

Are Self-Reported Medication Allergies Associated With Worse Hip Outcome Scores Prior to Hip Arthroscopy?

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Purpose: To determine if there are significant differences in preoperative patient-reported outcome (PRO) scores in patients with and without self-reported medication allergies undergoing hip arthroscopy. **Methods:** Consecutive subjects undergoing hip arthroscopy for femoroacetabular impingement (FAI) syndrome by a single surgeon were retrospectively reviewed. PROs were collected within 6 weeks of the date of surgery. PROs included International Hip Outcome Tool (iHOT-12), Hip Outcome Score (HOS), and Short-Form (SF-12) scores. Allergies to medications were self-reported preoperatively within 6 weeks of the date of surgery. Patient demographics were recorded. Bivariate correlations and multivariate regression models were calculated to identify associations with baseline hip outcome scores. **Results:** Two hundred twelve subjects were analyzed (56% female, mean age 35.1 ± 13.2 years). Seventy-two subjects (34%) self-reported allergies (range 1-10; 41 subjects had 1 allergy; 14 subjects had 2; 8 subjects had 3; 2 subjects had 4; 7 subjects had 5 or more). The most commonly reported allergies included penicillin (18), sulfa (13), and codeine (11). Female gender was significantly correlated with number of allergies (Pearson correlation coefficient, 0.188; $P < .001$). SF-12 Mental Component Score (MCS) was significantly correlated with HOS-ADL (Pearson correlation coefficient, 0.389; $P < .001$), HOS-SSS (Pearson correlation coefficient, 0.251; $P < .001$), and iHOT-12 (Pearson correlation coefficient, 0.385; $P < .001$). There was no significant correlation between number of allergies and all hip PROs. In all multivariate models, the SF-12 MCS had the strongest association with HOS-ADL, HOS-SSS, and iHOT-12 ($P < .001$ for all). Allergies were not significantly associated with any hip PROs. **Conclusions:** In patients undergoing hip arthroscopy for FAI syndrome, self-reported medication allergies are not significantly associated with preoperative patient-reported hip outcome scores. **Level of Evidence:** Level III, retrospective comparative case series.

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Hip arthroscopy is a common procedure used to treat several conditions such as femoroacetabular impingement (FAI) syndrome, acetabular labral tears, chondral defects, and extra-articular causes of hip pain.¹⁻⁴ Expanded indications, advancements in arthroscopic techniques, and significantly improved postoperative outcomes have led to a substantial increase in hip arthroscopy use throughout the world.⁵⁻⁸ However, patient selection remains critical in optimizing patient outcomes.

There are additional patient-specific preoperative factors that may affect postoperative pain, function, and outcomes after arthroscopic hip surgery. The presence of psychiatric distress may negatively impact patients with low back pain, arthritis, chronic shoulder pain, or hand and elbow conditions.⁹⁻¹³ In patients undergoing hip arthroscopy, psychological distress on the Distress Risk Assessment questionnaire has also been associated with inferior preoperative hip outcome scores and postoperative pain.^{14,15} Lower preoperative Harris Hip

Scores and Hip Outcome Scores (HOS) have been shown to correlate with worse postoperative pain control in these patients.^{16,17}

Anecdotal reports have long proposed that allergies may be associated with decreased psychiatric wellness in patients. These reports have been definitively confirmed by prior epidemiology studies showing that self-reported allergies are significantly correlated with mood and anxiety disorders.¹⁸⁻²⁰ In patients undergoing interventional radiology procedures, allergies are a marker for psychiatric history (major depressive disorder, generalized anxiety disorder, adjustment disorder, and personality disorder).²¹

As such, recent studies in the orthopaedic literature have begun to investigate the association between allergies and outcomes, with Nam et al. and Otero et al. showing that patient allergies are associated with worse postoperative outcomes following total knee and total hip arthroplasty.^{22,23} However, Rosenthal et al.²⁴ found that patient allergies were not correlated with worse outcomes after total shoulder arthroplasty. These contradictory findings necessitate the need for further investigation as the effect of allergies on arthroscopic hip surgery patients' preoperative symptoms has yet to be determined.

The purpose of this study was to determine if there are significant differences in preoperative patient-reported outcome (PRO) scores in patients with and without self-reported medication allergies undergoing hip arthroscopy. The authors hypothesized that the presence of 1 or more allergies will be associated with lower preoperative PRO scores for patients undergoing hip arthroscopy.

