

Comparison of Outcomes Between Nonsmokers and Patients Who Discontinued Smoking 1 Month Before Primary Hip Arthroscopy

A Propensity-Matched Study With Minimum 2-Year Follow-up

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Background: Cigarette smoking has been shown to negatively affect outcomes after hip arthroscopy for femoroacetabular impingement syndrome (FAIS). The effect of cessation of cigarette smoking before surgery has not been well established.

Purposes: (1) To report minimum 2-year patient-reported outcomes (PROs) of former smokers who underwent primary hip arthroscopy for FAIS and (2) to compare these results with those of a propensity-matched control group of nonsmokers.

Study Design: Cohort study; Level of evidence, 3.

Methods: Data were collected for all patients who underwent primary hip arthroscopy for FAIS between December 2008 and November 2017. Patients were eligible if they indicated that they had previously smoked cigarettes but had quit smoking at least 1 month before surgery and had minimum 2-year postoperative outcomes for the modified Harris Hip Score (mHHS), Nonarthritic Hip Score (NAHS), and visual analog scale (VAS) for pain. The percentage of hips achieving the minimal clinically important difference (MCID) were recorded. The study group was then propensity matched in a 1:1 ratio by age, sex, and body mass index (BMI) to patients who had never smoked.

Results: A total of 83 former-smoking patients (84 hips; age, 45.0 ± 13.5 years) were included at a median follow-up of 38.6 months (interquartile range, 27.5-48.2 months); all patients had stopped smoking at a mean \pm standard deviation of 14.3 ± 24.5 months preoperatively. Former smokers demonstrated significant improvement from preoperatively to the minimum 2-year follow-up for all recorded PROs ($P < .001$ for all) and achieved the MCID for the mHHS, NAHS, and VAS at favorable rates (75.0%-81.6%). Logistic regression analysis did not identify a significant relationship between cessation time and rates of achieving MCID for mHHS, NAHS, or VAS. When compared with 84 never-smokers (84 hips), the former smokers demonstrated similar preoperative scores, postoperative scores, and improvement on all recorded PROs ($P > .05$ for all). Both groups achieved MCID for mHHS, NAHS, and VAS at similar rates and demonstrated similar rates of revision surgery.

Conclusion: Former smokers who underwent primary hip arthroscopy for FAIS demonstrated significant improvement in PROs at minimum 2-year follow-up. When compared with a propensity-matched control group of never-smokers, they achieved similar postoperative PROs and rates of achieving psychometric thresholds.

Keywords: hip arthroscopy; FAIS; smoking

Despite its significantly detrimental health effects, cigarette smoking is still prevalent in the United States. The Centers for Disease Control and Prevention has estimated that >40

million Americans smoke on a regular basis.⁶ The negative effects of cigarette smoking have been well documented in the orthopaedic literature.^{5,8,14,18,26}

Several studies have evaluated the effects of cigarette smoking on outcomes after hip arthroscopy for femoroacetabular impingement syndrome (FAIS) at a minimum 2-year follow-up.^{5,21} Cancienne et al⁵ compared

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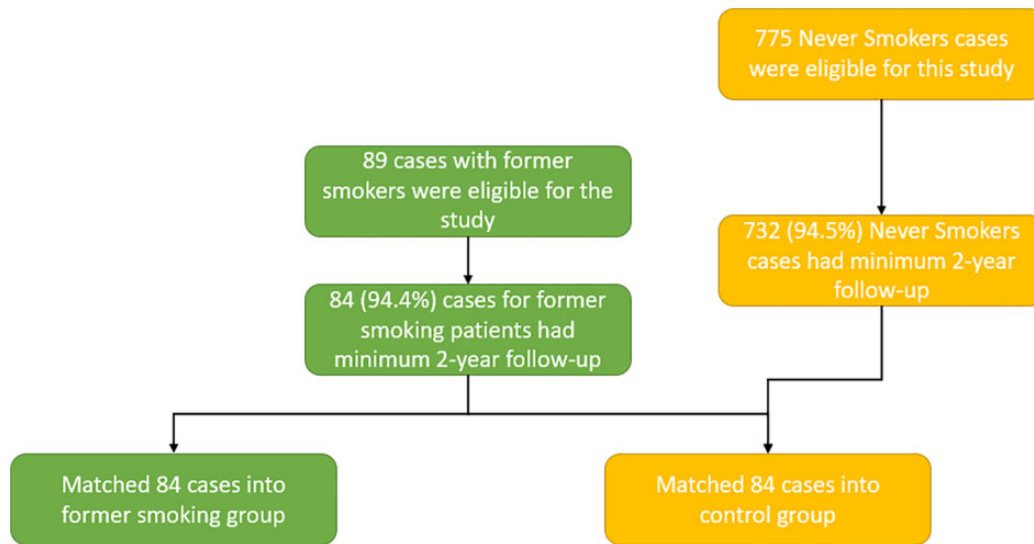


