Patients Age ≥ 40 Years Demonstrate Durable and Comparable Results to Patients Age < 40 Years following Primary Hip Arthroscopy for Femoroacetabular Impingement Syndrome: A Propensity Matched Study at Minimum 10-Year Follow Up

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INTRODUCTION:
Hip arthroscopy has become the mainstay surgical intervention for the treatment of femoroacetabular impingement syndrome (FAIS). However, postoperative outcomes and rate of secondary surgery are mixed in patients of differing age, specifically those less than or greater than 40 years old. Furthermore, there is a paucity of literature comparing patients less than or greater than 40 years old at long-term follow up. The purpose of the present study was to compare outcomes and rates of secondary surgery, including revision hip arthroscopy and conversion to total hip arthroplasty (THA), in patients greater than or equal to 40 years of age at minimum 10-year follow up compared to a propensity-matched control group of patients less than 40 years of age.
METHODS: Patients who underwent primary hip arthroscopy for FAIS between January 2012 and February 2013 were identified. Patients ≥40 years-old were propensity matched in a 1:1 ratio by sex, and body mass index (BMI) to patients with <40 years-old. Patient-reported outcomes (PROs) were collected at varying timepoints including preoperative, 1-, 2-, and 10-year postoperatively and compared between the two cohorts. Rates of Minimal Clinically Important Difference (MCID) and Patient Acceptable Symptomatic State (PASS) achievement at 10-years were evaluated and compared between groups. Rates of secondary surgery including revision hip arthroscopy and conversion to total hip arthroplasty (THA) were evaluated. Gross survivorship between cohorts was evaluated using a Kaplan-Meier gross survivorship curve.
RESULTS: Fifty-three patients age ≥40 (age: 48.3 ± 5.8 years; BMI: 26.3 ± 4.8 kg/m2) were successfully matched to 53 patients age <40 (age: 28.9 ± 7.2, <0.001; BMI: 25.5 ± 4.5 kg/m2, p = 0.354)(Table 1). No significant differences were noted regarding any preoperative characteristics, radiographic finding, or intraoperative findings between the two groups (p>0.05 for all). Both groups demonstrated significant improvement regarding all PROs at minimum 10-years (p<0.001 for all). No significant difference (p>0.05 for all) was noted between cohorts regarding any delta (preoperative to 10-years postoperative) scores (p>0.05 for all). When evaluating comparisons between preoperative, 1-, 2-, or 10-year PRO measures, no significant differences were noted regarding any PRO measure (p>0.05)(Table 2). High rates of MCID and PASS achievement were achieved in both cohorts, with no significant differences in any PRO measure (p>0.05 for all) (Figure 1). Similar rates of complications (age ≥40: 2.0%, age <40: 7.7%), rates of revision (age ≥40: 7.5%, age <40: 9.4%), and conversion to total hip arthroplasty (THA) (age ≥40: 13.2%, age <40: 3.8%) were demonstrated between groups (Table 3). On Kaplan-Meier analysis, no significant difference (p=0.321) was demonstrated in overall gross-survivorship between cohorts (Figure 2).
DISCUSSION AND CONCLUSION: Patients with age ≥40 undergoing primary hip arthroscopy for FAIS demonstrated durable and comparable 10-year PRO, rates of MCID and PASS achievement, and rates of reoperations to their propensity-matched age <40 counterparts.

Table 1. Preoperative demographic characteristics.

	Over 40	Under 40	p-Value
Sex			0.684
Female	33 (62.3%)	36 (67.9%)	
Male	20 (37.7%)	17 (32.1%)	
Age (years)	48.3 ± 5.8	28.9 ± 7.2	< 0.001*
BMI (kg/m2)	26.3 ± 4.8	25.5 ± 4.5	0.354
Physical Activity	54.7%	73.6%	0.068
Smoking (Current or Former)	3.8%	7.5%	0.678
Back Pain	30.2%	13.2%	0.058
Prior Spine Surgery	11.3%	5.7%	0.488
Psychiatric History	18.9%	18.9%	1.000
Workers' Compensation	9.4%	5.7%	0.716
Symptom Duration > 2 Years	50.9%	41.5%	0.436

BMI: body mass index. * indicates significance at a predetermined significance level of 0.05.