Methods

Institutional review board approval was obtained for this retrospective comparative case series (Level III evidence) of consecutive subjects ($n = 308$) that underwent hip arthroscopy by a single sports medicine fellowship-trained orthopaedic surgeon from December 2013 to April 2017. Subjects with FAI syndrome (defined by Warwick agreement as a triad of symptoms, clinical signs, and imaging findings consistent with cam and/or pincer morphology) who had completed a minimum 3-month course of nonsurgical treatment (included rest, activity modification, physical therapy, education, oral anti-inflammatory non-narcotic medications, or intra-articular injections [local anesthetic diagnostic with or without corticosteroid therapeutic]) and were dissatisfied with their hip condition were eligible for arthroscopic hip preservation surgery.²⁵ Patients with advanced arthritis (Tonnis grade >1 or joint space <2 mm), more than borderline dysplasia (lateral and/or anterior center-edge angles $<20^\circ$, and/or Tonnis angle $>15^\circ$, and/or femoral head extrusion index $>25\%$, and/or broken Shenton line), femoral head avascular necrosis, synovial chondromatosis (and osteochondromatosis), or septic arthritis were excluded.²⁵ Patients

without FAI syndrome that underwent an isolated peritrochanteric space endoscopy for abductor tendon pathology, and/or trochanteric bursitis were excluded.

Patients completed PRO scores within 6 weeks prior to surgery. All PRO forms were completed exclusively by the patient without assistance from any staff or research personnel (research assistants, fellows, residents, students, nurses, physicians, physician assistants, or nurse practitioners). These included the 12-item International Hip Outcome Tool (iHOT-12), HOS Activities of Daily Living (ADL) and Sport-Specific Subscore (SSS), and the 12-item Short Form Health Survey (SF-12) Mental Component Scores (MCS).

Allergies were self-reported preoperatively within 6 weeks prior to surgery. Recording of number of allergies was based exclusively on the number reported by the subject without regard for duplication of medication trade brand and generic names (e.g., Ancef vs cefazolin), route of administration (oral, intramuscular, intravenous, subcutaneous; e.g., Ancef vs Keflex; cefazolin vs cephalexin), or different medications in same class (e.g., cephalosporins, cephalexin, cefazolin). Patients were excluded if they did not complete preoperative scores or self-reported allergy questionnaire (Figure 1).

Data analysis was performed using SPSS Statistics software, version 20 (IBM Corp, Armonk, NY). Bivariate correlations were determined by Pearson correlation coefficients. Multivariate linear regression models were built to determine the effect of independent variables (patient age, gender, 0 allergies, 1+ allergies, SF-12 MCS) on continuous outcomes scores (iHOT-12, HOS-ADL, HOS-SSS). All P values were reported, with significance set at $P < .05$.

Results

Two hundred twelve patients were analyzed (Figure 1). There were 94 male (44%) and 118 female patients (56%). The mean age was 35.1 ± 13.2 years.

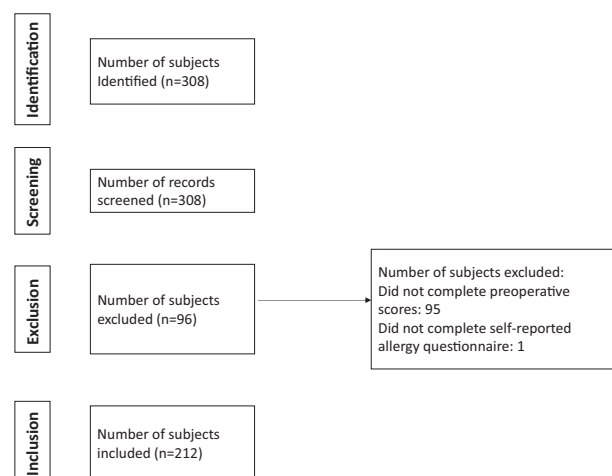


Fig 1. Flow diagram of patient exclusion and inclusion.

