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# Inflammatory bowel disease is associated with increased postoperative complications following shoulder arthroplasty: a propensity-matched analysis

## Abstract

**Introduction**: Shoulder arthroplasty (SA) is one of the most common joint replacement surgeries performed and its utilization continues to rise. Inflammatory Bowel Disease (IBD) is associated with decreased bone mineral density and increased risk of fractures. However, the literature remains divided whether IBD contributes to a heightened risk of postoperative complications. This study examines the potential impact of IBD on the incidence of postoperative infections following shoulder arthroplasty.

**Methods**: We analyzed data from the PearlDiver Mariner 165 database from January 1, 2010, to October 31, 2022. Patients who underwent total or reverse shoulder arthroplasty were identified and categorized into two groups, those with IBD and those without, using a 1:5 propensity score-matching approach. Matching was based on demographic data and infection-related comorbidities. Surgical site infections (SSIs) and hospital readmissions were measured at 90-days postoperatively. Surgical complications, including need for revision surgery, prosthetic joint infection (PJI), instability, and aseptic loosening, were recorded up to 2-years following the procedure. Chi-square tests and multivariate logistic regression using odds ratio analysis were performed, with the significance level (α) set at 0.05.

**Results**: The cohort comprised 5,647 IBD patients and 28,177 propensity-matched non-IBD controls, with comparable demographic and comorbidity profiles. There was a statistically significant increase in 90-day readmissions and 2-year SSIs among IBD patients. Similarly, 2-year postsurgical complications, including SSI, PJI, and aseptic loosening, were greater in the IBD group.

**Conclusion**: IBD is a significant risk factor for increased postoperative infection rates in shoulder arthroplasty patients. Although readmission rates are similar at the 2-year mark, along with other post-op complications, further study is needed to understand how medical treatment for IBD can impact the infection rates on SA.

**Keywords:** inflammatory bowel disease, shoulder arthroplasty, surgical site infection, readmission, aseptic loosening

Volume 17 Issue 4 - 2025

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**Received:** July 07, 2025 | **Published:** July 23, 2025

## Introduction

Shoulder arthroplasty (SA) is the third most common joint replacement surgery, followed by hip and knee arthroplasty, and is projected to grow at a faster rate than both.[1] With the increasing number of patients undergoing SA, it is important to understand which medical comorbidities significantly affect patient outcomes.

Inflammatory Bowel Disease (IBD) is an autoimmune condition characterized by chronic inflammation and is commonly treated with steroids, immunomodulators, and biologic agents.[2] This chronic inflammatory state, long-term steroid exposure, and intrinsic dysregulation of the normal absorptive properties of the alimentary tract results in reduced bone mineral density and a greater risk of osteoporotic fractures.[3]

The current literature is divided on the true risk posed by IBD itself, with some authors attributing observed complications more to concomitant comorbidities common in this population and to the effects of immunosuppressive therapy.[4,5] This study aimed to evaluate the risk of postoperative complications in patients with IBD compared to propensity score–matched non-IBD controls. We hypothesized that IBD alone confers an increased risk of both medical and surgical complications following SA.

## Methods

We performed a retrospective query of the PearlDiver Mariner 165 database from January 1, 2010, to October 31, 2022. Patients who underwent total or reverse shoulder arthroplasty were identified and categorized into two groups: those with IBD and those without. Both cohorts were propensity-score matched in a 1:5 ratio based on demographic data and infection-related comorbidities. Hospital readmissions and surgical site infections were measured at 90 days. 2 year surgical outcomes, including SSI, prosthetic joint infection (PJI), revision, aseptic loosening, and instability, were recorded. Chi-square tests and multivariate logistic regression with odds ratios were performed, with values $P < 0.05$ considered statistically significant.

## Results

A total of 33,824 patients were included in the study, comprising 5,647 with IBD and 28,177 matched non-IBD controls. Demographic and comorbidity profiles were comparable between groups (Table 1).

### 90 Day clinical outcomes

There was a statistically significant increased rate of 90-day Surgical Site Infections (SSI) among the IBD cohort compared to matched controls (0.65% vs. 0.40%; $P = 0.0099$) (Table 2).

Multivariate analysis demonstrated 62% greater odds of SSI in patients with IBD (OR: 1.62; 95% CI: 1.1-2.3) (Table 3). Ninety-day hospital readmissions were significantly higher in the IBD group (5.7% vs. 4.5%; $P < 0.0001$). IBD diagnosis was associated with 29% higher odds of readmission (OR: 1.29; 95% CI: 1.1-1.5).

