

Preoperative Corticosteroid Injections Within 4 Weeks of Arthroscopic Shoulder Procedures Are Associated With Increased Postoperative Infection Rates

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Purpose: To refine the understanding of the effect of timing of corticosteroid injections (CSIs) and shoulder arthroscopy on postoperative infection. **Methods:** An insurance database was used to determine all patients who underwent shoulder arthroscopy for a 5-year period with an associated preoperative ipsilateral corticosteroid injection. Patients were stratified into cohorts based on timing of preoperative CSI: (1) 0-<2 weeks, (2) 2-<4 weeks, (3) 4-<6 weeks, and (4) 6-<8 weeks. Patients were pooled to include all patients who had a CSI less than 4 weeks and those longer than 4 weeks. A cohort of patients who never had a corticosteroid injection before undergoing arthroscopy were used as a control. All patients had a follow-up of 2 years. Multivariable regression analyses were performed using R Studio with significance defined as $P < .05$. **Results:** Multivariate logistic regression showed a greater odds ratio (OR) for postoperative infection in patients who received CSI 0-<2 weeks before shoulder arthroscopy at 90 days (3.10, 95% confidence interval [CI] 1.62-5.57, $P < .001$), 1 year (2.51, 95% CI 1.46-4.12, $P < .001$), and 2 years (2.08, 95% CI 1.27-3.28, $P = .002$) compared with the control group. Patients who received CSI 2-<4 weeks before shoulder arthroscopy had greater OR for infection at 90 days (2.26, 95% CI 1.28-3.83, $P = .03$), 1 year (1.82, 95% CI 1.13-2.82, $P = .01$), and 2 years (1.62, 95% CI 1.10-2.47, $P = .012$). Patients who received CSI after 4 weeks had similar ORs of infection at 90 days (OR 1.15, 95% CI 0.78-1.69, $P = .48$) 1 year (OR 1.18, 95% CI 0.85-1.63 $P = .33$), and 2 years (OR 1.09, 95% CI 0.83-1.42, $P = .54$), compared with the control cohort. **Conclusions:** The present study shows the postoperative infection risk is greatest when CSIs are given within 2 weeks of shoulder arthroscopy, whereas CSIs given within 2-<4 weeks also portend increased risk, albeit to a lesser degree. The risk of postoperative infection is not significantly increased when CSIs are given more than 1 month before surgery. **Level of Evidence:** Level III, retrospective comparative; prognosis study.

Shoulder arthroscopy demonstrates low infection rates, ranging from 0.03% to 3.4%.¹⁻⁴ Nonetheless, male sex, age older than 60 years, surgical time longer than 90 minutes, and preoperative corticosteroid injections (CSIs) within 1 month of surgery have been described as risk factors for infection following arthroscopic rotator cuff repair.⁵⁻⁸ Despite the relative rarity of postoperative infections following shoulder

arthroscopy, they are potentially devastating complications associated with worse outcomes and high patient morbidity.^{9,10}

Previous studies have shown preoperative CSIs are associated with greater infection rates following shoulder arthroscopy, but the safe timing has not been fully elucidated.¹¹⁻¹⁸ One recent study concluded arthroscopic shoulder procedures can be safely

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performed at least 2 weeks following CSI. However, this study only included 79 patients who received injections at 0-<2 weeks and 263 patients who received injections at 2-<4 weeks preoperatively compared with 46,363 patients receiving no injections. Therefore, this study may be underpowered to show differences in patients receiving injections at 2-<4 weeks preoperatively.¹² Another study found CSIs performed within 1 month of surgery are associated with 2.1 times greater odds of infection, but the authors did not stratify by 0-<2 or 2-<4 weeks.⁶ Questions remain regarding the degree of risk for infection when injections are performed within the 2- to 4-week window before surgery, or if the increased risk of infection within a month of surgery is attributed to those performed at 0-<2 weeks preoperatively.

Due to the inconclusive data surrounding the timing of CSI before shoulder arthroscopy, a clarification of the timing of CSI and its association with infection rates in patients undergoing the procedure was sought. As such, a large all-payer database was used with cohorts stratified by specific time intervals based on preoperative CSI to quantify infection risk following shoulder arthroscopy. Therefore, the aim of this study was to refine the understanding of the effect of timing of CSI and shoulder arthroscopy on postoperative infection. We hypothesized that a CSI given at 2-<4 weeks' preoperatively would increase the risk of postoperative infection following shoulder arthroscopy.

