Image-Guided Intra-articular Hip Injections and Risk of Infection After Hip Arthroscopy

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Background: Although intra-articular injections are important in the management of patients who may later undergo hip arthroscopy, conflicting data are available regarding the safety of such injections when administered within 3 months of surgery. Furthermore, despite the increasing use of image-guided intra-articular hip injections, it is unknown whether the type of imaging modality used is associated with infection after hip arthroscopy.

Purpose: To assess the risk of infection associated with image-guided intra-articular injections before hip arthroscopy and, secondarily, compare that risk between ultrasound (US) and fluoroscopic (FL) guidance.

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

Methods: This was a retrospective cohort study of patients in a large national insurance database who underwent hip arthroscopy between 2007 and 2017. Patients were required to have continuous enrollment from at least 1 year before to 6 months after hip arthroscopy. Patient age, sex, geographic region, medical history, surgical details, and hip injections were collected. Patients who underwent injection $\leq$3 months preoperatively and >3 to $\leq$12 months preoperatively were compared with patients who did not undergo preoperative injection. Bivariate analyses and multivariable logistic regressions were used to assess the association between ipsilateral preoperative hip injection and surgical site infection within 6 months of surgery.

Results: We identified 17,987 patients (36.3% female; mean $\pm$ SD age, 37.6 $\pm$ 14.0 years) undergoing hip arthroscopy, 2276 (12.7%) of whom had an image-guided hip injection in the year preceding surgery (53.0% FL). Patients who underwent intra-articular injection $\leq$3 months preoperatively had similar infection rates to patients who did not undergo preoperative injection in the year before surgery for both the FL (0.46% vs 0.46%; $P \geq .995$) and the US cohorts (0.50% vs 0.46%; $P = .76$). Results persisted in adjusted analysis (FL $\leq$3 months: OR, 1.04; 95% CI, 0.32-3.37; $P = .94$; US $\leq$3 months: OR, 1.19; 95% CI, 0.36-3.90; $P = .78$). Similar results were seen for patients undergoing injections >3 to $\leq$12 months preoperatively.

Conclusion: Postoperative infection was rare in patients undergoing intra-articular hip injection $\leq$3 months before hip arthroscopy and was no more common than in patients not undergoing preoperative injection. Moreover, no differences were seen in infection risk between US and FL guidance. Although intra-articular hip injections should always be administered with careful consideration, these results do not suggest that these injections are uniformly contraindicated in the 3 months preceding hip arthroscopy.

Keywords: hip arthroscopy; intra-articular injection; infection; ultrasound; fluoroscopy

Intra-articular injections are fundamental in the diagnosis and treatment of many types of hip pathology.[6,12,31] Given the numerous extra-articular sources of hip pain, relief from an intra-articular anesthetic or corticosteroid injections can be used as an indicator of intra-articular symptoms that may benefit from operative intervention.[7,8,12,28] Furthermore, due to their ability to reduce inflammation and symptoms, intra-articular injections may be able to delay the need for arthroscopic hip surgery or may improve recovery after arthroscopic hip surgery.[4] As such, it is common for patients to undergo intra-articular injections before hip arthroscopy.

However, conflicting data are available about the safety of these injections when administered in the 3 months before hip arthroscopy.[4,14,28] For instance, in a large database study, Wang et al[28] demonstrated a >2-fold increase in infection risk when intra-articular injections were administered within 3 months of hip arthroscopy. Notably, the infection rates reported in that study (1.1%-2.8%) were higher than typically seen in the literature (<1%).[4,16,27] In contrast, Byrd et al[4] recently documented 0 infections in a single-institution case series of 500 patients undergoing intra-articular injection in the 3 months before hip arthroscopy at a high-volume hip arthroscopy practice. In addition to differing data sources, an important distinction between these works was the use of image guidance; Wang et al did

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not evaluate this factor (or include the Current Procedural Terminology [CPT] code for ultrasound [US]-guided injections),[15] and Byrd et al[4] included only US-guided injections. In fact, despite the increasing use of US-guided hip injections[17,21] (supported by studies on radiographic accuracy[2,13,18,21] and patient-reported outcomes[1,5,22]), to our knowledge no previous study has compared the risk of complications, including infection, between US- and fluoroscopy (FL)-guided hip injections before hip surgery. If preoperative injections do pose an infection risk, then differences in instrumentation, materials, and technique between US- and FL-guided injections could lead to differences in infection rates between modalities.[5,15]

Therefore, the purposes of this study were to assess the risk of postoperative infection (within 6 months) associated with image-guided intra-articular injections before hip arthroscopy and, secondarily, compare that risk between injections made under US and FL guidance. We hypothesized that infection after hip arthroscopy would be rare (<1%), even when intra-articular injections were administered within 3 months of surgery, and that US-guided injections would be associated with an infection risk similar to that of FL-guided injections.

