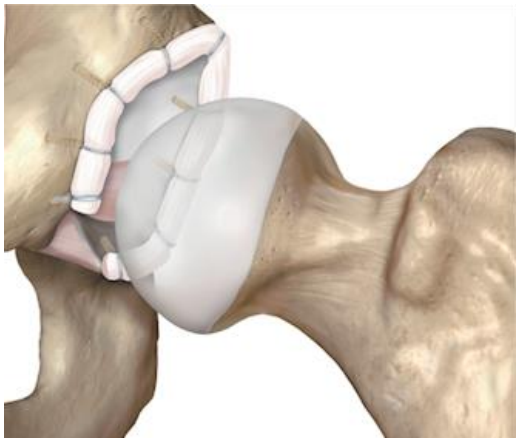
Adolescents Who Underwent Revision Hip Arthroscopy Demonstrated a Comparable Magnitude of Improvement at a Minimum Two-Year Follow-Up When Compared to a Primary Group. A Propensity Match Controlled Study

David R. Maldonado, MD
Andrew R. Schab, BS
Rachel M. Glein, BS
Drashti Sikligar, M.Eng
Benjamin G. Domb, MD



UTHealth
The University of Texas
Health Science Center at Houston

AMERICAN HIP INSTITUTE

ISAKOS CONGRESS 2025 | MUNICH GERMANY
June 8–11

Disclosures

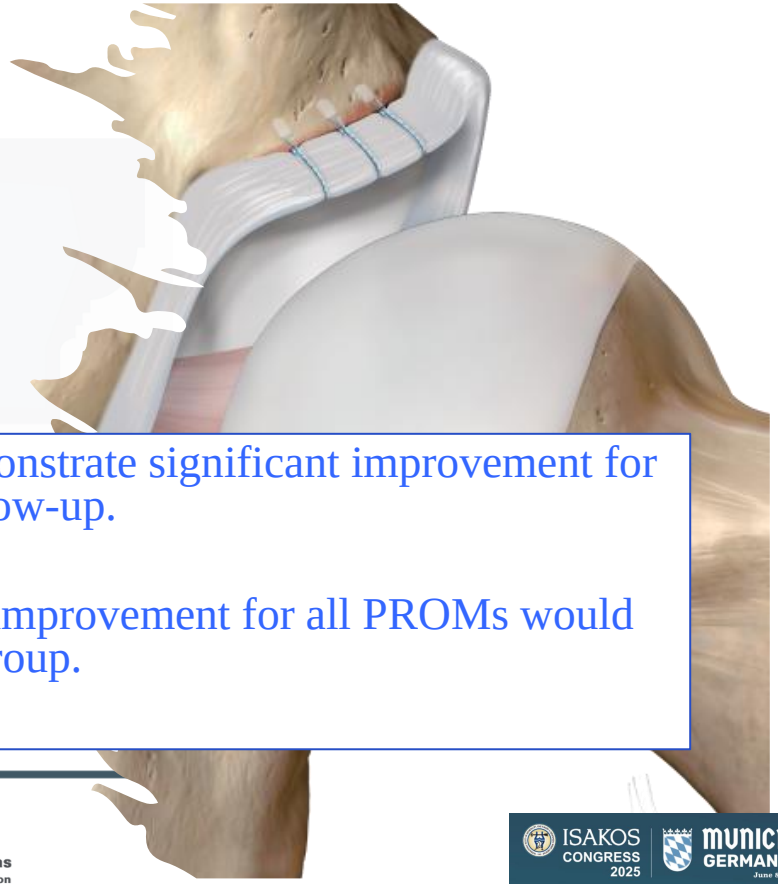
I (and/or my co-authors) have something to disclose.

Detailed disclosure information is available via:

AAOS Orthopaedic Disclosure Program on the AAOS website at http://www.aaos.org/disclosure

Purposes/Hypothesis

- To report a minimum two-year patient-reported outcome measures (PROMs) of revision hip arthroscopy (HA) in adolescents.
- To compare their results to a propensity-matched (PM) primary control group.