Methods

Database Selection

A national, all-payer database (PearlDiver, Colorado Springs, CO), including more than 120 million Health Insurance Portability and Accountability—compliant records within the United States was queried. This database tracks patients longitudinally and represents one of the largest aggregations of health care data. We identified *International Classification of Diseases* (ICD) Ninth Revision (9) and Tenth Revision (10) diagnosis codes, Current Procedure Terminology codes, as well as baseline patient demographics (Appendix Table 1, available at www.arthroscopyjournal.org). The study was granted an exception for institutional review board approval, given its retrospective nature and the use of publicly available deidentified patient information. ICD-10 codes were used to match the laterality of the CSI and surgical procedure. Only patients actively enrolled in the PearlDiver database for 90 days following arthroscopy were included in the study. All patients had a follow-up of 2 years.

Outcomes

In the primary analysis, the outcomes of the study were infection at 90-day, 1-year, and 2-year

postoperation. An infection was determined to have occurred by documentation of a septic shoulder or surgical-site infection, as defined by ICD-9 or -10 codes listed in Appendix Table 1, available at www.arthroscopyjournal.org. In the secondary analysis, postoperative infections were pooled to include all patients who had a CSI less than 4 weeks and those longer than 4 weeks.

Statistical Analysis

Continuous variables, including time to CSI injection, were compared using Student *t*-tests, whereas categorical variables, including demographics, comorbidities, and complications were analyzed using χ^2 tests. Multivariable logistic regression analyses were used to determine the risk of postoperative infection based on the timing of CSI after controlling for baseline demographics and patient characteristics (eg, age, sex, alcohol abuse, Charlson comorbidity index, chronic kidney disease, diabetes mellitus, obesity, rheumatoid arthritis, and tobacco use) in both the unpooled and pooled analyses. Statistical analyses were performed using R Studio (Statistics Department of the University of Auckland, New Zealand). Statistical significance was defined as $P < .05$.

Results

Patient Selection

Patients older than 18 years old who underwent primary shoulder arthroscopy between October 1, 2015, and October 31, 2020, and a received preoperative ipsilateral CSI were identified ($n = 9,860$). Patients were excluded if they had received bilateral corticosteroid injections or if they had previous shoulder surgery. Patients were stratified into 4 cohorts based on the timing of their preoperative CSI: (1) 0-<2 weeks ($n = 1,029$), (2) 2-<4 weeks ($n = 1,936$), (3) 4-<6 weeks ($n = 3,078$), (4) 6-<8 weeks ($n = 3,817$). A random cohort of patients not receiving a CSI before their shoulder arthroscopy was used as a noncorticosteroid injection control group ($n = 10,000$) (Fig 1).

Patient Demographics

Mean age, Charlson comorbidity index >3, rheumatoid arthritis, obesity, and tobacco use were significantly greater ($P < .05$) in the CSI cohort than the non-CSI cohort (Table 1). The differences in patient characteristics between the cohorts were controlled for in the multivariate logistic regression analyses.

Postoperative Infection

Patients who received CSI within 2 weeks of their shoulder arthroscopy demonstrated greater rates of infection at 90-day (1.4% vs 0.5% vs 1.0% vs 0.6%, vs