Table 1. Patient-Reported Allergies

Patient-Reported Allergy	Number of Times Reported
Penicillin	18
Sulfa	13
Codeine	11
Hydrocodone (Lortab, Vicodin, Norco), oxycodone (Percocet)	7
Amoxicillin (Augmentin)	6
Erythromycin	5
Bactrim	4
Cephalosporin (Keflex)	4
Morphine	4
Steroids	4
Tramadol (Ultram)	2
Vancomycin	2
Ceclor	2
Neosporin/Polysporin	2
Orencia	1
Aleve	1
Meperidine (Demerol)	1
Ibuprofen	1
Aspirin	1
Tetanus vaccine	1
Levaquin	1
Baclofen	1
Iodine	1
Tylenol	1
Clindamycin	1
Doxycycline	1
Ampicillin	1
Ciprofloxacin	1
Robaxin	1
Metronidazole	1
Clarithromycin	1
Zanaflex	1
Flu vaccine	1
Neurontin	1
Phenobarbital	1
Lomotil	1
Macroclantin	1
Darvocet	1
Flexeril	1
Celexa	1
Naproxen	1
Guaifenesin	1
Benzoyl peroxide	1

Seventy-two patients (34%) had allergies (range 1-10). Female patients had a significantly higher proportion of those with allergies (43.2%) ($P = .0014$). Female patients (0.96 allergies) also had a significantly higher number of allergies compared to males (0.39 allergies) ($P = .005$). Forty-one subjects had 1 allergy, 14 subjects had 2, 8 subjects had 3, 2 subjects had 4, and 7 subjects had 5 or more allergies. The most commonly reported allergies included penicillin (18), sulfa (13), and codeine (11) (Table 1). Four patients reported allergies to steroids.

Female gender was significantly correlated with number of allergies (Pearson correlation coefficient, 0.188; $P < .001$) (Table 2). SF-12 MCS was significantly

Table 2. Bivariate Correlation of Self-Reported Patient Allergies With Patient Demographics

Patient Demographics	Correlation With Number of Allergies*
Age	0.126
Female Gender	0.188 [†]
SF-12 MCS	0.071

MCS, Mental Component Score; SF-12, Short Form Health Survey.

*The values are given as the Pearson correlation coefficient.

[†]Values are significant at $P < .001$.

correlated with HOS-ADL (Pearson correlation coefficient, 0.389; $P < .001$), HOS-SSS (Pearson correlation coefficient, 0.251; $P < .001$), and iHOT-12 (Pearson correlation coefficient, 0.385; $P < .001$) (Table 3). There was no significant correlation between number of allergies and all hip PROs. In all multivariate models, the SF-12 MCS had the strongest association with the HOS-ADL, HOS-SSS, and iHOT-12 ($P < .001$ for all) (Table 4). Allergies were not significantly associated with any hip PROs.

Discussion

There was no significant association between the number of self-reported medication allergies and preoperative patient-reported hip outcome scores for patients undergoing hip arthroscopy. However, the SF-12 MCS was significantly correlated and had a significant association with preoperative patient-reported hip outcome scores. This refuted the authors' hypotheses that the presence of 1 or more allergies will be associated with lower preoperative PRO scores for patients undergoing hip arthroscopy.

Recent studies in the orthopaedic literature have provided contradicting reports on the connection between allergies and preoperative outcome scores. Patient-reported allergies have been shown to be significantly associated with worse postoperative outcomes following total knee and total hip arthroplasty in several studies.^{22,23,26} However, in patients undergoing total shoulder arthroplasty, there does not

Table 3. Bivariate Correlation of Patient Mental Well-Being With Patient-Reported Hip Measures

Patient-Reported Outcome Score	Correlation with SF-12 MCS*
HOS-ADL	0.389 [†]
HOS-SSS	0.251 [†]
iHOT-12	0.385 [†]

ADL, activities of daily living; HOS, Hip Outcome Score; iHOT-12, 12-item International Hip Outcome Tool; MCS, Mental Component Score; SF-12, Short Form Health Survey; SSS, Sport-Specific Subscore.

*The values are given as the Pearson correlation coefficient.

[†]Values are significant at $P < .001$.

