Elbow Arthroscopy: 30-Day Postoperative Complication Profile and Associated Risk Factors

Manish S. Noticewala, M.D., David P. Trofa, M.D., Danica D. Vance, M.D., Charles M. Jobin, M.D., William N. Levine, M.D., and Christopher S. Ahmad, M.D.

Purpose: To analyze (1) the incidence and type of complications after elbow arthroscopy, (2) the incidence of returning to the operating room (OR) after elbow arthroscopy, and (3) patient and risk factors for complications across a national surgical outcome database. **Methods:** Patients who underwent elbow arthroscopy from January 2005 through December 2014 were identified in the American College of Surgeons National Surgical Quality Improvement Program database by use of Current Procedural Terminology codes. Basic patient demographic data and medical comorbidities were recorded. Postoperative adverse events and a return to the OR occurring within 30 days after the index procedure were identified, and patient and procedural risk factors were investigated. **Results:** Five hundred thirty elbow arthroscopy cases were available for analysis. The aggregate rate of 30-day adverse events was 2.83%, whereas the rate of any patient having an adverse event was 1.89%. The most common adverse event was deep infection (0.57%). Univariate analyses showed that renal disease, preoperative steroid use, higher American Society of Anesthesiologists (ASA) class, and preoperative diagnosis were associated with the occurrence of an adverse event. Multivariate analyses showed that increasing ASA class, specifically ASA class 3 and class 4, was an independent predictor of a postoperative adverse event. Furthermore, 0.94% of cases required a return to the OR. Univariate analyses showed that preoperative steroid use and diagnosis of trauma were associated with a return to the OR. These findings were confirmed by multivariate analyses. **Conclusions:** Overall, the incidence of 30-day postoperative adverse events (1.89%) and need to return to the OR (0.94%) is low. Increased ASA class is an independent risk factor for the occurrence of a postoperative adverse event; preoperative steroid use and diagnoses relating to a traumatic or inflammatory cause are predictive of the need to return to the OR. These results can assist surgeons in patient selection, preoperative optimization, and preoperative risk stratification. **Level of Evidence:** Level IV, case series.

In recent decades, significant progress has been made in understanding elbow joint anatomy, biomechanical function, and pathology.[1] At the same time, improvements in arthroscopic technique and innovations in arthroscopic instrumentation have advanced arthroscopic practice across all joints, including the elbow. As such, the indications for performing elbow arthroscopy continue to evolve and expand. Although initially performed for diagnostic purposes and removal of loose bodies, elbow arthroscopy is now used in the treatment of multiple forms of arthritis, synovial plicae, lateral and medial epicondylitis, contractures, fractures, instability, osteochondritis dissecans, and so on.[2] Among the benefits of arthroscopic elbow surgery (as opposed to open elbow surgery) are increased operative visualization, decreased postoperative pain, reduced infection risk, and quicker postoperative rehabilitation.[3]

However, elbow arthroscopy is a technically challenging procedure. Furthermore, given the irregular morphology of the joint and proximity of major neurovascular structures, there is potential for significant morbidity. Analyses of complications in large retrospective case series have yielded complication rates varying from 3% to 14%.[3-7] Nelson et al.,[3] in a retrospective series of 417 elbow arthroscopies, reported a minor complication rate of 8.9% and a major complication rate of 4.8%. Still, the complication rate after

From the Center for Shoulder, Elbow, and Sports Medicine, Department of Orthopaedic Surgery, Columbia University Medical Center, New York Presbyterian Hospital, New York, New York, U.S.A.

The authors report that they have no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

Received January 22, 2017; accepted August 19, 2017.

Address correspondence to Manish S. Noticewala, M.D., Department of Orthopaedic Surgery, Columbia University Medical Center, 622 W 168th St, PH Building 11th Floor, New York, NY 10032, U.S.A. E-mail: manish.s.noticewala@gmail.com

0749-8063/1765/$36.00

https://doi.org/10.1016/j.arthro.2017.08.286

elbow arthroscopy may be higher than suggested by these studies, particularly with respect to peripheral nerve injuries.[8] Meanwhile, neither Kelly et al.[4] nor Nelson et al. reported permanent nerve injuries in their large retrospective series, and Leong et al.[9] reported a 1.26% reoperation rate for nerve injury.

