

An Analysis of Adult Patient Risk Factors and Complications Within 30 Days After Arthroscopic Shoulder Surgery



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Purpose: To identify risk factors of adult patients predisposing them to the most common complications that occur within 30 days after arthroscopic shoulder surgery. **Methods:** The National Surgical Quality Improvement Program database was queried for arthroscopic shoulder procedures. Complications and their frequency were calculated. Multivariate analysis was used to identify risk factors of adult patients predisposing them to complications. Risk factors for reoperation and characteristics of patients undergoing repair procedures were also analyzed. **Results:** Among 10,255 cases of shoulder arthroscopy, 119 complications were reported in 103 cases within 30 days of surgery. The rates of any, major, and minor complications were 1%, 0.57%, and 0.53%, respectively. Return to the operating room (29% of all complications) was the most frequent complication. With risk adjustment, the odds of complications developing were higher for patients older than 60 years (adjusted odds ratio [AOR], 3.47; $P = .03$), patients with a surgical time greater than 1.5 hours (AOR, 1.93; $P = .01$), patients with chronic obstructive pulmonary disease (COPD; AOR, 2.76; $P = .03$), patients with an inpatient status (AOR, 2.72; $P < .01$), patients with disseminated cancer (AOR, 21.9; $P < .01$), and current smokers (AOR, 1.94; $P = .01$). The presence of COPD (AOR, 4.67; $P = .04$) was a significant predictor for reoperation within 30 days. Repair procedures did not increase the risk of complications compared with non-repair. Male patients, patients aged younger than 30 years, nondiabetic patients, and nonsmokers were more likely to undergo repair procedures ($P < .05$ for all). **Conclusions:** Shoulder arthroscopy has a 1.0% thirty-day complication rate, with the most common complication being return to the operating room (29% of all complications). Age older than 60 years, surgical time greater than 90 minutes, COPD, inpatient status, disseminated cancer, and current smoking all increased a patient's risk of complications. Patients undergoing repair procedures were not at increased risk. Pulmonary comorbidity increases the risk of reoperation within 30 days. Patients undergoing repair procedures tend to be younger and carry fewer risk factors for complications. **Level of Evidence:** Level IV, prognostic case series.

Shoulder arthroscopy is one of the most commonly performed orthopaedic procedures and is the second most popular procedure in candidates taking the part II examination of the orthopaedic boards.¹ Arthroscopic shoulder surgery rates have increased significantly since the 1980s² because many

traditionally open procedures are now more commonly performed arthroscopically.²⁻⁴

Knowledge regarding the incidence and risk factors for common complications after arthroscopic shoulder surgery is important for patient counseling and quality-improvement initiatives. Investigating patient factors that contribute to the most common complications is a critical step in reducing perioperative complications further. The identification of procedures that increase perioperative complication rates, coupled with an analysis to determine whether certain types of patients have a higher likelihood of undergoing these procedures, would also aid in achieving these objectives.

The purpose of this study was to identify risk factors of adult patients predisposing them to the most common complications that occur within 30 days after arthroscopic shoulder surgery. The study hypothesis was that patients undergoing arthroscopic shoulder

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surgery would have a 30-day complication rate lower than 5%, reoperation would be the most common complication, patients undergoing repair procedures would be at higher risk of complications, and patients undergoing arthroscopic repair procedures would have similar profiles to patients undergoing non-repair arthroscopic procedures.

