsurgical hip at the time of hip arthroscopy predicted the likelihood of conversion to THA.

METHODS:

We performed a retrospective review of patients undergoing arthroscopic acetabular labral repair by a single-surgeon from 2008 to 2016 with a minimum of 5-year follow up. Patients were stratified into cohorts based on whether they received a subsequent THA. Preoperative, anteroposterior pelvic radiographs were obtained for each patient and semi-automated, quantitative JSW measurements were performed at 3 fixed locations per hip (10°, 30°, and 50° in a polar coordinate system, **Figure 1**). All measurements were obtained by an independent assessor blinded to other radiographic or clinical information, with high reliability (intra-class correlations >0.8), as previously described in literature. Differences in JSW at each prefixed angle were calculated by subtracting the width (millimeters) of each patient's operative hip from the measurements obtained from their nonsurgical hip.

RESULTS:

A total of 106 patients were identified with a mean [standard deviation (SD)] follow up of 8.23 [2.24] years. Of these patients, 21 (19.8%) converted to THA and 85 (80.2%) did not. When comparing demographic and intraoperative characteristics between cohorts (**Table 1, Table 2**), THA patients were found to have higher mean [SD] age 40.4 [13.1; p=0.006], BMI 27.2 [3.9; p=0.016], Tönnis grade (p<0.001), and Outerbridge grade (p=0.012). THA patients were found to have a significantly greater difference in JSW at 10° (0.494 ± 0.985mm versus -0.064 ± 0.609mm, p=0.009), 30° (0.779 ± 0.839mm versus 0.029 ± 0.507mm, p<0.001), and 50° (0.358 ± 0.832mm versus -0.044 ± 0.527mm, p=0.045) compared to those that did not require subsequent hip arthroplasty. Upon adjusting for differences in JSW at all locations, only the difference at 30° remained significantly correlated with conversion to THA (p=0.001), so our final regression only included JSW difference at the 30° location. When adjusting for significantly different covariates, the difference in JSW at 30° was correlated with an increased likelihood of conversion to THA (Adjusted Odds Ratio [AOR]: 16.64; 95% Confidence Interval [CI]: 3.18 to 87.05; p < 0.001) (**Table 3**).

DISCUSSION AND CONCLUSION: To best educate patients on the risk of THA following hip arthroscopy, identifying objective predictors of early failure is imperative during preoperative evaluation. This study identifies that differences in JSW at 30° between the operative and nonsurgical hip are significantly associated with increased risk of conversion after controlling for demographic and preoperative factors.

Figure 1: Quantitative Joint Space Width Measurements at Predefined Locations (10°, 30°, & 50°)

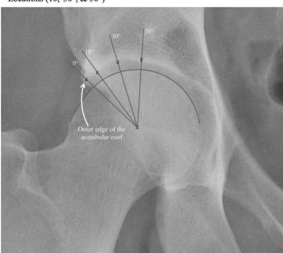


Table 1. Baseline Characteristics for Patients Undergoing Arthroscopic Labral Repair

	THA (n=21)	No THA (n=85)	P-value
Age	40.4 ± 13.1	32.9 ± 9.8	0.006
Body mass index	27.2 ± 3.9	23.0 ± 4.1	0.016
Sex			0.102
Male	11 (52.4)	31 (36.5)	
Female	10 (47.6)	54 (63.5)	
Laterality			0.211
Right	15 (71.4)	48 (56.5)	
Left	6 (28.6)	37 (43.5)	
Concordance angle, deg	34.5 ± 7.6	34.6 ± 7.8	0.951
Angle, deg	69.7 ± 11.0	63.0 ± 14.0	0.005
Tönnis angle, deg	19.4 ± 7	3.1 ± 4.3	0.007
Type of Fall			0.411
None	3 (14.3)	10 (11.8)	
Isolated Pincer	7 (33.3)	38 (44.7)	
Isolated Cam	3 (14.3)	4 (4.7)	
Combined	8 (38.1)	36 (42.3)	<0.001
Tönnis Grade			
Grade 0	2 (9.5)	23 (27.1)	
Grade 1	9 (42.9)	56 (65.5)	
Grade 2	7 (33.3)	8 (9.4)	*
Grade 3	3 (14.3)	8 (9.4)	*
Kellgren Lawrence			0.045
Grade 0	2 (9.5)	12 (14.1)	
Grade 1	3 (14.3)	22 (25.9)	
Grade 2	9 (42.9)	42 (49.4)	
Grade 3	7 (33.3)	9 (10.6)	*
Grade 4	0 (0.0)	0 (0.0)	*
JSW difference at 10° location, mm	0.494 ± 0.985	-0.064 ± 0.609	0.009
JSW difference at 30° location, mm	0.779 ± 0.839	0.029 ± 0.507	<0.001
JSW difference at 50° location, mm	0.358 ± 0.832	-0.044 ± 0.527	0.045

*Statistically Significant (P < 0.05 or adjusted standardized residual > 3).
None reported or none < 100% of hips (%), THA, Total Hip Arthroplasty; JSW, Joint Space Width.

Table 2. Intraoperative Characteristics for Patients Undergoing Arthroscopic Labral Repair

	THA (n=21)	No THA (n=85)	P-value
Outerbridge			0.012
Grade 0	0 (0.0)	3 (3.5)	
Grade 1	0 (0.0)	4 (4.7)	
Grade 2	2 (9.5)	24 (28.3)	
Grade 3	11 (52.4)	47 (55.3)	
Grade 4	8 (38.1)	7 (8.2)	*
Beck (Labral)			0.283
Stage 1	3 (14.3)	11 (12.9)	
Stage 2	4 (19.0)	34 (40.0)	
Stage 3	3 (14.3)	5 (5.9)	
Stage 4	7 (33.3)	23 (27.1)	
FAI Procedures			0.241
None	3 (14.3)	11 (12.9)	
Acetabuloplasty	6 (28.6)	35 (41.2)	
Emersonary	3 (14.3)	3 (3.5)	
Femoroacetabuloplasty	9 (42.9)	36 (42.4)	
Other Procedures			
Misofixation	1 (4.8)	7 (8.2)	1.000
Allograft Chondroplasty	2 (9.5)	2 (2.4)	0.175
On acetabul removal/fixation	2 (9.5)	3 (3.5)	0.257
Chondral Flip Prost	8 (38.1)	21 (24.7)	0.716

*Statistically Significant (P < 0.05 or adjusted standardized residual > 3).

Table 3. Results of Multivariable Regression

	AORs	95% CI	P-value
Age	0.99	0.92-1.06	0.726
Body mass index	1.28	1.07-1.52	0.008*
Tönnis Grade	16.56	3.32-82.53	<0.001*
JSW difference at 30° location	16.64	3.18-87.05	<0.001*

AOR, Adjusted Odds Ratio; CI, Confidence Interval; JSW, Joint Space Width.

Tönnis grade was categorized into low (grades 0-1) versus high (grades 2-3).

*Statistically Significant (P < 0.05).