METHODS

This was a retrospective cohort study of patients in the MarketScan database who underwent hip arthroscopy between 2007 and 2017. The MarketScan database is a premier commercial claims database in the United States, including ~50 million patients per year covered under employer-sponsored health insurance from >350 different payers in all 50 states.[19] For all patients, detailed information was available regarding insurance enrollment and professional and facility data records for all inpatient and outpatient services and procedures. The benefits of large databases must be balanced with their limitations; however, due to their large national samples, they are particularly well-equipped to answer questions with regard to rare outcomes, such as the risk of infection after hip arthroscopy.[15] Importantly, the MarketScan database is able to longitudinally track patients across health plans, health care sites and settings, and clinician types over time and is widely regarded to be one of the most complete, fully integrated databases in the United States.[25,29]

Drawing on previous work,[28] we used CPT codes 29860, 28961, 29862, 29863, 29914, 29915, and 29916 to identify a cohort of patients undergoing hip arthroscopy procedures. CPT codes were used because they include laterality modifiers. In addition to surgery type and laterality, the data included surgery date, indication, and geographic location. To ensure the absence of undetected injections preoperatively and loss to follow-up postoperatively, respectively, patients were required to have continuous insurance enrollment at least 12 months before and 6 months after their hip arthroscopy procedure. Hip arthroscopy procedures performed to treat an active infection[11,20] were excluded in our primary analysis.

Next, all FL- or US-guided intra-articular injections of the hip were identified. FL-guided injections were obtained by identifying major joint injections (CPT 20610) performed for hip indications (Appendix Table A1, available in the online version of this article) with concurrent use of FL guidance (CPT 77002). US-guided injections were obtained by identifying major joint injections (CPT 20610) performed for hip indications with concurrent use of US guidance (CPT 76942) or by the combined CPT code for major joint injection under US guidance (CPT 20611 [available 2015 onward]). In addition to image-guidance modality, the data included injection laterality, date, and drug. Injection timing relative to ipsilateral hip arthroscopy was grouped based on previous thresholds of ≤3 months preoperatively and >3 to ≤12 months preoperatively.[4,28] Patients who had an ipsilateral hip injection for which no image-guidance method was reported (n = 664, including potential landmark injections) and/or who underwent both types of injections within the given time period (n = 64) were excluded.

The primary outcome of this study was surgical-site infection in the first 6 postoperative months. Consistent with previous work,[28] infections were identified by documentation of a diagnosis of or procedure for a surgical site infection (Appendix Table A2, available online). For each image-guidance method, patients undergoing injection ≤3 months before surgery and >3 to 12 months before surgery were compared with control patients who did not receive an intra-articular hip injection in the year before hip arthroscopy.

Statistics

Categorical variables were presented as n (%) and compared by use of chi-square or Fisher exact tests, whereas continuous variables were presented as mean ± SD or median (interquartile range) and compared via Student *t* tests or Mann-Whitney *U* tests, as appropriate. To assess the independent association between preoperative hip injections and postoperative infection, we performed

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multivariable logistic regressions adjusting for age, sex, geography, year, smoking, and medical comorbidities.

To ensure the robustness of our results, we performed a variety of exploratory and sensitivity analyses. First, we performed an exploratory analysis in which we no longer excluded patients who underwent hip arthroscopy for a diagnosis of infection. Second, to ensure that infection rates were not spuriously deflated compared with previous work[28] due to the transition to International Classification of Diseases, Tenth Version (ICD-10), we compared the infection rates before 2015 (the ICD-9 era, as in the previous study[28]) and after 2015 (the ICD-10 era). Third, although all patients were required to have a diagnosis of hip pain for their injection, we performed a sensitivity analysis excluding any patients with concurrent knee or shoulder pain documented with the injection (Appendix Table A3, available online). Fourth, to ensure that none of the injections were for trochanteric bursitis, we performed sensitivity analyses excluding any patients with concurrent (1) trochanteric bursitis and (2) any bursitis (Appendix Table A4, available online). Fifth, we analyzed preoperative corticosteroid injections specifically (Appendix Table A8, available online). Sixth, we analyzed a stricter definition of postoperative infection (Appendix Table A9, available online). To explore whether the infection risk results may have been driven by a few, high-volume providers in our sample, we analyzed infection risk as a function of metropolitan statistical area. Seventh, we assessed the association with infection by analyzing time from injection to surgery as a continuous variable (Appendix, available online). All statistical analyses were performed in SAS Version 9.4 (SAS Institute), and $P < .05$ was considered significant. Because this study included only deidentified, US Health Insurance Portability and Accountability Act–compliant information, it was exempt from institutional review board approval.