- Adolescents who underwent revision HA would demonstrate significant improvement for all the PROMs collected at a minimum two-year follow-up.
- When compared to a PM primary control group, the improvement for all PROMs would be significantly inferior for the revision adolescent group.

Methods

- Data were prospectively collected & retrospectively reviewed (November 2008 and November 2021).
- April 2017 – July 2020.

Inclusion Criteria	Exclusion criteria
Revision hip arthroscopy.	Tönnis grade of osteoarthritis > 1.
Baseline & minimum 2-year FU for the mHHS, NAHS, HOS-SSS, iHOT-12 and VAS.	Lateral center-edge angle <18°.
Answered the 2-year anchor question for satisfaction.	Previous periacetabular/femoral osteotomies.
Age ≤ 19 –yo.	Concomitant pertrochanteric work.
	WC.

- Revision cohort PM to a control group in a 1:2 ratio based on age at surgery, sex, BMI, and acetabular Outerbridge grade.
- PROMs, Clinical benefit (MCID, PASS, MOI) and secondary surgery rates were compared.
- An a priori power analysis; 35 cases were required in each group.

Results

Table 1. Propensity Matched Groups Demographic Characteristics

	Revision	Primary	P Value
Eligible Hip Arthroscopy with Follow-Up*	37	361	
Matched Cases*	37	74	
Sex†			
Female	5 (13.5%)	12 (16.2%)	0.93
Age at Surgery (yr.)‡	17.55 ± 0.96	17.52 ± 0.99	0.89
Duration of symptoms (mo.)‡	4.97 ± 18.90	2.19 ± 14.05	0.46
Body mass index (kg/m^2)‡	22.86 ± 4.75	23.19 ± 4.61	0.73
Follow-up time (mo.)‡	64.13 ± 34.51	73.15 ± 33.21	0.19

Table 2. Propensity Matched Groups Radiographic Findings

	Revision	Primary	P Value
Preoperative Findings			
Tonnis grade*			
1	4 (10.8%)	6 (8.2%)	0.92
Lateral Center-Edge Angle (deg)†	30.46 ± 5.52	28.39 ± 5.47	0.06
Anterior Center-Edge Angle (deg)†	33.04 ± 7.62	30.54 ± 6.98	0.10
Alpha Angle (deg) †	47.31 ± 12.15	56.99 ± 12.16	< 0.01*
Postoperative Findings			
Tonnis grade*			
1	4 (10.8%)	6 (8.2%)	0.92
Lateral Center-Edge Angle (deg) †	29.28 ± 5.16	27.32 ± 5.98	0.10
Anterior Center-Edge Angle (deg)†	30.76 ± 5.89	30.14 ± 6.98	0.66
Alpha Angle (deg) †	43.37 ± 5.25	44.44 ± 6.27	0.39

Table 3. Propensity Matched Groups Intraoperative Findings

	Revision	Primary	P Value
Seldes Labral Tear Type			< 0.01*
None	3 (8.1%)	1 (1.4%)	
Type 1	6 (16.2%)	34 (45.9%)	
Type 2	6 (16.2%)	19 (25.7%)	
Combined Types 1 and 2	22 (59.5%)	20 (27.0%)	
ALAD			0.92
0	13 (35.1%)	26 (35.1%)	
1	11 (29.7%)	20 (27.0%)	
2	7(18.9%)	29 (25.7%)	
3	5 (13.5%)	8 (10.8%)	
4	1 (2.7%)	1 (1.4%)	
Acetabular Outerbridge Grade			0.96
0	12 (32.4%)	25 (33.8%)	
1	11 (29.7%)	20 (27.0%)	
2	8 (21.6%)	20 (27.0%)	
3	4 (10.8%)	6 (8.1%)	
4	2 (5.4%)	3 (8.1%)	
Femoral-Head Outerbridge Grade			0.22
0	30 (88.2%)	70 (94.6%)	
1	0 (0.0%)	0 (0.0%)	
2	1 (2.9%)	2 (2.7%)	
3	1 (2.9%)	2 (2.7%)	
4	2 (5.9%)	0 (0.0%)	