Figure 1. Flowchart of patient selection. FAIS, femoroacetabular impingement syndrome.

the outcomes of a cohort of smokers undergoing hip arthroscopy against a matched control group of nonsmokers. The results of this study showed that patients who smoked had lower patient-reported outcome (PRO) scores and lower rates of achieving the minimal clinically important difference (MCID) thresholds compared with the control group.⁵ Despite these results, the potentially beneficial effect of cigarette smoking cessation before undergoing hip arthroscopy has not been evaluated in the literature.

The purposes of this study were to (1) report minimum 2-year PROs of patients who were former cigarette smokers and who underwent primary hip arthroscopy for FAIS and (2) compare these results with those of a propensity-matched control group of patients who had never smoked. We hypothesized that former smokers would demonstrate favorable outcomes at a minimum 2-year follow-up and that these outcomes would be similar to those of a propensity-matched control group of never-smoking patients.

METHODS

Patient Selection Criteria

This study collected and assessed retrospective data on all patients who received a primary hip arthroscopy for FAIS between December 2008 and November 2017. Eligible

patients indicated they were former smokers in their history of present illness and self-reported the last time since they smoked in their most recent office visit before undergoing primary hip arthroscopic surgery; had preoperative data for the modified Harris Hip Score (mHHS),¹ Nonarthritic Hip Score (NAHS),⁷ and visual analog scale for pain (VAS)¹⁹; and had minimum 2-year follow-up data for the same PROs. Excluded patients had prior hip surgery; were receiving workers' compensation; were unwilling to consent to the study; had a Tönnis osteoarthritis grade >1; or had a previous hip condition including avascular necrosis, slipped capital femoral epiphysis, fracture, or acetabular dysplasia.

Overall, 89 hips from former smokers were eligible for this study. After all exclusion and inclusion criteria were applied, 84 of these hips (94.4%) in 83 patients had a minimum 2-year follow-up. The former-smoker group was propensity score matched in a 1:1 ratio to 84 hips (84 patients) from never-smokers according to age at the time of surgery, sex, and body mass index (BMI) (Figure 1).

Participation in the American Hip Institute Hip Preservation Registry

All patients enrolled in this study consented to participate in the American Hip Institute's hip preservation database. Previous studies may have used patient data that were

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Ethical approval for this study was obtained from Advocate Health Care (reference No. 5276).

used in this study; however, the findings of this research are novel. Institutional review board approval was received for data collection, analysis, and reporting of results.

Radiographic Imaging

Standing and supine anteroposterior (AP) pelvis modified 45° Dunn view and false-profile view radiographs were recorded and assessed before surgery. All radiographs were reviewed by a board-certified orthopaedic surgeon specialized in hip preservation (B.G.D.) using a picture archiving and communication system (General Electric Healthcare). Previous studies have indicated that this system has consistently achieved good interobserver reliability.^{11,13}

Tönnis osteoarthritis grade was measured in the AP supine view using the method described by Domb et al.¹⁰ Additionally, an AP supine view was used to record the lateral center-edge angle (LCEA) of Wiberg.⁴⁰ Crossover, ischial spine, and posterior wall signs were used to measure and assess the acetabular version. The Dunn lateral view was used to determine the alpha angle and the head-neck offset. Alpha angles >55° were classified as cam deformities.^{31,33} The false-profile view was used to measure the anterior center-edge angle (ACEA) of Lequesne and de Seze.²³ Labral tears and other extra- and intra-articular defects were identified using magnetic resonance arthrography.