RESULTS

This study included a total of 17,987 patients who underwent hip arthroscopy. Of these patients, 2276 (12.7%) had an image-guided hip injection within the 12 months before ipsilateral arthroscopic hip surgery, whereas 15,711 (87.3%) patients did not have a hip injection of any type in the 12 months preoperatively (Table 1). There were 1206 (53.0%) FL-guided injections and 1070 (47.0%) US-guided injections. Surgery ≤3 months after injection was slightly more common than surgery >3 to ≤12 months after injection for both the FL cohort (≤3 months; n = 658 [55.0%]) (Table 2) and the US cohort (≤3 months; n = 604 [56.4%]) (Table 3). The median (interquartile range [IQR]) time from injection to surgery for the ≤3-month and >3- to ≤12-month groups, respectively, was 56 days (IQR, 37-71 days) and 158 days (IQR, 115-213 days) for the FL cohort (Table 2) and 55 days (IQR, 37-71 days) and 145 days (IQR, 113-199 days) days for the US cohort (Table 3). With the exception of the patients who underwent US-guided injection ≤3 months preoperatively, injection patients tended to be slightly older than control patients (Tables 2 and 3). The overall infection rate across all patients was 0.47% (84 patients). Additional baseline data are reported in Table 1.

TABLE 1
Patient Characteristics for the Overall Sample (N = 17,987)[a]

Characteristic	Finding
Age, y	37.60 ± 14.04
Sex	
Female	6522 (36.3)
Male	11,465 (63.7)
Region	
North Central	4520 (25.1)
Northeast	2884 (16.0)
South	6158 (34.2)
Unknown	201 (1.1)
West	4224 (23.5)
Smoker	
No	17,096 (95.0)
Yes	891 (5.0)
Charlson Comorbidity Index	0.31 ± 0.73
Groups	
Control	15,711 (87.3)
Fluoroscopy: >3 to ≤12 mo	548 (3.0)
Fluoroscopy: ≤3 mo	658 (3.7)
Ultrasound: >3 to ≤12 mo	466 (2.6)
Ultrasound: ≤3 mo	604 (3.4)
Injection type[b]	
Fluoroscopy	1206 (53.0)
Ultrasound	1070 (47.0)
Time from injection to surgery, d[b]	105.65 ± 75.51
Postoperative infection	
No	17,903 (99.53)
Yes	84 (0.47)

[a]Data are presented as mean ± SD or number (%).
[b]Among patients who underwent injection.

Preoperative hip injection was not significantly associated with increased risk of postoperative surgical site infection compared with no-injection control patients for any image-guidance method or time point. Specifically, for the FL cohort, infection rates were similar to the no-injection control cohort for patients undergoing hip arthroscopy ≤3 months after injection (0.46% [3/658] vs 0.46% [73/15,711], respectively; $P \geq .999$) and >3 to ≤12 months after injection (0.55% [3/548] vs 0.46% [73/15,711]; $P = .74$). These results persisted in adjusted analysis controlling for age, sex, geographic region, calendar year, smoking status, and comorbidities, as preoperative injection remained unassociated with increased risk of infection compared with no-injection controls for injections ≤3 months before hip arthroscopy (odds ratio [OR], 1.04; 95% CI, 0.32-3.37; $P = .94$) and injections >3 to ≤12 months before hip arthroscopy (OR, 1.31; 95% CI, 0.40-4.25; $P = .65$) (Table 4). Similar results were seen for the US-guided cohort. Specifically, neither hip arthroscopy ≤3 months after intra-articular injection (0.50% [3/604] vs 0.46% [73/15,711]; $P = .77$) nor that >3 to ≤12 months after injection (0.43% [2/466] vs 0.46% [73/15,711]) was associated with increased risk of infection compared with control patients who did not undergo

TABLE 2
Patient Characteristics for Fluoroscopy Versus Control Groups[a]