Table 4. Propensity Matched Groups Intraoperative Procedures

	Revision	Primary	P Value
Labral Treatment			< 0.01*
None	1 (2.7%)	0 (0.0%)	
Repair	8 (21.6%)	65 (87.8%)	
Selective Debridement	13 (35.1%)	6 (8.1%)	
Reconstruction	15 (40.5%)	3 (4.1%)	
Osteoplasty			
Acetabuloplasty	19 (51.4%)	56 (75.7%)	< 0.05*
Femoroplasty	24 (64.9%)	62 (83.8%)	< 0.05*
Ligamentum Teres Treatment			
Debridement	6 (16.2%)	4 (5.4%)	0.06
Reconstruction	1 (2.7%)	0 (0.0%)	
None	30 (81.1%)	70 (94.6%)	
Capsular Treatment			< 0.01*
Repair	26 (70.3)	68 (91.9%)	
Interportal capsulotomy without repair	10 (27.0%)	6 (8.1%)	

Preoperative and Postoperative mHHS, NAHS, HOS-SSS, and iHOT-12 for Revision and Primary Hip Arthroscopy in Adolescents

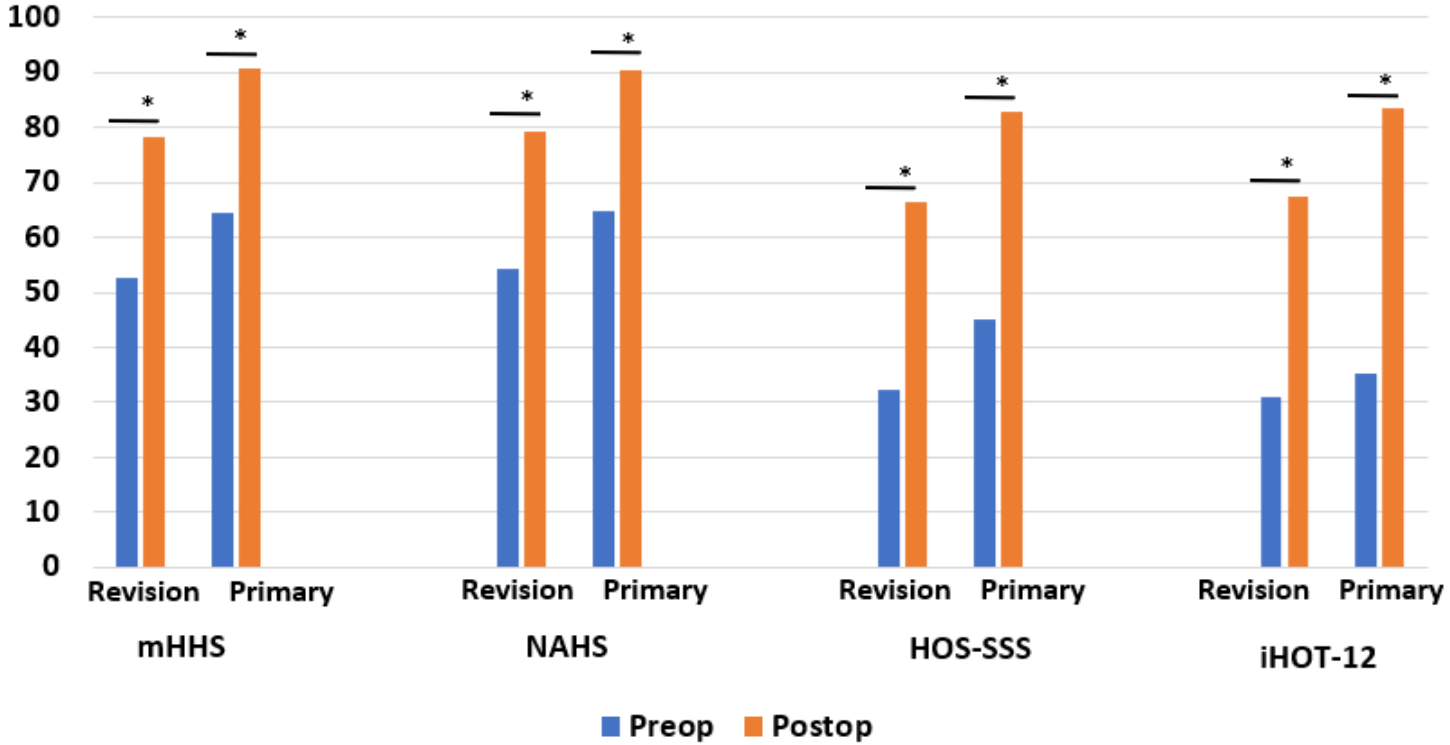


Table 5. Propensity Matched Groups PROMs

	Revision	Primary	P Value
mHHS			
Preoperative	*52.55 ± 15.05*	*64.38 ± 13.94*	< 0.01*
Postoperative	*78.21 ± 18.21*	*90.57 ± 11.01*	< 0.01*
P Value	< 0.01*	< 0.01*	
Δ	*25.46 ± 21.08*	*26.19 ± 16.37*	0.85
NAHS			
Preoperative	*54.15 ± 16.69*	*64.76 ± 16.37*	< 0.01*
Postoperative	*79.12 ± 18.07*	*90.51 ± 11.79*	< 0.01*
P Value	<0.01*	< 0.01*	
Δ	*23.85 ± 22.52*	*25.75 ± 17.74*	0.64
HOS-SSS			
Preoperative	*32.23 ± 20.32*	*45.23 ± 20.96*	< 0.01*
Postoperative	*66.29 ± 29.25*	*82.85 ± 20.54*	< 0.01*
P Value	< 0.01*	< 0.01*	
Δ	*34.48 ± 35.47*	*37.46 ± 26.11*	
iHOT-12			
Preoperative	*30.96 ± 10.80*	*35.23 ± 19.52*	0.44
Postoperative	*67.25 ± 28.49*	*83.48 ± 18.50*	< 0.01*