Table 2. Comparison of patient-reported outcomes (PROs) between patients who underwent reoperation prior to 10-year follow-up vs. those who did not at preoperative and 1-, 2-, and 10-year postoperative time points.

	Preoperative	1 Year Postoperative	2 Years Postoperative	10 Years Postoperative
			Over 40	
HOS-ADL	64.3 ± 19.0	98.3 ± 14.7	84.4 ± 17.1	83.4 ± 16.5
HOS-SS	42.8 ± 24.1	74.6 ± 21.7	65.2 ± 25.8	72.2 ± 22.6
mHHS	55.8 ± 17.5	77.4 ± 9.5	73.9 ± 17.6	72.9 ± 14.9
iHOT-12			66.9 ± 23.0	74.4 ± 24.3
VAS Pain	72.4 ± 16.1	58.2 ± 18.4	21.5 ± 23.2	26.9 ± 25.4
VAS Satisfaction	-	58.8 ± 22.1	83.3 ± 18.1	80.7 ± 18.0
			Under 40	
HOS-ADL	65.1 ± 17.9	88.6 ± 10.2	86.1 ± 17.9	86.1 ± 16.8
HOS-SS	40.7 ± 20.5	79.4 ± 16.9	72.3 ± 27.3	79.5 ± 26.9
mHHS	56.4 ± 14.8	76.9 ± 10.1	75.7 ± 17.2	75.9 ± 20.0
iHOT-12			58.3 ± 34.7	75.8 ± 28.4
VAS Pain	65.7 ± 19.0	41.9 ± 24.8	19.5 ± 21.7	26.5 ± 26.9
VAS Satisfaction	-	56.6 ± 30.1	74.8 ± 32.4	81.3 ± 31.5
			Over 40 vs. Under 40 (P-value)	
HOS-ADL	0.827	0.507	0.628	0.589
HOS-SS	0.643	0.369	0.216	0.225
mHHS	0.802	0.858	0.615	0.461
iHOT-12	-	-	0.475	0.830
VAS Pain	0.071	0.328	0.646	0.945
VAS Satisfaction	-	0.569	0.088	0.261

Continuous variables represented as mean ± standard deviation. Abbreviations: HOS-ADL/-SS: Hip Outcome Score Activities of Daily Living and Sports-Specific subscales. mHHS: modified Harris Hip Score. iHOT-12: 12-item international Hip Outcome Tool. VAS Pain/Satisfaction: Visual Analog Scales for Pain and Satisfaction. * indicates significance at a predetermined significance level of 0.05.

Table 3. Postoperative complications and reoperations.

	Over 40	Under 40	p-Value
Reoperation	20.8%	13.2%	0.438
Revision	7.5%	9.4%	1.000
THA	13.2%	3.8%	0.161
Complication	2.0%	7.7%	0.361
DVT	0.0%	1.9%	1.000
Infection	0.0%	3.8%	0.495
Neuropathy	2.0%	1.9%	1.000

Abbreviations: THA: total hip arthroplasty. DVT: deep-vein thrombosis. * indicates significance at a predetermined significance level of 0.05.

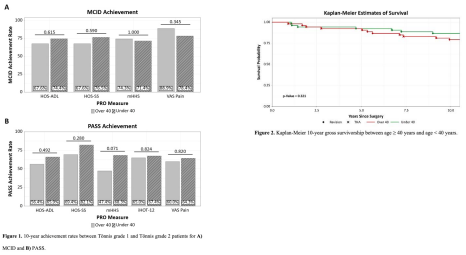

Figure 1. 10-year achievement rates between Tönnis grade 1 and Tönnis grade 2 patients for **A)** MCID and **B)** PASS.

Figure 2. Kaplan-Meier 10-year gross survivorship between age ≥ 40 years and age < 40 years.