Surgical Indications

All patients participated in at least 3 months of nonoperative treatment. The following nonoperative treatments were recommended: activity modification, nonsteroidal anti-inflammatory drugs, intra-articular injections, and physical therapy. If nonoperative treatments failed, the senior author (B.G.D.) recommended patients for surgery.^{4,15}

Surgical Technique

The senior surgeon (B.G.D.) conducted all primary hip arthroscopies. Patients were positioned in the modified supine position on the traction table, and general anesthesia was administered to the patients during the procedure.^{9,22} The hip joint was accessed using the anterolateral, distal anterolateral, and modified midanterior accessory portals. During the procedure, an additional diagnostic arthroscopy and interportal capsulotomy were performed.²⁴ During the surgery, the following patient intraoperative findings were recorded: labral tears, chondrolabral junction damage, acetabular and femoral damage, and ligamentum teres damage. Seldes guidelines were used to classify labral tears.^{29,36} The chondrolabral junction was graded using the acetabular labrum articular disruption.³⁸ Acetabular and femoral cartilage defects were determined using Outerbridge classifications.³² Ligamentum teres damage was assessed using the Domb and Villar classifications.^{2,3} LCEAs were recorded and used to assess whether hips had pincer-type

morphologies (LCEA, >40°) and/or required an acetabuloplasty >2 mm (minor rim trimming) to produce a bony bed necessary for proper labral construction healing. The surgeon additionally conducted femoroplasties on patients with cam-type morphologies (alpha angle, >55°).^{25,27}

Rehabilitation Protocol

All rehabilitation protocols recommended 3 months of physical therapy and were administered as early as 1 day after surgery. Patients were advised to restrict weightbearing activities to ≥ 20 lb (9.07 kg) on flat feet for 6 weeks post-operation. Crutches and a brace for stability (DonJoy VersaRom, Enovis, Lewisville, TX) were recommended to limit weightbearing and range of motion between 0° and 90°. Additionally, 8 weeks of stationary bicycle exercises were recommended after surgery. Finally, patients were prescribed nonsteroidal anti-inflammatory drugs and were instructed to take them twice daily over a 4-week period for heterotopic ossification prophylaxis.

Outcome Measures

Patients completed questionnaires with PROs (mHHS, NAHS, and pain VAS) during clinic visits preoperatively and postoperatively at 3 months, 12 months, and annually thereafter. Patients received encrypted emails or responded to telephone interviews to complete questionnaires that were uncompleted during clinic visits. Preoperative and minimum 2-year follow-up data were compared for this retrospective study. In addition, patients completed postoperative questionnaires for the Hip Outcome Score (HOS)–Sport Specific Subscale¹⁶ and International Hip Outcome Tool–short version²⁸ and reported overall satisfaction at the latest follow-up.

The MCID for the PROs was determined using the distribution-based method described by Norman et al.³⁰ This method has been recommended because of its ability to simply and consistently approximate results comparable to anchor-based methods.^{35,37,39} Unique MCIDs were calculated by dividing the standard deviation of the preoperative score by 2. The proportion of hips achieving MCID was reported for the mHHS, NAHS, and VAS. For former smokers, cessation time of and any postoperative smoking were reported as well.

Propensity Score–Matched Analysis

Eligible patients who were former smokers were propensity score matched in a 1:1 ratio to never-smokers. Former smokers were defined by a social history of indicating smoking cessation in the most recent office visit at least one month before surgery. Never-smokers were defined by a social history of indicating “never smoking” during the most recent office visit before surgery but otherwise met all inclusion criteria. The software program R (Version 4.1.0; R Foundation for Statistical Computing) was used to propensity score match former smokers and never-smokers to reduce the noise of potential confounding variables.¹² The groups were greedy matched

TABLE 1
Patient Characteristics^a

	Former Smokers, n = 84	Never-Smokers, n = 84	P
Age at surgery, y	45.0 ± 13.5	45.9 ± 14.1	.668
Sex			.608
Female	62 (73.8)	58 (69.0)	
Male	22 (26.2)	26 (31.0)	
BMI	26.6 [24.2-30.8]	28.0 [23.2-31.2]	.968
Follow-up, mo	38.6 [27.5-48.2]	39.0 [28.3-48.1]	.941

^aValues are presented as No. (%), mean ± SD, or median [interquartile range]. BMI, body mass index.