Methods

The American College of Surgeons National Surgical Quality Improvement Program (NSQIP)⁵ database for the years 2005 to 2011 was used. NSQIP is a national program that aims to improve the quality of surgical care delivered in the inpatient and outpatient settings of hospitals through a rigorous outcome-based approach.⁵ Hospitals that have voluntarily participated in NSQIP and used the database to drive quality-improvement efforts have shown significant reductions in post-operative complications.⁶⁻⁸ The adult (aged ≥ 18 years) NSQIP database contains chart-abstracted data from more than 1.7 million surgical procedures that were conducted in 258 participating hospitals in the United States. It includes de-identified data on preoperative patient demographic and clinical risk factors, perioperative variables, and postoperative 30-day morbidity and mortality outcomes for a sample of major surgical procedures performed on an inpatient and outpatient basis. Hospitals participating in the NSQIP multi-specialty program, which includes orthopaedic surgery, are required to submit data on approximately 20% of the cases (high-volume model: minimum of 1,680 cases submitted annually) or the maximum number of cases (low-volume model: minimum of 900 cases submitted annually) in each of the 10 surgical specialties.⁹ The bias in case selection is minimized through a systematic sampling process, thereby generating a nationally representative sample of cases. A trained and dedicated surgical clinical reviewer conducts chart reviews and communicates with patients to obtain information for each sampled case. NSQIP adopts rigorous approaches such as continual training and support of the surgical clinical reviewer, as well as periodic audits for maintaining data integrity and inter-rater reliability.¹⁰

Inclusion and Exclusion Criteria

Current Procedural Terminology (CPT) codes¹¹ (29805 to 29807 and 29819 to 29828) were used to retrospectively identify 10,570 shoulder arthroscopy cases from the adult NSQIP database between the years 2005 and 2011. In all cases the primary procedure code was an arthroscopic shoulder procedure. If secondary procedures are performed in addition to the primary procedure code for the same case, the NSQIP database does record that additional codes are present; however, the exact code is not recorded or searchable. Patients were excluded if they were younger than 18 years

Table 1. Shoulder Arthroscopies Included in Study Cohort

CPT code	Shoulder Arthroscopy	Repair Procedure	Volume	% of Total
29827	Rotator cuff repair	Yes	3,439	33.53
29826	SAD with acromioplasty	No	3,362	32.78
29807	SLAP lesion repair	Yes	976	9.52
29806	Capsulorrhaphy	Yes	726	7.08
29824	Distal claviclectomy	No	544	5.3
29823	Extensive debridement	No	461	4.5
29822	Limited debridement	No	379	3.7
29825	Lysis and resection of adhesions with or without manipulation	No	149	1.45
29828	Biceps tenodesis	Not included	105	1.02
29821	Complete synovectomy	No	47	0.46
29819	Foreign-body removal	No	38	0.37
29820	Partial synovectomy	No	29	0.28
Total			10,255	

CPT, Current Procedural Terminology; SAD, subacromial decompression.

($n = 31$); they had preoperative sepsis, systemic inflammatory response syndrome, or septic shock ($n = 50$); or they had preoperative wound infections and/or their operative wounds were classified as clean/contaminated, contaminated, or dirty/infected ($n = 234$). The final study cohort included 10,255 shoulder arthroscopy cases (Table 1).

Outcomes

For defining the most common complications after shoulder arthroscopy, the outcomes of interest were 30-day mortality and 30-day morbidity after shoulder arthroscopy. Table 2 lists the conditions included in the scope of these complications. The primary endpoint was the occurrence of at least 1 complication (death or ≥ 1 morbidity) within the 30-day postoperative period. The secondary endpoints were the occurrence of (1) death or at least 1 major morbidity and (2) at least 1 minor morbidity. The classification of morbidities into major and minor was based on previously published literature.¹² We checked that patients with certain post-operative morbidities such as superficial, deep, and organ/space surgical-site infections; pneumonia; ventilator dependence for more than 48 hours; and urinary tract infections did not have preoperative conditions that would have directly increased the risk of these particular morbidities developing. Each of the endpoints was coded as a binary variable (1 or 0). For identifying factors that were associated with the risk of reoperation, the outcome of interest was a binary variable (1 or 0), indicating whether the patient returned to the operating room for any major surgical procedure within 30 days of shoulder arthroscopy.

The association between patient health profile and the chance of undergoing repair surgery was examined.

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