	Control (n = 15,711)	Fluoroscopy: >3 to ≤12 Months (n = 548)	Fluoroscopy: ≤3 Months (n = 658)	*P* Value >3 to ≤12 Months[b]	*P* Value ≤3 Months[b]
Time from injection to surgery, d					
Mean ± SD	NA	174.81 ± 71.23	54.37 ± 21.38	NA	NA
Median (IQR)	NA	158.0 (115.5-213.0)	56.0 (37.0-71.0)	NA	NA
Age, y	37.46 ± 14.07	40.45 ± 13.44	39.33 ± 13.63	<.001	<.001
Charlson Comorbidity Index	0.31 ± 0.72	0.35 ± 0.76	0.35 ± 0.81	.22	.16
Sex				.44	<.001
Female	5814 (37.0)	194 (35.4)	195 (29.6)		
Male	9897 (63.0)	354 (64.6)	463 (70.4)		
Region				<.001	<.001
North Central	3821 (24.3)	200 (36.5)	222 (33.7)		
Northeast	2536 (16.1)	83 (15.1)	84 (12.8)		
South	5303 (33.8)	173 (31.6)	250 (38.0)		
Unknown	191 (1.2)	2 (0.4)	3 (0.5)		
West	3860 (24.6)	90 (16.4)	99 (15.0)		
Smoker				<.001	<.001
No	14,975 (95.3)	503 (91.8)	601 (91.3)		
Yes	736 (4.7)	45 (8.2)	57 (8.7)		
Postoperative infection				.74	≥.999
No	15,638 (99.54)	545 (99.45)	655 (99.54)		
Yes	73 (0.46)	3 (0.55)	3 (0.46)		

[a]Data are presented as mean ± SD or number (%) unless otherwise noted. IQR, interquartile range; NA, not applicable.
[b]Versus control.

TABLE 3
Patient Characteristics for Ultrasound Versus Control Groups[a]

	Control (n = 15,711)	Ultrasound: >3 to ≤12 Months (n = 466)	Ultrasound: ≤3 Months (n = 604)	*P* Value >3 to ≤12 Months[b]	*P* Value ≤3 Months[b]
Time from injection to surgery, d					
Mean ± SD	NA	164.67 ± 65.14	53.23 ± 21.91	NA	NA
Median (IQR)	NA	145.0 (113.0-199.0)	55.0 (37.0-71.0)	NA	NA
Age, y	37.46 ± 14.07	38.16 ± 13.55	36.33 ± 14.12	.29	.05
Charlson Comorbidity Index	0.31 ± 0.72	0.37 ± 0.79	0.36 ± 0.82	.09	.11
Sex				.012	<.001
Female	5814 (37.0)	146 (31.3)	173 (28.6)		
Male	9897 (63.0)	320 (68.7)	431 (71.4)		
Region				<.001	<.001
North Central	3821 (24.3)	140 (30.0)	137 (22.7)		
Northeast	2536 (16.1)	78 (16.7)	103 (17.1)		
South	5303 (33.8)	174 (37.3)	258 (42.7)		
Unknown	191 (1.2)	2 (0.4)	3 (0.5)		
West	3860 (24.6)	72 (15.5)	103 (17.1)		
Smoker				.54	.28
No	14,975 (95.3)	447 (95.9)	570 (94.4)		
Yes	736 (4.7)	19 (4.1)	34 (5.6)		
Postoperative infection				≥.999	.76
No	15,638 (99.54)	464 (99.57)	601 (99.50)		
Yes	73 (0.46)	2 (0.43)	3 (0.50)		

[a]Data are presented as mean ± SD or number (%) unless otherwise noted. IQR, interquartile range; NA, not applicable.
[b]Versus control.

preoperative injection in the year before surgery. These results persisted in adjusted analysis, as hip arthroscopy ≤3 months after intra-articular hip injection (OR, 1.19; 95% CI, 0.36-3.90; $P = .78$) and >3 to ≤12 months after injection (OR, 1.06; 95% CI, 0.25-4.47; $P = .94$) remained unassociated with increased risk of postoperative infection compared with no-injection control patients (Table 4). Findings persisted in all sensitivity analyses, including the

TABLE 4
Adjusted Risk of Surgical Site Infection Between Injection Time Points Stratified by Image-Guidance Modality