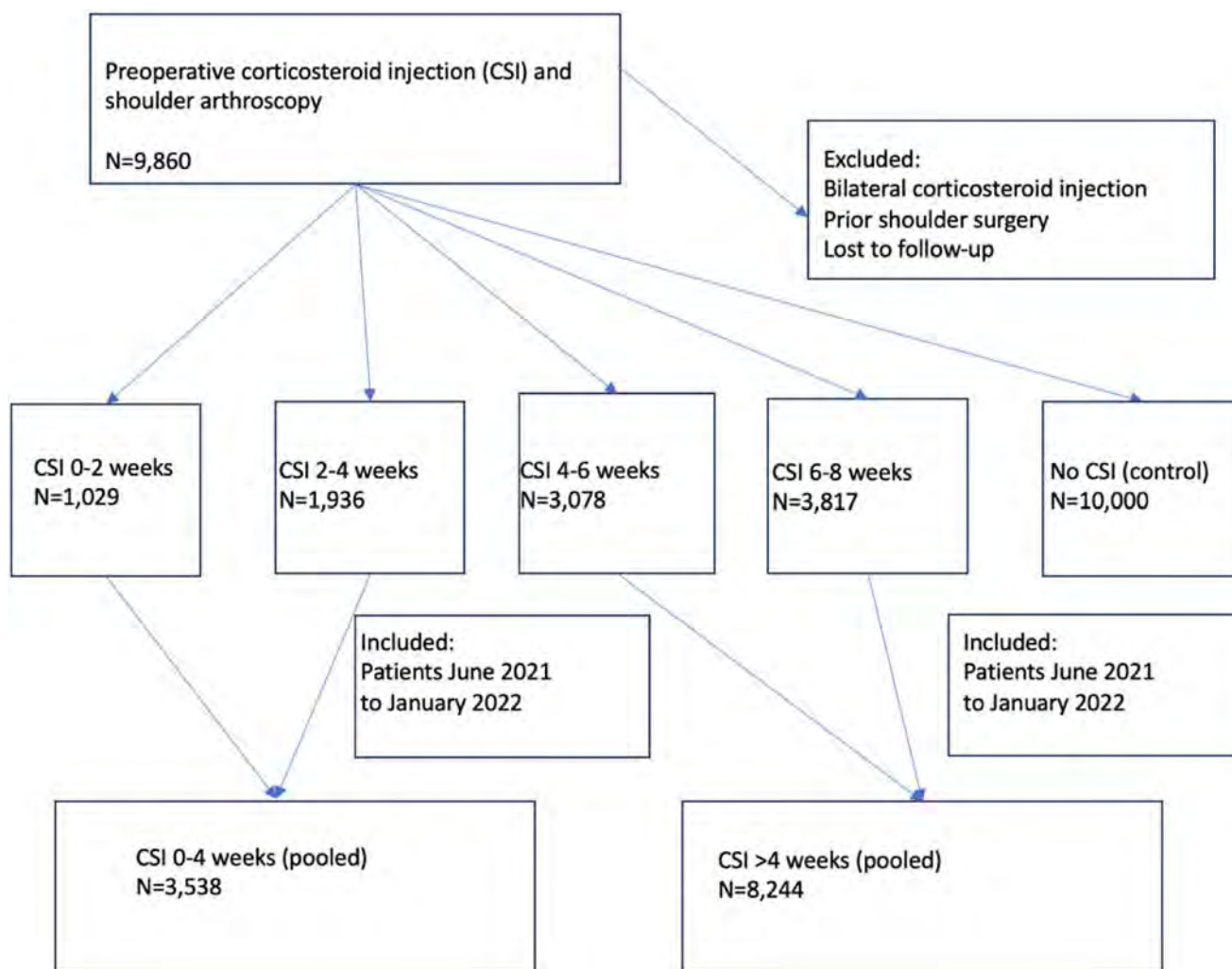


Fig 1. Flow chart of patient inclusion and exclusion. CSI, corticosteroid injection.

0.6%, $P = .001$), 1-year (1.8% vs 0.8% vs 1.3% vs 0.9% vs 0.8%, $P = .002$), and 2-year (2.1% vs 1.0% vs 1.7% vs 1.3% vs 1.2%, $P = .004$) time points compared with the no CSI, CSI at 2-<4 week, 4-<6 week, and 6-<8 week groups, respectively (Table 2). Multivariate logistic regression revealed greater odds ratios (ORs) for postoperative infection in patients who received CSI within 1 month of their shoulder arthroscopy. In particular, those receiving CSI within 2 weeks of their surgery experienced the greatest OR for infection at 90-day (3.10, 95% confidence interval [CI] 1.62-5.57, $P < .001$), 1-year (2.51, 95% CI 1.46-4.12, $P < .001$), and 2-year (2.08, 95% CI 1.27-3.28, $P = .002$) time points compared with the control group. Patients who received CSI 2-<4 weeks before their shoulder arthroscopy similarly experienced greater OR for infection at 90-day (2.26, 95% CI 1.28-3.83, $P = .03$), 1-year (1.82, 95% CI 1.13-2.82, $P = .01$), and 2-year (1.62, 95% CI 1.10-2.47, $P = .012$), albeit to a lesser degree than those receiving CSI within 2 weeks. CSI >4

weeks before surgery was not associated with an increased risk of infection (Table 3).