TABLE 2
Radiographic Measurements^a

	Former Smokers	Never-Smokers	P
LCEA, deg	32.0 [25.8 to 35.3]	31.0 [27.0 to 35.0]	.450
Acetabular inclination, deg	5.4 ± 4.2 (-5.0 to 14.0)	4.1 ± 5.1 (-10.0 to 16.0)	.072
ACEA, deg	30.1 [26.0 to 35.0]	30.4 [25.8 to 35.0]	.265
Alpha angle, deg	57.0 [51.8 to 64.0]	55.0 [51.0 to 65.0]	.746
Tönnis grade			>.999
0	63 (75.0)	63 (75.0)	
1	21 (25.0)	21 (25.0)	

^aValues are presented as No. (%), mean ± SD (range), or median [interquartile range]. ACEA, anterior center-edge angle; LCEA, lateral center-edge angle.

without replacement using the following variables: age at the time of surgery, sex, and BMI.

Statistical Analysis

All statistical analyses were conducted using Microsoft Excel (Microsoft Corp) with the Real Statistics Add-in package. The *F* test and Shapiro-Wilk test were used to determine the equality and normality of variance. For continuous data, significance was determined based on the results of a 2-tailed *t* test or its nonparametric equivalent. Nonparametric data were reported as median and interquartile range. For categorical data, the Fisher exact test or chi-square test was conducted to establish significant differences. In addition, a logistic regression model was used to determine the effect of time from smoking cessation on rates of achieving MCID for the mHHS, NAHS, and VAS. Statistical significance for all data was established at a *P* value of .05.

Before researching this study, we used an a priori power analysis to calculate the number of hips required in the former-smoker and never-smoker groups to detect 80% power with a 1:1 matching ratio. Based on the power analysis, we concluded that 26 hips were required in each group to minimize the possibility of type 2 errors.

RESULTS

Patient Characteristics

The patient characteristics for the former-smoker and never-smoker groups are reported in Table 1. The mean

ages at the time of surgery for the former smokers and never-smokers were 45.0 years (range, 16.4-74.8 years) and 45.9 years (range, 17.1-75.9 years), respectively (*P* = .668), and the mean BMIs were 26.6 (IQR, 27.5-48.2) and 28.0 (IQR, 23.2-31.2), respectively (*P* = .968).

Radiographic Measurements

The average acetabular inclinations for the former-smoker and never-smoker groups were 5.4° and 4.1°, respectively (*P* = .072). Although the difference was nonsignificant, this was the most prominent difference observed in radiographic measurements between the 2 groups. The former-smoker and never-smoker groups had 63 hips and 21 hips with Tönnis osteoarthritis grades of 0 and 1, respectively (*P* > .999). All other radiographic measurements are reported in Table 2.

Intraoperative Findings

Intraoperative findings are found in Table 3, and surgical procedures are mentioned in Table 4. There was a significant difference in the types of Seldes tears between the former and never-smokers (*P* = .040), with a higher proportion of grades 1 and 2 tears in the former-smoker compared with the never-smoker group. Additionally, 2 hips in the former-smoker group and 1 hip in the never-smoker group underwent a femoral head microfracture (*P* > .999).