	Fluoroscopy		Ultrasound	
Injection Timing	Odds Ratio (95% CI)	*P* Value	Odds Ratio (95% CI)	*P* Value
≤3 months vs control	1.04 (0.32-3.37)	.94	1.19 (0.36-3.9)	.78
>3 to ≤12 months vs control	1.31 (0.4-4.25)	.65	1.06 (0.25-4.47)	.94
≤3 months vs >3 to ≤12 months	0.8 (0.16-3.97)	.78	1.12 (0.19-6.75)	.9

following: when excluding patients with concurrent knee or shoulder disorders (Appendix Table A5, available online) or with concurrent bursitis (Appendix Tables A6 and A7, available online); when analyzing patients who underwent corticosteroid injections specifically (hip arthroscopy ≤3 months after corticosteroid injection vs no-injection control: 0.31% [3/981] vs 0.46% [73/15,711], respectively; $P = .47$; adjusted OR, 0.68; 95% CI, 0.21-2.22; $P = .51$) (Appendix Table A8, available online); when using a stricter definition of deep postoperative infection (Appendix Table A9, available online); and when analyzing time from injection to surgery as a continuous variable (Appendix, available online).

Notably, when we no longer excluded patients with infection at the time of arthroscopy, the infection rate for FL-guided injection within the 3 months before hip arthroscopy increased from 0.46% (3/658) to 1.21% (8/663). All 5 of the patients who had a baseline infection in this group underwent their FL-guided hip injection within the 8 days preceding arthroscopy (2 patients, 1 day before; 1 patient, 2 days before; 1 patient, 6 days before; and 1 patient, 8 days before). For the US ≤3-month group, the infection rate increased from 0.50% (3/604) to 0.83% (5/606), whereas there was a slightly smaller relative increase in control patients from 0.46% (73/15,711) to 0.69% (109/15,791). In analyzing geographic diversity, we found that patients underwent image-guided intra-articular injections in 275 different metropolitan statistical areas. No single metropolitan statistical area accounted for >2.6% of all injections, and the majority (66.4%) of injections were performed in a metropolitan statistical area that accounted for <1.0% of all injections. A total of 267 (12.2%) injections were performed in a location outside a defined metropolitan statistical area; these were spread across 37 different states, with no state having >22 injections (0.97% of all injections).

DISCUSSION

Although image-guided intra-articular injections are a fundamental component in the nonoperative management of patients who may need hip arthroscopy, the exact infection risk posed by these injections when administered within the 3 months preceding surgery is uncertain. In this study, we found that postoperative infection in patients undergoing intra-articular hip injection ≤3 months before hip arthroscopy was rare and no more common than in patients not undergoing preoperative injection. Notably, postoperative infection rates were appreciably higher when we did not exclude patients undergoing hip arthroscopy for an infectious indication. Moreover, we provide the first data comparing infection rates between US- and FL-guided injections, finding no evidence of a differential infection risk between US- and FL-guided injections. These results provide the most definitive data on the risk of image-guided intra-articular injections before hip arthroscopy, highlight the importance of selection criteria when working with large databases, and support the continued use of either US- or FL-guided injections for prospective hip arthroscopy patients.

The most important finding of this study was the lack of association between preoperative image-guided intra-articular injections and infection after hip arthroscopy. Given that hip injections are central to diagnosing labral and other intra-articular hip pathologies,[9,13,30] it is not uncommon for a hip injection to be administered in the months preceding hip arthroscopy. The present study population highlights this practice, as the majority of all patients who received injection underwent arthroscopy within 3 months of injection. Despite this, conflicting data have been reported about the risks of infection after hip arthroscopy when injections are administered in this time frame.[4,28] In the current study, which entailed nearly 4 times as many patients (n = 1262) undergoing hip injection in the 3 months preceding hip arthroscopy when compared with the previous large database study (n = 339),[28] we found no evidence of increased infection risk. Moreover, infection rates were <0.5%, corresponding more closely with previous systematic review data[16] and raising questions about the hypothesis that infection rates may be substantially higher in big data studies due to the inclusion of nonacademic centers.[15] In fact, the majority of injections included in our study were performed in metropolitan statistical areas that accounted for <1.0% of all injections, suggesting that the patients in this study were treated at a broad sample of centers across the United States. Although injections within 3 months of hip arthroscopy should be administered cautiously, the current results do not indicate that injections administered within 3 months before hip arthroscopy should be uniformly avoided. Additionally, the effect of relatively immediate surgery after injection is still uncertain, as >75% of patients in the 3-month cohort had injections ≥5 weeks before surgery, and allowing a 4- to 6-week interval from injection to surgery is likely still advisable.[4]