**Table 1** Demographics of Propensity-Score Matched Groups

| Demographics | | | |
|---|---|---|---|
| | **IBD (n=5,647)** | **no IBD (n=28,177)** | **p-value** |
| age | 66.0 (8.7) | 65.9 (8.5) | 0.42 |
| gender | | | 0.99 |
| F | 3566 | 17794 | |
| M | 2081 | 10383 | |
| obesity | 2745 | 13703 | 0.99 |
| diabetes | 2771 | 13827 | 0.99 |
| Rheum | 745 | 3693 | 0.88 |
| CKD | 1799 | 8967 | 0.98 |
| smoking | 2992 | 14923 | 0.99 |

**Table 2** Postoperative Complications (Chi-square analysis).

| | **IBD (n=5,647)** | **no IBD (n=28,177)** | **p-value** |
|---|---|---|---|
| 90 day readmissions | 322 | 1260 | <0.0001 |
| 90 day SSI | 37 | 114 | 0.0099 |
| 2 yr SSI | 127 | 317 | <0.0001 |
| 2 yr PJI | 11 | 27 | 0.0427 |
| 2 yr revisions | 137 | 613 | 0.2432 |
| 2 yr instability | 50 | 205 | 0.2106 |
| 2 yr aseptic loosening | 53 | 193 | 0.0407 |

**Table 3** Multivariate logistic regression and odds ratios of postoperative complications

| | **OR** | **CI** | **p-value** |
|---|---|---|---|
| 90 day readmissions | 1.29 | 1.1 - 1.5 | < 0.0001 |
| 90 day SSI | 1.62 | 1.1 - 2.3 | 0.0111 |
| 2 yr SSI | 2.02 | 1.6-2.5 | < 0.0001 |
| 2 yr PJI | 2.03 | 1.0 - 4.0 | 0.0480 |
| 2 yr revisions | 1.12 | 0.9 - 1.3 | 0.2483 |
| 2 yr instability | 1.22 | 0.9 - 1.6 | 0.216 |
| 2 yr aseptic loosening | 1.37 | 1.0 - 1.9 | 0.0425 |

### 2 Year Surgical Outcomes

The IBD cohort had a significantly higher incidence of SSI (2.24% vs. 1.13%; $P < 0.0001$), PJI (0.19% vs. 0.1%; $P = 0.0407$), and aseptic loosening (0.94% vs 0.68%; $P = 0.0427$) at 2 years postoperatively (Table 2). Multivariate analysis demonstrated a 102% (OR: 202; 95% CI: 1.6-2.5), 103% (OR: 2.03; 95% CI: 1.0-4.0), and 37% (OR: 1.37; 95% CI: 1.0-1.9) greater odds of these complications, respectively (Table 3). Rates of revision and instability were not significantly different between groups.

## Discussion

The findings of this study add to the growing evidence suggesting that patients with inflammatory bowel disease (IBD) may be predisposed to increased perioperative risks, consistent with prior reports across various surgical institutes. While previous research has highlighted higher rates of complications, including infections, delayed wound healing,[6] and suboptimal outcomes, in IBD patients undergoing procedures such as total hip and knee arthroplasty,[7] less is known about the impact of IBD in the context of shoulder arthroplasty (SA). Given the rising utilization of SA in recent years, understanding how IBD may influence surgical outcomes is increasingly relevant. Our analysis helps fill this knowledge gap by comparing short- and long-term complication rates between IBD and non-IBD patients undergoing SA.

Our results revealed that IBD is associated with a significantly increased risk of both early and late postoperative complications. Specifically, patients with IBD demonstrated higher 90-day readmission rates and increased rates of 90-day surgical site infections. At the 2-year mark, IBD patients continued to show significantly elevated risks of SSI, PJI, and aseptic loosening. These findings were consistent with our pre-study hypothesis and parallel data from arthroplasty studies involving other joints, which have shown increased postoperative complications in IBD patients, including infection, readmission, and longer hospital stays.[8]

A 2022 study noted that patients with IBD who underwent primary hip or knee arthroplasty were at an increased risk of PJI and aseptic loosening within 2 years.[9] These previous reports are consistent with our findings and highlight the increased risk of long-term complications in IBD patients. Increased long-term complication risk among IBD patients has been highlighted in recent literature, including a 2023 meta-analysis showing elevated complication rates at the two-year mark compared to controls,[5] and a 2022 study specifically examining Crohn's disease patients undergoing total knee arthroplasty, which reported comparable findings.[10]