Postoperative Infection After Pooling

Patients who received CSI within 4 weeks of their shoulder arthroscopy ($n = 3,538$) and patients who received CSI after 4 weeks ($n = 8,244$) were pooled and compared with patients who received no CSI after shoulder arthroscopy ($n = 10,000$).

Patients who received CSI within 4 weeks of their shoulder arthroscopy showed greater ORs of infection at 90-day (OR 2.22, 95% CI 1.48-3.32, $P < .001$), 1-year (OR 1.97, 95% CI 1.38-2.80, $P < .001$), and 2-year (OR 1.53, 95% CI 1.12-2.08, $P = .007$) time points in comparison with the control cohort.

Patients who received CSI after 4 weeks had similar odds ratios of infection at 90 days (OR 1.15, 95% CI 0.78-1.69, $P = .48$) 1 year (OR 1.18, 95% CI 0.85-1.63, $P = .33$), and 2 years (OR 1.09, 95% CI 0.83-1.42, $P = .54$), compared with the control cohort (Table 4).

Table 1. Demographics and Baseline Characteristics

	No. CSIs	CSI 0-<2 Weeks Before Shoulder Arthroscopy	CSI 2-<4 Weeks Before Shoulder Arthroscopy	CSI 4-<6 Weeks Before Shoulder Arthroscopy	CSI 6-<8 Weeks Before Shoulder Arthroscopy	P Value
	n = 9,860	n = 1,029	n = 1,936	n = 3,078	n = 3,817	
Age, y (SD)	54 (14.07)	58 (11.26)	56 (12.59)	56 (12.63)	55 (12.45)	
Sex						<.001
Female	4,669 (46.7)	589 (57.2)	1,081 (55.8)	1,763 (57.3)	2,103 (55.1)	
Male	5,331 (53.3)	440 (42.8)	855 (44.2)	1,315 (42.7)	1,714 (44.9)	
Alcohol abuse	635 (6.4)	68 (6.6)	157 (8.1)	216 (7.0)	268 (7.0)	.060
CCI >3	743 (7.4)	143 (13.9)	238 (12.3)	384 (12.5)	506 (13.3)	<.001
Cancer	1,351 (13.5)	117 (11.4)	213 (11.0)	346 (11.2)	455 (11.9)	<.001
CKD	1,157 (11.6)	121 (11.8)	203 (10.5)	311 (10.1)	361 (9.5)	.003
CHF	472 (4.7)	43 (4.2)	80 (4.1)	115 (3.7)	139 (3.6)	.028
Depression	3,776 (37.8)	495 (48.1)	907 (46.8)	1,411 (45.8)	1,708 (44.7)	<.001
Diabetes	3,644 (36.4)	402 (39.1)	707 (36.5)	1,078 (35.0)	1,356 (35.5)	.159
F&E disorders	2,418 (24.2)	272 (26.4)	510 (26.3)	790 (25.7)	922 (24.2)	.089
Hypertension	6,480 (64.8)	728 (70.7)	1,323 (68.3)	2,044 (66.4)	2,502 (65.5)	<.001
Hypothyroidism	2,379 (23.8)	270 (26.2)	497 (25.7)	811 (26.3)	980 (25.7)	.012
Rheumatoid arthritis	403 (4.0)	53 (5.2)	99 (5.1)	120 (3.9)	181 (4.7)	.046
Obesity	3,750 (37.5)	495 (48.1)	867 (44.8)	1,310 (42.6)	1,675 (43.9)	<.001
Tobacco use	3,658 (36.6)	443 (43.1)	789 (40.8)	1,272 (41.3)	1,646 (43.1)	<.001

NOTE. Values are given as the number with the percentage in parentheses.

CCI, Charlson comorbidity index; CHF, congestive heart failure; CKD, chronic kidney disease; CSI, corticosteroid injection; DM, diabetes mellitus; F&E disorders, fluid and electrolyte disorders; SD, standard deviation.

