

BACKGROUND AND OBJECTIVES

- The acetabular labrum is a triangular shaped fibrocartilaginous structure that surrounds the hip.
- If the labrum becomes torn, the seal is disrupted and health of the joint may be compromised.
- One of the major risk factors for acetabular labral tears is femoroacetabular impingement (FAI): asphericity of the femoral head (cam), excessive coverage of the anterior superior acetabular rim (pincer) or a retroverted acetabulum.
- Arthroscopic treatments for labral tears include debridement and repair. Labral debridement involves trimming and smoothing areas of torn or frayed labrum, while labral repair utilizes anchors and sutures to bundle tissue together and refix the labrum to its anatomical position.
- While restoration of the labral seal provides a theoretical advantage, biomechanical studies have yielded mixed results when comparing the two surgical options and their effects on cartilage preservation.
- While the current literature has shown positive functional results with labral repair, the comparative studies have not reported a significant difference in conversion to THA.
- The purpose of this study was to investigate two different labral treatments, labral repair and labral debridement, with an adjusted analysis to evaluate the long-term conversion to THA.

METHODS

- This is a retrospective cohort study of patients undergoing hip arthroscopy by a single surgeon between April 2007 and October 2014.
- Patients were included if they met the following criteria: acetabular labral tear that was treated with labral repair or labral debridement, minimum 5-year follow-up from the date of surgery to the date of survey response, completion of study surveys and availability of preoperative radiographs.
- Patients were excluded if they met any of the following conditions: preoperative radiographs demonstrating a center edge angle (CEA) of $<20^\circ$ indicating hip dysplasia, underwent hip arthroscopy for FAI without concomitant labral tear, underwent hip arthroscopy after previous ipsilateral hip surgery or underwent hip arthroscopy for osteonecrosis or pigmented villonodular synovitis.
- Labral debridement was performed if the labral tear was degenerative, hypoplastic, or isolated to a single plane involving less than 50% of the labrum.
- Labral repair was performed if there was adequate remaining healthy labral tissue for suture fixation or if the tear was complex with extension into the chondrolabral junction.
- All patients analyzed in this study underwent the same strict postoperative rehabilitation protocol.
- Postoperative follow-up information included repeat hip arthroscopy on ipsilateral side following surgery with the senior author, conversion to THA, patient-reported outcome measures and patient satisfaction.

RESULTS

- Of the 204 hips included in the study, 99 (48.5%) and 105 (51.5%) underwent labral repair and labral debridement, respectively. (Table 1)

Table 1: Baseline Demographics for Patients Undergoing Hip Arthroscopy for Acetabular Labral Tear

	Labral Repair N=99	Labral Debridement N=105	P Value
Age	34.1 ± 1.9	40.4 ± 2.3	0.000*
BMI	25.8 ± 0.7	27.5 ± 1.0	0.012
Sex			0.589
Male	49 (49.5%)	48 (45.7%)	
Female	50 (50.5%)	57 (54.3%)	
Laterality			0.875
Right	52 (52.5%)	54 (51.4%)	
Left	47 (47.5%)	51 (48.6%)	
Preoperative Steroid Injections	1.23 ± 0.2	1.08 ± 0.2	0.422
CEA	34.8 ± 1.1	35.4 ± 1.2	0.472
Radiographic FAI			0.000*
Isolated Pincer	36 (36.4%)	5 (4.8%)	
Isolated Cam	8 (8.1%)	47 (44.8%)	
Combined	43 (43.4%)	16 (15.2%)	
None	12 (12.1%)	37 (35.2%)	
Tönnis			0.113
Grade 0	24 (24.2%)	30 (28.6%)	
Grade 1	67 (67.7%)	57 (54.3%)	
Grade 2	8 (8.1%)	16 (15.2%)	
Grade 3	0 (0.0%)	2 (1.9%)	

Abbreviations: BMI (Body mass index), CEA (Center edge angle), FAI (Femoroacetabular impingement)
Significance: * $p < 0.05$

RESULTS

- Intraoperative demographics between the two cohorts included Outerbridge grade ($p=0.18$), femoroplasty ($p=0.35$), acetabuloplasty ($p < 0.001$), microfracture ($p=0.19$), abrasion chondroplasty ($p < 0.001$), os acetabuli removal/fixation ($p=0.29$), chondrocalcinosis debridement ($p=0.33$), ligamentum teres debridement ($p=0.94$) and iliopsoas tendon debridement ($p=0.76$). (Table 2)

Table 2: Intraoperative Demographics for Patients Undergoing Hip Arthroscopy for Acetabular Labral Tear