Table 4. Multivariate Analysis of the Effect of Patient Demographics, Mental Well-Being, and Self-Reported Allergies on Patient-Reported Hip Measures

Variable	Regression Coefficient	P Value
Age		
HOS-ADL	-0.135	.066
HOS-SSS	-0.131	.100
iHOT-12	-0.049	.522
Female gender		
HOS-ADL	-0.005	.942
HOS-SSS	-0.128	.109
iHOT-12	-0.026	.739
SF-12 MCS		
HOS-ADL	0.390	<.001*
HOS-SSS	0.250	<.001*
iHOT-12	0.385	<.001*
0 allergies		
HOS-ADL	0.017	.824
HOS-SSS	0.001	.989
iHOT-12	-0.021	.790
1+ allergies		
HOS-ADL	-0.019	.800
HOS-SSS	-0.043	.591
iHOT-12	-0.014	.860

ADL, Activities of Daily Living; HOS, Hip Outcome Score; iHOT-12, 12-item International Hip Outcome Tool; MCS, Mental Component Score; SF-12, Short Form Health Survey; SSS, Sport-Specific Subscore.

*Significant association at $P < .05$.

appear to be any significant association between allergies and outcomes.²⁴ This is similar to the present study as patient allergies are not significantly associated with hip-specific outcomes measures.

This raises the question as to why allergies have a negative association in patients undergoing total hip and knee arthroplasty but not hip arthroscopy. One potential explanation is that the current study was underpowered to detect any significant differences. However, this was not the case. A post hoc power analysis revealed that our study was adequately powered to detect significance between patients with and without allergies for the iHOT-12 (78.2%), HOS-ADL (84.1%), and HOS-SSS (80.5%). It is also possible that age had played a major factor. Prior studies have found that patients with multiple allergies are older and that patients undergoing total hip and knee replacement are older than patients undergoing hip arthroscopy.²⁷ As there is a high correlation between number of allergies and poor mental well-being, these older patients may be more negatively affected by the presence of a mental disorder.¹⁸⁻²⁰

Analysis of outcome measures in patients with psychiatric distress showed preoperative HOS-ADL (62 ± 2) and HOS-SSS (36 ± 3) scores similar to the present study (HOS-ADL: 58.2 ± 22.1 and HOS-SSS: 37.8 ± 24.2).¹⁵ This same trend was seen in patients without allergy

(HOS-ADL: 67.3 ± 19.4 and HOS-SSS: 47.6 ± 23.5) compared to patients without psychiatric distress (HOS-ADL: 72 ± 2 and HOS-SSS: 47 ± 3).¹⁵ The similarities between the preoperative outcomes lead one to deduce a correlation between number of patient allergies and poor mental well-being. The present study failed to show any correlation between the presence of patient allergies and SF-12 MCS. A post hoc power analysis showed that our study was underpowered to detect significance between patients with and without allergies in regard to the SF-12 MCS (22.6%). As such, there is likely a correlation between allergies and the SF-12 MCS that our study population is unable to detect.

On the other hand, the SF-12 MCS was significantly correlated with HOS-ADL, HOS-SSS, and iHOT-12. Additionally, in all multivariate models, the SF-12 MCS had the strongest association with all the hip-specific PROs compared to age, female gender, and patient allergies. This is similar to a previous study by Wylie et al.²⁸ that showed the SF-36 MCS had the strongest association and correlation with shoulder-specific outcome measures compared with patient demographics, tear size for rotator cuff tears. The correlation between psychiatric illness and outcomes may potentially explain how mental health influence patients following interventions. Psychiatric illness leads to upregulation of the inflammatory pathways resulting in increased interleukin-1 (IL-1), IL-4, IL-6, interferon alpha, tumor necrosis factor-alpha, and other inflammatory cytokines.²⁹⁻³³ These inflammatory cytokines cross the blood-brain barrier and act on neural centers responsible for modulating behavior and emotions.³⁴ This inflammatory cascade may therefore result in increased perception of patient pain as pain and depression have a synergistic effect.³⁵

Limitations

There are limitations to this study. The study was retrospective and only 212 (69%) of the 308 reviewed patients were included in the study, possibly leading to selection bias. However, analysis of the excluded patients did not show a significant difference in patient demographics between groups, thus limiting the magnitude of selection bias. All surgeries were performed by a single fellowship-trained orthopaedic surgeon with an extensive experience in hip arthroscopy. Thus, the results of this investigation may not be extrapolated to all patient and surgeon populations. Patient reactions to medications were not recorded, limiting the potential to evaluate for "true" allergic reactions to medication. Postoperative PROs were not included, limiting the authors' ability to fully assess the effect of patient allergies on postoperative outcomes after hip arthroscopy.

Conclusions

In patients undergoing hip arthroscopy for FAI syndrome, self-reported medication allergies are not significantly associated with preoperative patient-reported hip outcome scores.

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