Discussion

The main finding of this study was that injections administered within 1 month of shoulder arthroscopy elevates the risk for postoperative infection. In particular, patients who received CSIs between 0-<2 weeks and 2-4 weeks preoperatively had greater odds of infection at 90 days (OR 3.10; OR 2.26), 1 year (OR 2.51; OR 1.82), and 2 years (OR 2.08; OR 1.67), respectively when compared with the control group.

The literature has established that the administration of CSI before arthroscopic shoulder surgery increases the risk of postoperative infection. However, Singh et al.¹⁹ studied 1,773 patients at a single institution undergoing arthroscopic rotator cuff repair and found no correlation between the use of preoperative CSI and postoperative infection. The authors argue that single-institution studies address the limitations of database studies but they fail to acknowledge that only 102 injections were given within 1 month preoperatively and do not specify a time point within weeks. One recent

systematic review examined 3 studies in patients who received preoperative CSI before primary rotator cuff repair and found an increased risk of infection. The authors suggested that the poor-quality literature surrounding the topics warrants further investigation as does the lack of focus on the timing of CSI before rotator cuff arthroscopy.²⁰

The timing of preoperative CSI is still a point of controversy. A systematic review by Puzzitiello et al.²¹ reviewed 8 articles of patients who underwent CSI injections before rotator cuff repair and showed that the risk of adverse outcomes was greatest if CSI was administered within 6 months of surgery (OR 1.8 [1.3-2.6]). Desai et al.²² examined 110,567 patients from the Medicare database and 12,892 patients from a private insurance database and found no association between CSI injection within the year before rotator cuff repair and increased risk of revision surgery. In a database study, Forsythe et al.⁶ showed preoperative CSIs within 1 month of arthroscopic rotator cuff repair significantly

Table 2. Bivariate Analysis of Postoperative Infection

	No. CSIs	CSI 0-<2 Weeks Before Shoulder Arthroscopy	CSI 2-<4 Weeks Before Shoulder Arthroscopy	CSI 4-<6 Weeks Before Shoulder Arthroscopy	CSI 6-<8 Weeks Before Shoulder Arthroscopy	P Value
	n = 9,860	n = 1,029	n = 1,936	n = 3,078	n = 3,817	
90-day infection	45 (0.5)	14 (1.4)	19 (1.0)	18 (0.6)	22 (0.6)	.001
1-year infection	75 (0.8)	19 (1.8)	26 (1.3)	29 (0.9)	32 (0.8)	.002
2-year infection	99 (1.0)	22 (2.1)	33 (1.7)	39 (1.3)	47 (1.2)	.004

CSI, corticosteroid injection.

Table 3. Multivariate Logistic Regression for Infection

Infection			
90-day infection	OR*	95% CI	P Value
CSI 0-<2 weeks before shoulder arthroscopy	3.10	1.62-5.57	<.0001
CSI 2-<4 weeks before shoulder arthroscopy	2.26	1.28-3.83	.003
CSI 4-<6 weeks before shoulder arthroscopy	1.42	0.80-2.42	.216
CSI 6-<8 weeks before shoulder arthroscopy	1.39	0.81-2.29	.215
1-year infection			
CSI 0-<2 weeks before shoulder arthroscopy	2.51	1.46-4.12	<.0001
CSI 2-<4 weeks before shoulder arthroscopy	1.82	1.13-2.82	.010
CSI 4-<6 weeks before shoulder arthroscopy	1.33	0.85-2.03	.200
CSI 6-<8 weeks before shoulder arthroscopy	1.17	0.76-1.76	.470
2-year infection			
CSI 0-<2 weeks before shoulder arthroscopy	2.08	1.27-3.28	.002
CSI 2-<4 weeks before shoulder arthroscopy	1.67	1.10-2.47	.012
CSI 4-<6 weeks before shoulder arthroscopy	1.29	0.87-1.86	.191
CSI 6-<8 weeks before shoulder arthroscopy	1.23	0.86-1.75	.242

NOTE. Multivariable logistic regression analyses were performed to adjust for age, sex, body mass index, tobacco use, alcohol use, Charlson comorbidity index, chronic kidney disease, rheumatoid arthritis, obesity, and diabetes mellitus.

CI, confidence interval; CSI, corticosteroid injection; OR, odds ratio.