This study also highlights that careful selection criteria and methods are critical in large database studies. Although rare, hip arthroscopy may represent an appropriate treatment for septic arthritis in select patients.[11,20] Because hip injections are coded under the same CPT code as hip aspirations, it is possible that some of the "injections" performed within 3 months of hip surgery in large databases are actually aspirations for suspected joint infection.[24] To test this hypothesis, we performed an exploratory analysis in which we no longer excluded patients with a baseline infection. In this analysis, the risk of infection associated with FL-guided injections administered within the 3 months preceding hip arthroscopy nearly tripled, from 0.46% to 1.21%. Furthermore, we found that all of the patients in the FL-guided injection group who were previously excluded for baseline infection received their "injection" within 8 days of their arthroscopy, further suggesting that these were likely diagnostic aspirations for suspected infection. To our knowledge, this is the first study to demonstrate the potential effect of this subtlety on database studies analyzing intra-articular injections in orthopaedic surgery. Moving forward, it may be important for investigators studying this topic to exclude patients undergoing surgery for infection and/or to use databases that can identify that a specific medication was, in fact, injected (eg, corticosteroid, hyaluronic acid).

Another unknown factor in the evaluation of safety of intra-articular injections before hip arthroscopy was the role of image guidance.[15] Although the use of US-guided hip injections is increasing,[17,21] whether there are differences in infection risk between US and FL guidance has not been assessed. Due to greater maneuverability and reduced number of procedural steps associated with US-guided injections,[5] accidental contamination could be less likely than with fluoroscopy.[15] Alternatively, the use of ultrasound gel could lead to an increased infection risk with US-guided injections.[15,23,26] Although the rarity of infection after hip arthroscopy precludes a definitive determination that there is no difference in infection risk between techniques, there was certainly no evidence that these techniques are associated with a difference in infection risk in the current study. The infection rates for both US-guided (0.50%) and FL-guided (0.46%) injections administered within 3 months before hip arthroscopy were extremely similar to each other as well as to the control infection rate of 0.46%. Consequently, the decision about which image guidance method to use should likely be made on the basis of other factors, such as provider experience, patient-reported outcomes and satisfaction, radiographic accuracy, and resource availability.[1,2,4,5,13,18,21,22]

Although this study has numerous strengths, including the largest sample of injections before hip arthroscopy ever reported and providing the first data comparing image-guidance modalities, it is not without limitations. First, this is a retrospective, large database study and is subject to the limitations therein.[15] However, the MarketScan database is one of the largest and highest quality commercial claims databases available,[25,29] and a number of steps were taken to minimize potential limitations of the large database approach, including specific inclusion criteria and numerous sensitivity analyses. Furthermore, due to the rarity of both hip arthroscopy and infection after it, the study question would be pragmatically challenging to answer with a randomized controlled trial, making it an important topic to evaluate with big data.[15] Next, because image guidance may have been used but not billed for, we could not assess the risk of landmark-guided injections. We could only verify when either US or FL guidance did occur. Although future institutional studies could seek to address the infection risk associated with landmark-guided injections specifically, due to the increasing use of image-guided injections by most providers[17] this may be of lower import. Although this study explored many factors that may be related to infection rates after intra-articular injections, including timing, image guidance, injectate (eg, corticosteroids), and facility volume, other factors that may affect infection rates could include the experience and field of the provider administering the injection, the extensiveness of the postinjection procedure (eg, labral reconstruction vs simple labral repair), and the administration of perioperative antibiotics. Finally, although the MarketScan database provides extremely high-quality data from a large sample of patients across >350 commercial payers in the United States, it is inherently limited to patients younger than 65 years, and the generalizability of these results to other populations, such as those receiving Medicare, is unknown. Nevertheless, this is likely to be a minor limitation, as the vast majority of patients undergoing hip arthroscopy are younger than 65 years.[3,10]

In conclusion, intra-articular hip injections are an important tool in the hip arthroscopist's armamentarium for both diagnostic and therapeutic purposes. Although optimal management often would indicate hip arthroscopy within 3 months of these injections, whether this may place patients at increased risk of postoperative infection was unclear. In this study, we found no evidence that image-guided hip injections within 3 months of hip arthroscopy were associated with increased risk of postoperative infection, consistent with previous institutional data.[4,16] Moreover, we found no evidence that US- and FL-guided injections were associated with differences in postoperative infection risk. Although intra-articular hip injections should always be administered with careful consideration, our results do not suggest that such injections are uniformly contraindicated within the 3 months preceding hip arthroscopy.

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