Surgical Outcome Tools

Both former smokers and never-smokers demonstrated significant improvement between preoperatively and the

TABLE 3
Intraoperative Findings

	Former Smokers	Never-Smokers	P Value
Seldes			.040
0	3 (3.6)	2 (2.4)	
I	20 (23.8)	21 (25.0)	
II	17 (20.2)	32 (38.1)	
I & II	44 (52.4)	29 (34.5)	
ALAD			.911
0	14 (16.7)	12 (14.3)	
1	19 (22.6)	24 (28.6)	
2	24 (28.6)	24 (28.6)	
3	23 (27.4)	20 (23.8)	
4	4 (4.8)	4 (4.8)	
Outerbridge: acetabulum			.676
0	14 (16.7)	12 (14.3)	
1	18 (21.4)	24 (28.6)	
2	21 (25.0)	24 (28.6)	
3	20 (23.8)	14 (16.7)	
4	11 (13.1)	10 (11.9)	
Outerbridge: femoral head			.755
0	67 (79.8)	70 (83.3)	
1	2 (2.4)	0 (0.0)	
2	5 (6.0)	6 (7.1)	
3	7 (8.3)	5 (6.0)	
4	3 (3.6)	3 (3.6)	
LT percentile class (Domb)			.896
0: 0	39 (46.4)	41 (48.8)	
1: 0 to <50	22 (26.2)	24 (28.6)	
2: 50 to <100	19 (22.6)	15 (17.9)	
3: 100	4 (4.8)	4 (4.8)	
LT Villar Class			.810
0: No tear	39 (46.4)	41 (48.8)	
1: Complete tear	2 (2.4)	3 (3.6)	
2: Partial tear	18 (21.4)	20 (23.8)	
3: Degenerative tear	25 (29.8)	20 (23.8)	

Values are presented as No. (%) or mean ± SD (range). Bold indicates statistical significance ($P < 0.05$). ALAD, acetabular labrum articular disruption; LT, ligamentum teres.

TABLE 4
Surgical Procedures^a

	Former Smokers	Never-Smokers	P
Labral treatment			.393
Repair	48 (57.1)	47 (56.0)	
Reconstruction	10 (11.9)	6 (7.1)	
Selective debridement	22 (26.2)	28 (33.3)	
None	4 (4.8)	3 (3.6)	
Capsular repair	42 (50.0)	39 (46.4)	.335
Femoroplasty	72 (85.7)	76 (90.5)	.475
Acetabular microfracture	7 (8.3)	8 (9.5)	.787
Femoral head microfracture	2 (2.4)	1 (1.2)	>.999

^aValues are presented as No. (%).

minimum 2-year follow-up according to all 3 PROs ($P < .001$). Additionally, former smokers achieved significantly

higher patient satisfaction at the minimum 2-year follow-up than did never-smokers (9.0 vs 8.0, respectively; $P = .031$). All PROs scores are reported in Table 5.

The following individualized MCIDs were calculated in this study: mHHS (former smokers, ≥ 9.25 ; never-smokers, ≥ 9.50); NAHS (former smokers, ≥ 8.27 ; never-smokers, ≥ 9.91); VAS for pain (former smokers, ≥ 1.18 ; never-smokers, ≥ 1.15). Former smokers and current smokers achieved the MCID at similar rates for mHHS, NAHS, and VAS. All calculations for MCID achievement rates are listed in Table 6.

Secondary Surgeries

Five hips (6.0%) in the former- and never-smoker groups had revision hip arthroscopies ($P > .999$). Four hips (4.8%) in the former-smoker group and 3 hips (3.6%) in the never-smoker group underwent total hip arthroplasties ($P > .999$).

Former-Smoker Characteristics

On average, former smokers had a cessation time of 14.3 months before surgery. Most of the former-smoker group (91.7%) reported that they did not restart cigarette smoking after surgery. All other former-smoker data can be found in Table 7.

Effect of Smoking Cessation Time on MCID Achievement

According to the results of the logistic regression model, smoking cessation time did not have a significant effect on MCID achievement for the mHHS, NAHS, or VAS. A summary of the logistic regression analysis can be found in Table 8.

DISCUSSION

The main finding of this study was that patients who formerly smoked cigarettes but discontinued smoking at least 1 month before undergoing primary hip arthroscopy had favorable outcomes and significant improvements in all recorded PROs at a minimum 2-year follow-up. Former-smoking patients had similar postoperative scores and rates of achieving MCID of mHHS, NAHS, and VAS when compared with a propensity-matched control group of never-smoking patients. Further rates of revision surgery were similar between the 2 groups.

