

Factors That Increase the Risk of Infection After Elbow Arthroscopy: Analysis of Patient Demographics, Medical Comorbidities, and Steroid Injections in 2,704 Medicare Patients

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Purpose: To use a national database to determine (1) the incidence of joint infection after elbow arthroscopy, (2) identify independent patient-related risk factors for infection, and (3) determine the influence of concomitant intra-articular corticosteroid injection on infection risk. **Methods:** The 100% Medicare Standard Analytic Files were queried to identify patients who underwent elbow arthroscopy from 2005 to 2012. Postoperative elbow infections occurring within 6 months of surgery were identified using both International Classification of Diseases, 9th Revision codes for postoperative infection and Current Procedural Terminology codes for the surgical treatment of a postoperative infection. Patients were excluded if their initial arthroscopic procedure was performed for infection. A multivariate binomial logistic regression analysis was then used to evaluate patient-related risk factors for postoperative infection. **Results:** Of the 2,704 elbow arthroscopy cases identified, 42 (1.55%) developed a postoperative infection. The annual incidence of infections did not increase significantly over the course of the study ($P = .374$). A number of patient demographics and medical comorbidities significantly increased the risk of infection. The most notable factors included age ≥ 65 years (odds ratio [OR] 2.38, $P = .006$), body mass index > 40 (OR 1.97, $P = .024$), tobacco usage (OR 1.80, $P = .046$), alcohol usage (OR 4.01, $P < .001$), diabetes mellitus (OR 2.10, $P = .015$), inflammatory arthritis (OR 2.81, $P < .001$), hypercoagulable disorder (OR 2.51, $P = .015$), and intra-articular corticosteroid injection at the time of arthroscopy (OR 2.79, $P = .006$). **Conclusions:** The annual number of elbow arthroscopies performed in the United States has increased steadily; however, the postoperative infection rate remained consistently low at 1.55%. There are a number of patient-specific risk factors that increase this risk with OR ranging from 1.97 to 4.01. Similarly, patients who receive an intra-articular corticosteroid injection at the time of surgery are nearly 3 times (OR 2.79) more likely to develop a postoperative infection. **Level of Evidence:** Level III, case-control study.

Over the past decade, elbow arthroscopy has emerged as a common method for treating a variety of intra- and periarticular elbow pathologies.¹

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Several procedures that once required open elbow arthrotomy are now commonly performed arthroscopically, resulting in decreased postsurgical pain, reduced arthrofibrosis, easier postoperative rehabilitation, and improved intraoperative joint visualization.²⁻⁵

These benefits have driven an expansion in both the incidence and diversity of arthroscopic elbow procedures currently being performed.^{2,3,6,7} Because the popularity and use of elbow arthroscopy have increased in recent years, the concern for complications has also risen. The reported complications in the current literature include peripheral nerve injury, heterotopic ossification, joint stiffness, compartment syndrome, septic arthritis, and obesity.^{4,7-10} Despite the increase in the use of elbow arthroscopy over the past decade, complication rates remain largely ill-defined and limited to institutional series and case reports.^{3,4,11-13}

Although septic arthritis after elbow arthroscopy is infrequent, its effects can be devastating to the patient, and this often leads to subsequent procedures, a prolonged course of antibiotics, and an overall decline of joint function.¹⁴ Currently, the reported rate of deep, postoperative infection for elbow arthroscopy ranges from 0% to 2.2%.²⁻⁵ Given the low incidence of infection after this procedure, studies investigating independent risk factors for this complication have been either underpowered or limited by the lack of multivariate analysis to control for confounding variables.^{3,5,11-13} Although one prior database study provided a national perspective on complications after elbow arthroscopy, the group was unable to provide any analysis of risk factors for such complications, including infection²; however, another review identified obesity as an independent risk factor for infection after elbow arthroscopy.¹⁰ With the recent growth in popularity and complexity of elbow arthroscopy, it is critical that patients who are at increased risk of postoperative joint space infection be identified. Therefore, the purpose of the present study was to use a national database to determine (1) the incidence of joint infection after elbow arthroscopy, (2) identify independent patient-related risk factors for infection, and (3) determine the influence of concomitant intra-articular corticosteroid injection on infection risk. We hypothesized that although the risk of postoperative infection is low, a number of patient-specific demographics and medical comorbidities would be independently associated with an increased risk of infection.

Methods

The PearlDiver Patient Records Database (www.pearldiverinc.com, Fort Wayne, IN) was used to query the 100% Medicare Standard Analytic Files to identify all Medicare insured patients who underwent elbow arthroscopy in the United States from 2005 to 2012. The senior author (B.C.W.) performed the query on May 15, 2016. The Current Procedural Terminology (CPT) and International Classification of Diseases, 9th Revision procedure codes used to identify arthroscopic procedures of the elbow are listed in Table 1. Patient demographics included gender, 5-year age group, body mass index, and region of the United States in which the procedure was performed. Concomitant medical diagnoses and comorbidities analyzed included tobacco use, alcohol use, diabetes mellitus (DM), inflammatory arthritis, hypercoagulable disorder, congestive heart failure, depression, hyperlipidemia, hypertension, peripheral vascular disease, coronary artery disease, chronic kidney disease, chronic lung disease, and chronic liver disease. Whether or not the patient underwent ipsilateral, intra-articular corticosteroid injection (identified by the CPT code) at the time of surgery was also recorded.

Table 1. Patient Demographics and Procedural Codes Used to Identify Patient Undergoing Arthroscopic Procedures of the Elbow

Patient Demographics	n (%)
Gender	
Male	1,658 (61)
Female	1,046 (39)
Age group, yr	
<65	1,159 (43)
65–69	721 (27)
70–74	420 (16)
75–79	225 (8)
80–84	115 (4)
85+	42 (2)
Region of the United States	
Midwest	736 (27)
Northeast	494 (18)
South	1,058 (39)
West	416 (15)
Procedural codes	
CPT-29830: Arthroscopy elbow diagnostic with or without synovial biopsy procedure (separate procedure)	117 (3)
CPT-29834: Arthroscopy elbow surgical; with removal of loose body or foreign body	1,191 (32)
CPT-29835: Arthroscopy elbow surgical; synovectomy partial	332 (9)
CPT-29836: Arthroscopy elbow surgical; synovectomy complete	333 (9)
CPT-29837: Arthroscopy elbow surgical; debridement limited	729 (19)
CPT-29838: Arthroscopy elbow surgical; debridement complete	978 (26)
ICD-9-P-8022: Arthroscopy elbow	77 (2)

CPT, Current Procedural Terminology; ICD-9, International Classification of Diseases, 9th Revision.

Postoperative elbow infections occurring within 6 months of surgery were identified using both International Classification of Diseases, 9th Revision codes for the diagnosis of postoperative infection and CPT codes for postoperative debridement for infection. Patients with multiple codes for infection were only considered a single time. Patients were excluded if their initial arthroscopic procedure was performed for infection of any type.

Statistical Analysis

A multivariate binomial logistic regression analysis was used to determine the independent adjusted odds ratio (OR) for the risk of postoperative infection for each of the patient demographics and medical comorbidities studied. The impact of an intraoperative corticosteroid injection at the time of surgery was included in this analysis. This allowed for an independent assessment of each risk factor while controlling for all other variables. All OR are reported with corresponding 95% confidence intervals and *P* values. The trends in procedural volume and infection rates across the study period were assessed with linear regression analysis.

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