P Value	<0.01*	<0.01*	
Δ	*45.12 ± 22.65*	*46.11 ± 30.12*	0.91
VAS			
Preoperative	*6.13 ± 2.46*	*5.47 ± 2.21*	0.16
Postoperative	*3.50 ± 2.74*	*1.68 ± 2.06*	< 0.01*
P Value	< 0.01*	< 0.01*	
Δ	*-2.58 ± 3.11*	*-3.79 ± 2.87*	0.05
Satisfaction	*7.68 ± 2.42*	*8.41 ± 2.01*	0.10

- Rates for achieving the MCID, PASS, and MOI were significantly lower, except for the PASS and MOI for the mHHS, for the revision group.

- The revision group was 4.83 times as likely to receive a subsequent hip arthroscopy when compared to the primary group ($P < 0.05$).

Discussion

Significant improvement for all PROs and high following Revision HA in adolescents at a minimum 2-year FU.

Comparable PROMs improvement but ower clinical benefit and higher risk of secondary surgery compared to PM matched primary group.

- Newton et al. AJSM2016

  Similar results in terms of PROMs

- In our study, over 40% of the adolescents in the revision group underwent a labral reconstruction in the present study.

  - ✓ An irreparable tear is a possibility, particularly in the revision setting.
  - ✓ Herickhoff and Safran concluded that the intraoperative appearance of the labrum is the single most important factor for the labral treatment decision-making process.
  - ✓ Trivedi et al. systematically reviewed the indications for labral reconstruction and concluded that the most common indication was a deficient labrum on intraoperative evaluation.