Although several authors have reported their outcomes with elbow arthroscopy, the total number of elbow arthroscopy cases analyzed remains relatively low, especially when compared with the number of shoulder and knee arthroscopy cases analyzed.[10] Furthermore, much of the elbow arthroscopy literature regarding complications comprises single-center and/or single-surgeon retrospective case reviews.[3-5] The purpose of this study was to analyze (1) the incidence and type of complications after elbow arthroscopy, (2) the incidence of returning to the operating room (OR) after elbow arthroscopy, and (3) patient and surgical risk factors for complications across a national surgical outcome database. Our hypothesis was that certain patient comorbidities would be independent predictors of postoperative complications and returning to the OR after elbow arthroscopy.

Methods

Data Source

The data used in this study were derived from the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database from January 2005 through December 2014. We obtained access to this database by placing an electronic request through the ACS NSQIP website, and thus institutional review board approval was not required to query this publicly accessible deidentified database. As a representation of the sampling of data available for any given year, for 2013, the ACS NSQIP database captured 651,490 surgical cases performed across 435 hospitals across the United States, with approximately 150 patient and/or case variables recorded per procedure. The procedures were performed across a broad mix of hospital types, including large academic centers, community hospitals, and freestanding surgical centers. A trained surgical clinical reviewer (SCR) randomly and prospectively identifies patients and captures data at each hospital using a variety of methods including retrospective chart review and telephone interview. Preoperative through 30-day postoperative data are collected by SCRs (with patients being randomly assigned to SCRs) and entered online in a Health Insurance Portability and Accountability Act—compliant, secure, Web-based platform that can be accessed 24 hours a day. For quality control regarding data collection, the ACS NSQIP has built-in software checks and conducts reliability audits of participating institutions. Case selection and case mix are monitored by the program on a weekly basis to ensure appropriate sampling.

Data Collection

The ACS NSQIP database was queried for patients who underwent elbow arthroscopy from January 2005 through December 2014 by use of the following Current Procedural Terminology (CPT) codes: 29830 (arthroscopy, elbow, diagnostic, with or without synovial biopsy [separate procedure]); 29834 (arthroscopy, elbow, surgical; with removal of loose body or foreign body); 29835 (arthroscopy, elbow, surgical; synovectomy, partial); 29836 (arthroscopy, elbow, surgical; synovectomy, complete); 29837 (arthroscopy, elbow, surgical; debridement, limited); and 29838 (arthroscopy, elbow, surgical; debridement, extensive). The exclusion criteria included trauma and/or tumor cases in which patients underwent a concurrent procedure that would require an open approach to the elbow. These cases included open elbow approaches for radial head fractures requiring fixation, arthroplasty, or excision; open elbow approaches for coronoid fractures requiring fixation; and open elbow approaches for excision and curettage of bone cysts or tumors. Given the prevalence of ulnar nerve decompression and/or transposition in the setting of elbow arthroscopy, patients undergoing concurrent ulnar nerve decompression and/or transposition were included in the final analysis.[3] Any patients with incomplete datasets were excluded from the final analysis. A total of 530 cases were ultimately available for analysis.

Among the demographic variables derived from the ACS NSQIP database and included in our analysis were sex, age, height, weight, and history of smoking. Body mass index (BMI) was calculated from each patient's height and weight. Information on medical comorbidities was also collected for each patient. A history of pulmonary disease was defined as a history of dyspnea or severe chronic obstructive pulmonary disease, ventilator-assisted respiration within 48 hours before surgery, or current pneumonia. A history of cardiac disease was defined as a history of congestive heart failure or angina within 1 month before admission, myocardial infarction within 6 months before admission, cardiac surgery, or percutaneous coronary intervention. A history of vascular disease was defined as having peripheral vascular disease and/or resting lower extremity pain. A history of diabetes mellitus was defined as occurring when a patient had a diagnosis of diabetes mellitus. A history of renal disease was defined as occurring when a patient had a diagnosis of renal failure and/or required regular dialysis. A history of bleeding disorder was defined as occurring when a patient had a diagnosis of a clotting disorder predisposing to bleeding. When steroids were taken regularly for an underlying medical diagnosis, patients were classified as using steroids. Other patient-specific variables recorded included the patients' American Society of Anesthesiologists (ASA) class.