Primary Hip Arthroscopy for Patients ≥ 40 Years of Age: Substantial Postoperative Improvements, Similar Revision Rates, but Higher 5 Year Risk of Conversion to Total Hip Arthroplasty Compared to Patients Under 40

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INTRODUCTION: This large retrospective cohort study sought to determine the relationship between patient age and risk of conversion to Total Hip Arthroplasty (THA) or revision hip arthroscopy and patient outcomes after primary hip arthroscopy for symptomatic femoroacetabular impingement syndrome (FAIS) at a minimum follow-up of 5-years.

METHODS: A retrospective review was conducted to identify patients who underwent primary hip arthroscopy for symptomatic FAIS by a single surgeon at a high-volume institution with a minimum 5-years follow-up. Patients were grouped as follows: age <40 years, age ≥40 years. Preoperative radiographs were assessed. Patient reported outcomes (PROs) were obtained preoperatively and at 5-years. Clinically Significant Outcomes (CSOs) were assessed by achievement of previously defined threshold scores to achieve a Minimal Clinically Important Difference (MCID), Patient Acceptable Symptom State (PASS), and Substantial Clinical Benefit (SCB) for the Hip Outcome Score Activities of Daily Living (HOS-ADL) and Sports Scale (HOS-SS) subscales, modified Harris Hip Score (mHHS), and the International Hip Outcome Tool (iHOT-12). Cox proportional hazards regression models with cubic splines were used to assess the continuous non-linear relationship between age and risk of conversion to total hip arthroplasty (THA) and revision hip arthroscopy (RHA) at 5-years as well as the risk of not achieving CSOs at 5-years.

RESULTS:

In total, 935 patients met the criteria for inclusion in this study. 618 patients (435 females, 183 males) were included in the <40 cohort with a mean age of 27±7 years compared to 317 patients (202 females, 115 males) a mean age of 48 ± 6 years (p<0.001) in the ≥40 cohort. The age <40 cohort had a significantly lower BMI (25±5 vs. 27±5 kg/m2; p=0.046), rate of hypertension (6% vs. 18%; p<0.001), back pain (10% vs. 26%; p<0.001), Tönnis Grade 1 osteoarthritis (4% vs. 14%; p<0.001), and preoperative chronic pain >2 years (17% vs. 23%; p=0.019) and postoperative chronic pain >2 years (3% vs. 10%; p<0.001).

Postoperatively, patients in both the <40 and ≥40 cohorts demonstrated statistically significant postoperative improvements (p<0.05) in all PROs measured. However, patients age ≥ 40 demonstrated lower HOS-ADL, HOS-SS, mHHS (p<0.001), and Visual Analog Scale (VAS) Satisfaction scores (p=0.006 and less improvement in mHHS scores (p = 0.010) as compared to patients < 40. Additionally, patients age ≥ 40 had lower rates of achievement of MCID, PASS, and SCB for the HOS-SS (p<0.001) and PASS, and SCB for the mHHS (p=0.002/p=0.004) and iHOT-12 (p=0.023/p=0.009).

Continuous Cox proportional hazards with advanced cubic splines modeling demonstrated an increased risk of failure to achieve CSOs with progressively increased age, and, to a lesser degree, for decreasing age for very young patients. The local minimum (highest chance of CSO achievement) was observed to be at age 22.9 years for mHHS, 23.2 for HOS-ADL, and 23.0 for iHOT-12.

The RHA rate was similar between the two age groups (8% vs. 7%; p=0.638), with continuous Cox proportional hazards modeling demonstrated a trend towards increased RHA rates for patients age <25. In contrast, the rate of conversion to THA was significantly higher in patients aged ≥40 (5% vs. 2%; p=0.016), with Cox regression demonstrating an inflection point and sustained progressive increase in THA-risk for patients older than 40 at the time of index arthroscopy.

DISCUSSION AND CONCLUSION: Patients age ≥40 demonstrated lower postoperative PROs at 5-years and likelihood of reaching CSOs. Increasing age was associated with greater risk of conversion to THA and decreased age was associated with an increased risk of revision hip arthroscopy.

Table 2. Achievement of MCID, PASS, and SCB for patients younger than 40 versus age 40 and older.

	Age < 40	Age > 40	P-Value
MCID			
HOS-ADL	54.7%	54.0%	0.858
HOS-SS	76.9%	63.3%	<0.001*
mHHS	78.6%	70.8%	0.050
iHOT-12	79.0%	76.8%	0.602
Any PRO	82.3%	84.5%	0.458
PASS	**Age < 40**	**Age > 40**	**P-Value**
HOS-ADL	80.2%	84.6%	0.130
HOS-SS	65.6%	51.4%	<0.001*
mHHS	60.0%	47.5%	0.002*
iHOT-12	62.8%	53.9%	0.023*
Any PRO	91.5%	92.5%	0.621
SCB	**Age < 40**	**Age > 40**	**P-Value**
HOS-ADL	80.2%	84.6%	0.130
HOS-SS	64.6%	48.6%	<0.001*
mHHS	51.4%	40.1%	0.004*
iHOT-12	58.1%	47.7%	0.009*
Any PRO	88.2%	91.8%	0.105

*Indicates statistical significance based upon a predetermined significance level of 0.05.