*Reference group: Patients who do not have steroid injection for shoulder arthroscopy.

increase the risk of postoperative infection within 6 months of surgery when compared with controls (1.3% vs 0.8%, $P = .04$). After controlling for other variables, the risk of postoperative infection more than doubles when preoperative CSIs are performed within a month of surgery. The authors did not stratify the timing of CSI further, so it was unclear whether infection rates were greater if the injection was given at 0-<2 weeks versus 2-<4 weeks preoperatively. Bhattacharjee et al¹² provided more specific biweekly time intervals to help answer this question. The authors compared 4,115 patients receiving CSI within 6 months of shoulder arthroscopy with those not receiving CSI and found a significant increase in both overall infection rate (8.86% vs 1.56%, $P < .0001$) and severe infection rate (6.33% vs 0.55%, $P < .0001$) in those receiving CSI within 2 weeks of surgery ($n = 79$). The authors did not show a significant difference in infection rates when CSI was given between 2-4 weeks of surgery, however, which may be due to a lack of power. They only included 79 patients in the 0- to 2-week time interval and 263 patients in the 2- to 4-week time interval

Table 4. Multivariate Logistic Regression for Pooled Cohorts for Infection

Infection			
90-day infection	OR*	95% CI	P Value
CSI 0-4 weeks before shoulder arthroscopy	2.22	1.48-3.32	<.001
CSI >4 weeks before shoulder arthroscopy	1.15	0.78-1.69	.48
1-year infection			
CSI 0-4 weeks before shoulder arthroscopy	1.97	1.38-2.80	<.001
CSI >4 weeks before shoulder arthroscopy	1.18	0.85-1.63	.33
2-year infection			
CSI 0-4 weeks before shoulder arthroscopy	1.53	1.12-2.08	.007
CSI >4 weeks before shoulder arthroscopy	1.09	0.83-1.42	.54

NOTE. Multivariable logistic regression analyses were performed to adjust for age, sex, body mass index, tobacco use, alcohol use, Charlson comorbidity index, chronic kidney disease, rheumatoid arthritis, obesity, and diabetes mellitus.

CI, confidence interval; CSI, corticosteroid injection; OR, odds ratio.

*Reference group: Patients who do not have steroid injection for shoulder arthroscopy.

compared with 1,029 in the 0- to 2-week time interval and 1,936 in the 2- to 4-week time interval in our study. The present study attempts to bridge the gap between these studies, where we employed a greater number of patients for each biweekly CSI group, which showed CSI at 0-2 weeks and 2-4 weeks preoperatively significantly increases the risk of postoperative infection. Although the present study, as well as the articles by Bhattacharjee et al and Forsythe et al, did not show an increased risk beyond 1 month preoperatively, other studies have shown increased risk at other time intervals. Werner et al¹³ performed a database study to determine the risk of infection following CSI within 0 to 3 months and 3 to 12 months of shoulder arthroscopy, and compared this risk with matched controls without preoperative CSI. The authors found a greater incidence of infection at both 3 months' and 6 months' postoperatively for patients who had a CSI performed within 3 months of surgery as compared with matched controls who did not have a CSI. There was no increase in the infection rate for individuals who had surgery more than 3 months after the CSI. A limitation of the study is that it did not stratify timing of the CSI within the 3-month interval before surgery and therefore could not distinguish if a differential risk of infection existed depending on how close to the time of the surgery the CSI was administered. The present study provides further evidence that CSI within 4 weeks of shoulder arthroscopy increases the risk of postoperative infection, with risk greatest within 2 weeks of surgery. CSI more than 4 weeks before surgery did not increase the risk of infection in the present study. A particular

strength of this study is the use of ICD-10 codes in order to determine laterality of the injection and the large number of patients in each group, reducing the potential for type II error, which was a likely limitation in prior studies.^{6,12,13}

Previous studies have questioned the roles of joint penetration versus the medication profile of corticosteroids in elevating the risk of infection postoperatively. In patients undergoing total knee arthroplasty, Richardson et al²³ concluded CSI and hyaluronic acid injections within 3 months of surgery significantly increased the odds of postoperative infection. In patients undergoing shoulder arthroscopy, Livesey and colleagues¹¹ showed preoperative needle penetration for magnetic resonance arthrogram was associated with an increased risk of postoperative infection when performed within 2 weeks of surgery. The risk of infection was greater in patients who received a preoperative CSI within 4 weeks of surgery, however, indicating the medication profile of corticosteroids may play a bigger role than joint penetration alone. Despite this, the study captures clinically relevant infections following shoulder arthroscopy and establishing a possible association between preoperative CSI and postoperative infections.