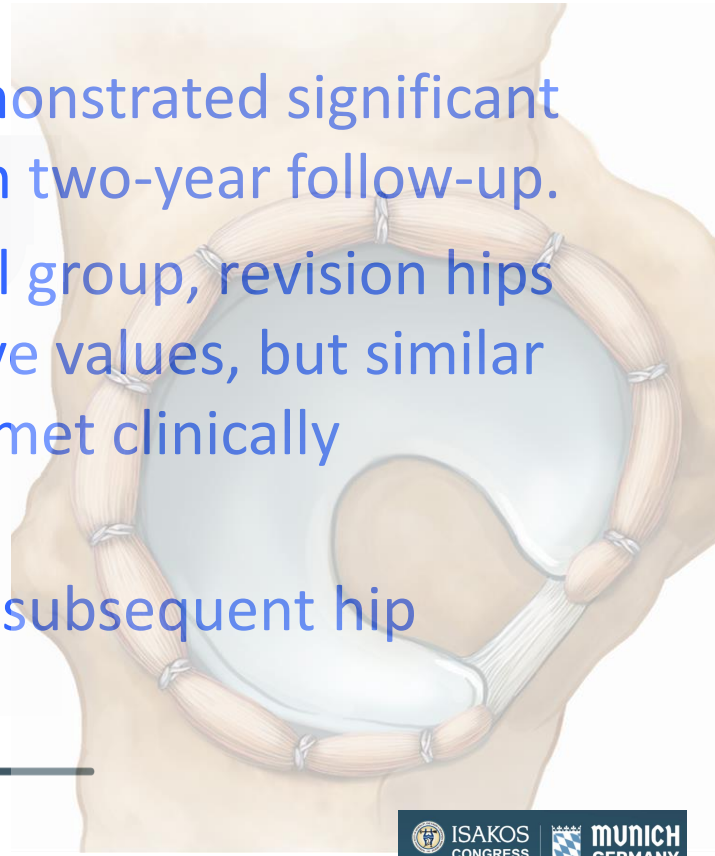
Strengths/Limitations

- Control group.
- Multiple PROs.
- Psychometrics tools.

- Non-randomized.
- Retrospective design.
- Short follow-up.
- Single Center-Single surgeon.
- Modest sample size.
- Selection bias.

Conclusions

- Adolescents undergoing revision HA demonstrated significant improvement in all PROMs at a minimum two-year follow-up.
- When compared to a PM primary control group, revision hips had lower preoperative and postoperative values, but similar improvement magnitude for all PROMs, met clinically meaningful thresholds at lower rates.
- Were 4.83 times more likely to require a subsequent hip arthroscopy.



References

1. Chen SL, Maldonado DR, Go CC, Kyin C, Lall AC, Domb BG. Outcomes of Hip Arthroscopic Surgery in Adolescents With a Subanalysis on Return to Sport: A Systematic Review. *Am J Sports Med*. 2020;48(6):1526-1534.
2. Maldonado DR, Kufta AY, Krych AJ, et al. Primary Hip Arthroscopy for Femoroacetabular Impingement Syndrome in Adolescents Improves Outcomes and Clinical Benefit Achievement Rates at Short-Term Follow-Up: A Multicenter Analysis. *Arthroscopy*. 2023;39(5):1211-1219.
3. Maldonado DR, Glein RM, Saks BR, et al. Minimum 2-Year Outcomes Following Arthroscopic Hip Labral Reconstruction in Adolescents and Young Adults. *J Pediatr Orthop*. 2022;42(2):83-89.
4. Maldonado DR, Monahan PF, Domb BG. Restoration of Labral Function in Primary Hip Arthroscopy From Labral Repair to Labral Reconstruction. *Arthroscopy*. 2021;37(10):3013-3015.
5. Maldonado DR, Kyin C, Rosinsky PJ, et al. Minimum 5-Year Outcomes for Revision Hip Arthroscopy With a Prospective Subanalysis Against a Propensity-Matched Control Primary Group. *Am J Sports Med*. 2021;49(8):2090-2101.
6. Menge TJ, Briggs KK, Rahl MD, Philippon MJ. Hip Arthroscopy for Femoroacetabular Impingement in Adolescents: 10-Year Patient-Reported Outcomes. *Am J Sports Med*. 2021;49(1):76-81.
7. Ashberg L, Walsh JP, Yuen LC, Perets I, Chaharbakhshi EO, Domb BG. Outcomes of Hip Arthroscopy in Adolescents: A Comparison of Acute Versus Chronic Presentation. Two-Year Minimum Follow-up. *J Pediatr Orthop*. 2018;38(2):e50-e56 .
8. Makhni EC, Ramkumar PN, Cvetanovich G, Nho SJ. Approach to the Patient With Failed Hip Arthroscopy for Labral Tears and Femoroacetabular Impingement. *J Am Acad Orthop Surg*. 2020;28(13):538-545.