Table 3. Patient demographic and preoperative characteristics by age cohort.

	Age < 40	Age > 40	P-Value
N	618	317	
Age	26.9 ± 7.3	48.2 ± 6.3	<0.001*
Gender, % Female	70.3%	63.9%	0.050
BMI	24.9 ± 5.2	26.8 ± 5.4	0.046*
Smoking	10.8%	13.3%	0.267
Hypertension	5.6%	18.4%	<0.001*
Diabetes	3.6%	6.5%	0.052
Back Pain	9.5%	26.2%	<0.001*
Workers Compensation	3.2%	8.9%	<0.001*
Athletic Activity			<0.001*
None	17.0%	38.8%	
Recreation	61.4%	60.1%	
High School	10.2%	0.4%	
College	9.3%	0.0%	
Semi/Professional	2.1%	0.7%	
Preop Chronic Pain	16.6%	23.3%	0.019*
Postop Chronic Pain	3.3%	10.0%	<0.001*
Psychiatric History	15.6%	14.5%	0.659

*Indicates statistical significance based upon a predetermined significance level of 0.05.

Table 1. Preoperative, 5-year postoperative, and delta Patient Reported Outcome scores patients age 40 and older versus those younger than 40.

	Age < 40	Age > 40	P-Value
Preoperative			
HOS-ADL	66.4 ± 18.7	60.9 ± 18.8	0.925
HOS-SS	43.2 ± 22.4	37.7 ± 23.5	0.551
mHHS	59.5 ± 14.3	55.5 ± 15.5	0.474
iHOT-12	36.0 ± 17.7	32.3 ± 17.7	0.968
VAS Pain	61.6 ± 21.9	65.1 ± 21.6	0.780
5-Years Postoperative	**Age < 40**	**Age > 40**	**P-Value**
HOS-ADL	87.8 ± 17.3	81.1 ± 20.5	<0.001*
HOS-SS	78.6 ± 25.5	68.4 ± 30.2	<0.001*
mHHS	82.0 ± 17.9	75.8 ± 20.8	<0.001*
iHOT-12	72.7 ± 27.6	67.8 ± 29.1	0.123
VAS Pain	25.1 ± 26.9	27.0 ± 27.4	0.327
VAS Satisfaction	79.1 ± 28.4	76.9 ± 32.8	0.006*
Delta	**Age < 40**	**Age > 40**	**P-Value**
HOS-ADL	20.7 ± 20.9	19.6 ± 22.1	0.124
HOS-SS	35.2 ± 29.2	30.4 ± 32.1	0.057
mHHS	22.2 ± 19.8	20.8 ± 23.6	0.010*
iHOT-12	36.2 ± 28.9	36.9 ± 30.1	0.478
VAS Pain	35.8 ± 32.9	35.8 ± 30.4	0.130

*Indicates statistical significance based upon a predetermined significance level of 0.05.

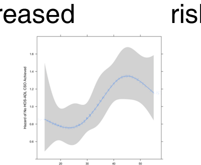

Figure 3: Cox proportional hazards regression model between Age and risk of failure to achieve clinically significant outcomes (CSOs) as defined by achievement of a minimum Hip Outcome Score Activities of Daily Living subscale (HOS-ADL) greater than a threshold score to achieve a Minimally Clinically Important Difference (MCID), Patient Acceptable Symptomatic State (PASS), or Substantial Clinical Benefit (SCB).

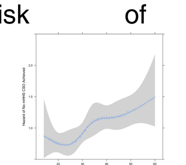

Figure 4: Cox proportional hazards regression model between Age and risk of failure to achieve clinically significant outcomes (CSOs) as defined by achievement of a minimum Harris Hip Score (mHHS) greater than a threshold score to achieve a Minimally Clinically Important Difference (MCID), Patient Acceptable Symptomatic State (PASS), or Substantial Clinical Benefit (SCB).

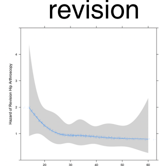

Figure 1: Cox proportional hazards regression model between Age and risk of any reoperation after primary hip arthroscopy (HA) for symptomatic femoroacetabular impingement (FAI).

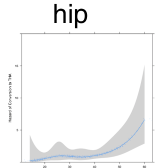

Figure 2: Cox proportional hazards regression model between Age and risk of conversion to Total Hip Arthroplasty (THA) after primary hip arthroscopy (HA) for symptomatic femoroacetabular impingement (FAI).