Limitations

This study is not without limitations. First, we employed a large database to gather its data and ascertain conclusions. Large database studies can be subject to medical billing and coding errors, as reported by the United States Department of Human and Health Services.²⁴ Therefore, it is possible that the true number of infections may be underestimated. Second, laboratory values of infection were not available in the database and the diagnosis of an infection was based on ICD and Current Procedural Terminology codes alone. Due to the limitations of the database, the study does not address the risk of a second surgery, which might be greater with CSI injection before arthroscopy. As with all database studies, the results can be fragile; however, this study had large numbers which should help mitigate that issue. Notably, there were demographic differences among cohorts, but these were controlled for by including a multivariable analysis to account for the various patient comorbidities.

Conclusions

The present study shows the postoperative infection risk is greatest when CSIs are given within 2 weeks of shoulder arthroscopy, whereas CSIs given within 2-<4 weeks also portends increased risk, albeit to a lesser degree. The risk of postoperative infection is not significantly increased when CSIs are given more than one month prior to surgery.

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Appendix

Appendix Table 1. *International Classification of Diseases (ICD) Codes 9 and 10 as Well as Current Procedural Terminology (CPT) for Procedures and/or Diagnosis*

	CPT or ICD 9/10 Code
Right shoulder arthroscopy	ICD-10-D-M24411, ICD-10-D-S43084A, ICD-10-D-S43084D, ICD-10-D-S43004A, ICD-10-D-S43004D, ICD-10-D-S43431A, ICD-10-D-S43431D, ICD-10-D-M75101, ICD-10-D-M75121, ICD-10-D-M75111, ICD-10-D-M7501, ICD-10-D-M19011, ICD-10-D-M19111, ICD-10-D-M19211, ICD-10-D-S46011A, ICD-10-D-S46011D, ICD-10-D-M7551
Left shoulder arthroscopy	ICD-10-D-S43005A, ICD-10-D-S43005D, ICD-10-D-S43085A, ICD-10-D-S43085D, ICD-10-D-M24412, ICD-10-D-S43432A, ICD-10-D-S43432D, ICD-10-D-M75102, ICD-10-D-M75122, ICD-10-D-M75112, ICD-10-D-M7502, ICD-10-D-M19012, ICD-10-D-M19112, ICD-10-D-M19212, ICD-10-D-M7552, ICD-10-D-S46012A, ICD-10-D-S46012D
Injections Steroids	CPT-20610, CPT-20611 CPT-J3300, CPT-J1030, CPT-J3301, CPT-J1040, CPT-J1700, CPT-J1710, CPT-J1720, CPT-C9256, CPT-J1094, CPT-J1095, CPT-J1020, CPT-J1000, CPT-J2650, CPT-J2920, CPT-J2930, CPT-J3302, CPT-J3303
Infection	ICD-9-D-99859, ICD-9-D-99851, ICD-10-D-T814XXA, ICD-10-D-T8149XA, ICD-10-D-T814XXD, ICD-10-D-T8140XA, ICD-10-D-T8141XA, ICD-10-D-T8142XA, ICD-10-D-T8149XD, ICD-10-D-T8140XD, ICD-10-D-T8141XD, ICD-10-D-T8142XD, ICD-9-D-71101, ICD-9-D-71191, ICD-9-D-73001, ICD-9-D-73011, ICD-9-D-73091, ICD-9-D-73081, ICD-9-D-71101, ICD-9-D-71191, ICD-10-D-M00811, ICD-10-D-M00812, ICD-10-D-M00012, ICD-10-D-M00011, ICD-10-D-M86111, ICD-10-D-M86112, ICD-10-D-M868 × 1, ICD-10-D-M00211, ICD-10-D-M00212, ICD-10-D-M00819, ICD-10-D-M01 × 12, ICD-10-D-M01 × 11, ICD-10-D-M60012, ICD-10-D-M00019, ICD-10-D-M00219, ICD-10-D-M60011, ICD-10-D-M60019, ICD-10-D-M60021, ICD-10-D-M60022, ICD-10-D-M60029, ICD-10-D-M01 × 19