Based on these results, IBD patients undergoing shoulder arthroplasty are at an increased risk of both early and long-term readmissions and complications such as SSI, PJI, and aseptic loosening as compared to non-IBD patients. Although the literature is still unclear as to the mechanisms leading to this increased risk in complications, it is likely that multiple factors play a role.[11] When considering the effects of IBD, disease severity, immunosuppressive therapies, and disease course all play an important role. The immunosuppressive state associated with IBD likely contributes to the increased incidence of postprocedural complications in these patients. IBD treatment often involves immunomodulators and corticosteroids; while the former were not linked to increased infection risk, corticosteroids were and have also been associated with higher fracture risk.[12] Prolonged corticosteroid use can induce immunosuppression, contributing to the heightened vulnerability of IBD patients to complications.

The impact of immunotherapies on joint replacements in IBD patients was investigated in a retrospective case-control study spanning 2006-2014. Analyzing data from 1455 cases, which included shoulder, hip, and knee replacements, the study found that IBD patients treated with Anti-Tumor Necrosis Factor drugs or other immunomodulators did not show a significant increase in serious post-procedure infections. However, the use of Corticosteroids in these patients was associated with a higher risk of complications compared to other medications or IBD alone.[11]

A 2023 meta-analysis reported differing results. A total of 29,738 IBD patients across 8 studies were found to have significantly higher overall complication rates when compared to controls.[5] These complications included medical complications ($p < 0.001$), surgical complications ($p < 0.001$), 90-day readmissions ($p < 0.001$) and a positive association with the development of venous thromboembolism ($p < 0.001$) and postoperative infection ($p<0.001$). Although, as acknowledged by the authors, there are confounding variables between the studies that were not accounted for, such as

severity and frequency of disease.

Ninety-day readmission rates and two-year SSI rates were significantly higher in the IBD cohort compared to controls. These early and delayed complications may reflect different underlying mechanisms—acute readmissions could be related to active disease or immunosuppressive therapies at the time of surgery, while longer-term complications may indicate impaired healing or persistent immunologic dysfunction. Prior studies, such as Gregory et al,[11] suggest that IBD alone may not confer additional risk, but corticosteroid use significantly increases the likelihood of postoperative complications. These findings highlight the importance of recognizing IBD as a potential risk factor for adverse surgical outcomes in shoulder arthroplasty. Future studies evaluating the specific contributions of disease severity, immunosuppressive regimens, and perioperative management strategies may provide further insights into the causal links between IBD and postoperative complications. This could guide preoperative risk stratification, multidisciplinary optimization, and tailored postoperative care to improve outcomes in this vulnerable population.

While our study highlighted significant outcomes between both groups, some limitations in data collection and analysis may not have been fully addressed. The retrospective nature of our study limited the number of confounding factors we were able to evaluate. Specifically, the use of disease modifying therapies, degree of immunosuppressive therapy, and disease severity during and after surgery were not able to be measured.

With the spotlight now on IBD, future studies should evaluate the causal mechanisms of increased perioperative infections/aseptic loosening in IBD patients, the role of various IBD therapeutics on surgical outcomes, and stratify IBD procedural risk scores based on severity. Prospective studies can build on current findings—namely, that patients with IBD undergoing shoulder arthroplasty face higher risks of early readmissions and delayed complications—to inform tailored perioperative planning and improve patient outcomes.

## Conclusion

As the incidence of shoulder arthroplasty continues to rise, understanding how the systemic effects of inflammatory bowel disease (IBD) influence postoperative outcomes is increasingly important. Our findings indicate that patients with IBD are at elevated risk for postoperative complications following shoulder arthroplasty, including significantly higher rates of 90-day readmissions and surgical site infections, as well as increased rates of 2-year SSIs, PJIs, and aseptic loosening. These results underscore the need for thorough preoperative counseling and postoperative management in this patient population. Further research is warranted to identify strategies for mitigating these risks and improving perioperative and postoperative care for patients with IBD.

## Acknowledgments

None.

## Conflicts of interest

The authors declare that there are no conflicts of interest.

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**Citation:** Tovar J, Haque H, Johnson M, et al. Inflammatory bowel disease is associated with increased postoperative complications following shoulder arthroplasty: a propensity-matched analysis. *MOJ Orthop Rheumatol.* 2025;17(4):82–84. DOI: 10.15406/mojor.2025.17.00705