Prior literature has established a negative effect between cigarette smoking and postoperative outcomes for patients after undergoing hip arthroscopy for FAIS.^{5,21} Cancienne et al⁵ evaluated minimum 2-year outcomes in 40 smokers undergoing primary hip arthroscopy and labral repair compared with a control group of never-smokers. In that study, the authors established inferior postoperative scores for HOS-Activities of Daily Living and HOS-Sport Specific Subscale, increased pain levels, and lower odds of achieving MCID for HOS-Activities of Daily Living compared with

TABLE 5
Patient-Reported Outcomes

	Former Smokers	Never-Smokers	P Value
mHHS			
Preoperative	59.2 [50.8 – 67.3]	63.0 [48.0 – 67.3]	.724
Latest	86.0 [68.0 – 96.0]	86.0 [65.0 – 96.0]	.648
P value	<0.001	<0.001	
Improvement	22.6 ± 18.8 (-15.8 - 75.0)	21.9 ± 22.2 (-33.0 - 68.0)	.963
NAHS			
Preoperative	58.6 ± 16.5 (20.0 – 96.0)	55.9 ± 15.7 (16.0 – 88.8)	.277
Latest	86.3 [76.6 – 92.8]	85.6 [72.2 – 97.5]	.730
P value	<0.001	<0.001	
Improvement	21.6 ± 18.0 (-41.5 – 60.0)	24.5 ± 22.1 (-40.5 – 79.0)	.392
HOS-SSS			
Postoperative	65.6 [45.7 – 91.1]	64.3 [37.5 – 100]	.705
IHOT-12			
Postoperative	71.3 [41.7 – 83.8]	69.9 [41.2 – 89.0]	.855
VAS for Pain			
Preoperative	6.0 [3.6 – 7.0]	6.0 [4.0 – 7.0]	.680
Latest	2.0 [0.5 – 4.0]	1.5 [0.0 – 4.0]	.300
P value	<0.001	<0.001	
Improvement	4.0 [1.5 – 6.0]	3.8 [2.0 – 9.0]	.532

Values are presented as mean ± SD (range) or median [Interquartile Range]. Bold indicates statistical significance ($P < .05$); HOS-SSS, Hip Outcome Score-Sport Specific Subscale; mHHS, modified Harris Hip Score; NAHS, Nonarthritic Hip Score; VAS, visual analog scale for pain.

TABLE 6
Comparison of MCID Achievement Rates^a

MCID	Former Smokers	Never-Smokers	P
mHHS	54 (75.0)	56 (78.9)	.723
NAHS	55 (77.5)	59 (81.9)	.647
VAS pain	62 (81.6)	67 (87.0)	.483

^aValues are presented as No. (%). mHHS, modified Harris Hip Score; NAHS, Nonarthritic Hip Score; VAS, visual analog scale.

TABLE 7
Former Smoker Demographics

	Former Smokers
Cessation Time Before Surgery, months	14.3 ± 24.5
Postoperative Smoking	
Yes	5 (6.0)
No	77 (91.7)
Unknown	2 (2.4)

Values are presented as No. (%) or mean ± SD.

patients who never smoked.⁵ A similar study by Lall et al²¹ found that patients who smoked also demonstrated lower 2-year PROs compared with never-smoking patients. The present study builds on this prior literature and provides evidence of the benefits of smoking cessation. In the present paper, postoperative PROs, improvement in PROs, rates of achieving MCID, and revision rates were similar between

TABLE 8
Regression Analysis Evaluating the Effect of Cessation Time on Rates of Achieving MCID

	Log Odds Ratio	Standard Error	P Value	OR (95% CI)
mHHS	0.014	0.014	.319	1.014 (0.987 – 1.041)
NAHS	0.007	0.012	.589	1.007 (0.983 – 1.031)
VAS	0.003	0.010	.756	1.003 (0.983 – 1.023)

CI, confidence interval; mHHS, modified Harris Hip Score; NAHS, Non-Arthritic Hip Score; OR, odds ratio; VAS, visual analog scale for pain.

former smokers and a matched control group of never-smokers. These findings suggest the benefit of smoking cessation on outcomes after hip arthroscopy.