	Labral Repair N=99	Labral Debridement N=105	P Value
Outerbridge			0.176
Grade 0	1 (1.0%)	3 (2.8%)	
Grade I	17 (17.2%)	17 (16.2%)	
Grade II	46 (46.5%)	35 (33.3%)	
Grade III	26 (26.3%)	31 (29.5%)	
Grade IV	9 (9.1%)	19 (18.1%)	
Procedures			
Femoroplasty	52 (52.5%)	62 (59.0%)	0.348
Acetabuloplasty	81 (81.8%)	19 (18.1%)	0.000*
Microfracture	4 (4.0%)	9 (8.6%)	0.185
Abrasion Chondroplasty	5 (5.0%)	23 (21.9%)	0.000*
Os Acetabuli Removal/Fixation	3 (3.0%)	1 (1.0%)	0.285
Chondrocalcinosis Debridement	0 (0.0%)	1 (1.0%)	0.330
Ligamentum Teres Debridement	3 (3.0%)	3 (2.8%)	0.942
Iliopsoas Tendon Debridement	3 (3.0%)	4 (3.8%)	0.760

Significance: * $p < 0.05$

- Twenty-eight (13.7%) of the 204 patients underwent conversion to THA within 10 years following hip arthroscopy.
- In the multivariable Cox model, which adjusted for all variables that were significantly different between treatment groups at baseline or those presumed to be predictive of conversion of THA, labral repair remained associated with significantly lower risk of conversion to THA compared to debridement (hazard ratio [HR] = 0.24, 95% CI 0.07-0.74, $p = 0.01$). (Figure 1)
- Additional factors associated with risk of conversion to THA included increasing age at time of arthroscopy (HR = 1.06 per year, 95% CI 1.02-1.11, $p = 0.002$) and Tönnis grade (HR = 2.39, CI 1.14-5.41, $p = 0.03$). (Table 3)

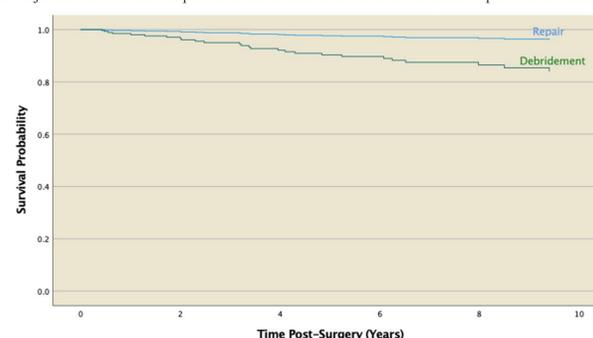
Table 3: Results of Cox multivariate regression adjusting for variables that were significantly different at baseline between treatment groups and those presumed to be predictive of conversion to total hip arthroplasty

Variable	HR	95% Confidence Interval	P Value
Treatment (Repair v Debridement)	0.24	0.07-0.74	0.014*
Abrasion Chondroplasty	1.80	0.65-5.00	0.257
Acetabuloplasty	2.39	0.84-6.78	0.102
Age	1.06	1.02-1.11	0.002*
BMI	1.06	0.98-1.14	0.176
Outerbridge	1.23	0.68-2.21	0.490
Radiographic FAI	0.84	0.58-1.20	0.329
Tönnis	2.39	1.14-5.41	0.026*

Abbreviations: BMI (Body mass index), FAI (Femoroacetabular Impingement)

Significance: * $p < 0.05$

Figure 1: Adjusted survival curves plotted at the means of covariates for labral repair versus labral debridement



- For patients who did not convert to THA, there was no difference in mean ($\pm 95\%$ CI) patient reported outcome measures at final follow-up for mHHS [labral repair: 86.1 ± 3.1 v labral debridement: 84.1 ± 3.1 , $p=0.38$], HOS-ADL [88.3 ± 3.0 v 87.2 ± 3.0 , $p=0.60$], HOS-Sport [75.1 ± 5.0 v 72.4 ± 5.5 , $p=0.48$], iHOT-33 [75.0 ± 4.9 v 71.5 ± 5.2 , $p=0.31$], NAHS [84.1 ± 3.8 v 83.0 ± 3.1 , $p=0.69$], or LEFS [67.8 ± 3.0 v 66.0 ± 3.3 , $p=0.40$].

CONCLUSIONS

- The results from this study provide novel evidence, the first study to document a statistically significant difference, that patients who underwent labral repair were less likely to convert to total hip arthroplasty when compared to patients who underwent labral debridement despite adjusting for differences in baseline demographics and preexisting pathology.
- This study reinforces the importance of labral conservation to preserve long term health of the hip joint.
- Additional factors associated with a lower rate of hip survival were older age and osteoarthritis at the time of hip arthroscopy.
- This study supports prior evidence that advanced age and osteoarthritis at the time of hip arthroscopy are predictive of poor postoperative outcomes and progression to THA.
- Among the hips that survived, both cohorts reported PROMs at final follow-up that exceeded the patient acceptable symptomatic state threshold for long term follow-up.

LIMITATIONS AND FUTURE DIRECTIONS

- This was a retrospective analysis and subject to the limitations therein; a randomized controlled trial would be needed to definitively determine causality.
- The choice of treatment was based on pre-existing labral pathology.
- However, indications for labral debridement featured pathology that was not necessarily more severe than labral repair, as patients with tears isolated to a single plane involving less than 50% of the labrum were debrided, whereas patients with tears extending into the chondrolabral junction were repaired.
- The analysis also adjusted for differences that are correlated with poor prognoses following hip arthroscopy including cartilage damage, FAI, and OA.
- Labral debridement is a less technically challenging procedure, while labral repair is complicated and requires an expert hip arthroscopist. Thus, results may differ in non-high-volume hip arthroscopists.

FUNDING SOURCE

The authors gratefully acknowledge the funding and generosity of the Conine Family Fund for Joint Preservation.

KEY REFERENCES

- Beaulé PE, Speirs AD, Anwender H, et al. Surgical Correction of Cam Deformity in Association with Femoroacetabular Impingement and Its Impact on the Degenerative Process within the Hip Joint. *Journal of Bone and Joint Surgery - American Volume*. 2017;99(16):1373-1381. doi:10.2106/JBJS.16.00415
- Crawford MJ, Dy CJ, Alexander JW, et al. The biomechanics of the hip labrum and the stability of the hip. In: *Clinical Orthopaedics and Related Research*. Vol 465. Lippincott Williams and Wilkins; 2007:16-22. doi:10.1097/BLO.0b013e31815b181f
- Ferguson SJ, Bryant JT, Ganz R, Ito K. An in vitro investigation of the acetabular labral seal in hip joint mechanics. *Journal of Biomechanics*. 2003;36(2):171-178. doi:10.1016/S0021-9290(02)00365-2
- Ferguson SJ, Bryant JT, Ganz R, Ito K. The acetabular labrum seal: A poroelastic finite element model. *Clinical Biomechanics*. 2000;15(6):463-468. doi:10.1016/S0268-0033(99)00099-6
- Kelly BT, Weiland DE, Schenker ML, Philippon MJ. Arthroscopic labral repair in the hip: Surgical technique and review of the literature. *Arthroscopy - Journal of Arthroscopic and Related Surgery*. 2005;21(12):1496-1504. doi:10.1016/j.arthro.2005.08.013
- Krych AJ, Thompson M, Knutson Z, Scoon J, Coleman SH. Arthroscopic labral repair versus selective labral debridement in female patients with femoroacetabular impingement: A prospective randomized study. *Arthroscopy - Journal of Arthroscopic and Related Surgery*. 2013;29(1):46-53. doi:10.1016/j.arthro.2012.07.011
- Larson CM, Giveans MR, Stone RM. Arthroscopic debridement versus refixation of the acetabular labrum associated with femoroacetabular impingement: Mean 3.5-year follow-up. *American Journal of Sports Medicine*. 2012;40(5):1015-1021. doi:10.1177/0363546511434578
- Leunig M, Beaulé PE, Ganz R. The concept of Femoroacetabular impingement: Current status and future perspectives. In: *Clinical Orthopaedics and Related Research*. Vol 467. Springer New York; 2009:616-622. doi:10.1007/s11999-008-0646-0
- Menge TJ, Briggs KK, Dorman GJ, McNamara SC, Philippon MJ. Survivorship and outcomes 10 years following hip arthroscopy for femoroacetabular impingement labral debridement compared with labral repair. *Journal of Bone and Joint Surgery - American Volume*. 2017;99(12):997-1004. doi:10.2106/JBJS.16.01060
- Schmaranzer F, Haefeli PC, Hanke MS, et al. How Does the dGEMRIC Index Change After Surgical Treatment for FAI? A Prospective Controlled Study: Preliminary Results. *Clinical Orthopaedics and Related Research*. 2017;475(4):1080-1099. doi:10.1007/s11999-016-5098-3