Previously published studies have proposed a physiologic mechanism for how cigarette smoking leads to worse outcomes after hip arthroscopy.⁵ Namely, nicotine found in the cigarettes causes vasoconstriction and inhibits blood and oxygen delivery, which is critical for healing in the postoperative period.^{5,34} Additionally, carbon monoxide from cigarette smoke favorably binds to hemoglobin and can decrease its oxygen-carrying ability.³⁴ From a physiologic standpoint, both of these effects are reversible with smoking cessation, and the results of the current study support that similar outcomes after undergoing primary hip arthroscopy can be achieved in former smokers as

compared with never-smokers. From a clinical perspective, the arthroplasty literature has demonstrated that smoking is an independent predictor for lower postoperative PROs in a dose-dependent relationship. Increased preoperative smoking has been correlated with increasingly worse outcomes in patients undergoing total joint arthroplasty; however, studies are still needed to define the optimal window for smoking cessation.¹⁷

Of note, the average time in between smoking cessation and hip arthroscopy was 14.3 ± 24.5 months. In the clinical setting, patients would only realistically be able to discontinue for a shorter period of time before undergoing surgery. In the present study, a regression analysis was performed to evaluate the effect of smoking cessation time on rates of achieving MCID, and no significant relationship was found for mHHS, NAHS, or VAS. This suggests that the negative effects of smoking are reversible and even small periods between smoking cessation and surgery would be beneficial, but further research is warranted to help clarify this relationship. Similarly, postoperatively only 6% of the former-smoker cohort resumed smoking within the study period. As a result, the present study is unable to determine if there is a negative effect of smoking on outcomes if smoking is resumed postoperatively.

Limitations

This study has several limitations. First, the retrospective study design has inherent limitations. Second, former-smoking status was considered a binary (yes/no) variable, and sufficient numbers of patients were not available to stratify patients based on how long ago they had quit smoking and how much they had previously smoked. Next, determination of smoking status was based on the patient indicating at their preoperative visit that they smoked within 1 month of surgery and may be subject to bias. In addition, former smokers and never-smokers did not receive the same labral treatment (10 vs 6 labral reconstructions, respectively); although type of labral treatment was not a significant variable, it may have affected the PRO scores between groups, and future studies should propensity match by surgical treatment and pathology to increase the generalizability.

In addition, we did not compare smokers who underwent surgery, former smokers who underwent surgery, and never-smokers who underwent surgery, which may limit the findings of this study in regard to whether cigarette smoking reduces clinical outcomes. Also, 1 patient in the former-smoker group underwent bilateral hip arthroscopy. Although recent literature has demonstrated that patients undergoing bilateral hip arthroscopy have comparable outcomes to those of patients undergoing unilateral hip arthroscopy, this may have impacted the PROs.²⁰ Furthermore, it should be noted that although smoking cessation leads to benefits in hip arthroscopy, chronic nicotine usage can lead to irreversible health changes not captured in this study. Additionally, smoking cessation was not a controlled action. External factors such as willpower, social support networks, and access to treatment such as nicotine patches may have influenced postoperative rehabilitation and

outcomes and may have introduced bias by selecting patients who were determined to quit for the study group. Next, we were unable to measure pack-years, and the inability to quantify smoking may have affected the outcomes of the study. Given the lack of knowledge of smoking pack history, the results of this study may not be generalizable to patients with higher pack-year smoking histories, in which potential irreversible physiological changes may have occurred. Additionally, data measuring nicotine or cotinine levels were unable to be recorded. This prevented the study from evaluating nicotine therapy options such as patches and gum. This may have affected outcomes, as patients could have undergone smoking cessation but still had nicotine in their systems, which would maintain vasoconstriction and limit healing during the postoperative period. Last, the study was performed at a single institution, and all surgeries were performed by a single high-volume hip preservation-trained surgeon, which may limit the generalizability of the results.

CONCLUSION

Former smokers who underwent primary hip arthroscopy for FAIS demonstrated significant improvement in PROs at the minimum 2-year follow-up. When compared with a propensity-matched control group of never-smokers, they achieved similar postoperative PROs and rates of achieving psychometric thresholds.

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