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The impact of preoperative opioid use on outcomes after arthroscopic rotator cuff repair

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Background: Preoperative opioid use has been correlated to suboptimal outcomes in orthopedic surgery. This study evaluated the effect of preoperative opioid use on outcomes after arthroscopic rotator cuff repair (RCR).

Methods: A retrospective review was performed of 79 patients who underwent arthroscopic RCR; of these, 31 with a history of preoperative opioid use were compared with a control group of 48 patients without a history of preoperative opioid use. Preoperative and postoperative patient-reported outcomes and functional scores were compared.

Results: Both cohorts significantly improved on all patient-reported shoulder scores; however, the nonopioid group demonstrated significantly better postoperative patient-reported outcome scores ($P = .015$) and external rotation measurement ($P = .008$). Functional outcomes also significantly improved from preoperatively to postoperatively for forward flexion, but no differences were seen between groups.

Conclusions: Patients with a history of preoperative opioid use can still achieve significant improvements in outcomes after arthroscopic RCR, although not to the same extent as opioid-naïve patients. Therefore, orthopedic surgeons must consider a patient's preoperative opioid use and temper expectations with regard to outcomes so that they are able to set realistic postoperative goals for patients undergoing RCR.

The opioid epidemic in the United States presents a challenge for all medical specialties, especially orthopedic surgery patients, who often require significant pain management after treatment of orthopedic injuries and surgical procedures. Not surprisingly, orthopedic surgeons are the third highest prescribers of opioid pain relievers (OPRs) in the United States.[10,14] Between 1999 and 2010, pharmaceutical sales of OPRs nearly quadrupled.[1] In 2014 alone, nearly 61% of all drug overdose deaths involved an opioid, most of which involved OPR prescriptions; notably, this statistic excludes death resulting from heroin overdose.[13]

This rise in opioid use presents several challenges in the postoperative management of orthopedic patients such that pain is successfully controlled while at the same time avoiding opioid tolerance and potential dependence.[3,6,7,10,15] Current literature suggests that preoperative opioid abuse in the orthopedic trauma population significantly increases the rate of inappropriate narcotic-seeking behavior by patients from multiple providers postoperatively ("doctor-shopping").[12] Ultimately, surgeons have the responsibility to manage pain while also avoiding opioid dependence in their patients. Thus, it is important for surgeons to understand the effect of opioid use on orthopedic patients to optimize surgical outcomes.

To date, opioid use has been correlated with suboptimal patient outcomes after total knee arthroplasty, reverse shoulder arthroplasty, and spine surgery.[8,9,11,15] Morris and colleagues[9-11] evaluated the effect of preoperative opioid use on patient outcomes after reverse shoulder arthroplasty and found that patients with a history of preoperative opioid use had lower preoperative baseline scores and did not achieve the same peak outcome scores as those without a history of preoperative opioid use.

To the best of our knowledge, no studies have investigated outcomes for patients undergoing arthroscopic repair of rotator cuff tears with a history of preoperative opioid use. The purpose of our study was to evaluate the effect of preoperative opioid use on outcomes after arthroscopic rotator cuff repair (RCR). We hypothesized that patients with a history of preoperative opioid use would

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demonstrate lower preoperative and postoperative patient-reported and functional outcome scores compared with opioid-naïve patients after RCR.

Materials and methods

Patient inclusion criteria and demographics

In this retrospective study, we identified and reviewed all arthroscopic RCR procedures performed from 2014 to 2016. All operations were performed by the same shoulder fellowship-trained orthopedic surgeon (V.J.S.). To eliminate potential confounding factors, we only included patients with a full-thickness tear repaired using an arthroscopic technique. Patients were excluded if they had a revision RCR, a massive irreparable rotator cuff tear, concomitant labral repair, or open procedure.

History of opioid use for any reason, except those that were previously excluded, was determined using a preoperative patient questionnaire completed by all patients at their first clinic appointment. Type of narcotic medication and dosages were recorded for 2 weeks before the date of surgery. The dosage of each drug was standardized to morphine milligram equivalents,[4] and every patient received a minimum of 1 prescription of 230 mg total morphine equivalents (for example, oxycodone/acetaminophen, 5/325 mg, every 6-8 hours per day) for a duration of no more than 10 days. Baseline patient characteristics assessed included age, body mass index, sex, follow-up duration, and comorbidities, including diabetes, smoking status, morbid obesity, hypertension, and depression. Shoulder function was evaluated preoperatively and at the final follow-up visit. All patients included in this study were stratified into 2 cohorts: those with preoperative opioid use (OU) and those who had no opioid use (NOU) preoperatively.

Surgical technique and postoperative rehabilitation

All patients received standard of care general endotracheal anesthesia and multimodal pain management. Patients received a RCR with a preferred repair technique consisting of a single-row or double-row transosseous-equivalent type repair (Arthrex, Inc., Naples, FL, USA) based on the indicated tear size and characteristics.

Patients were placed in a shoulder immobilizer for the first few days after surgery and performed pendulum exercises and passive/active assist exercises for the first 6 weeks, limiting external rotation. After this point, they progressed to full active range of motion and a graduated strengthening program.

Assessment of outcomes

Patient-reported outcome data evaluated preoperatively and at the most recent patient follow-up included the visual analog scale for pain, Penn Shoulder Score, American Shoulder and Elbow Surgeons (ASES) Standardized Shoulder Assessment Form, and Subjective Shoulder Value.[5] Functional outcome data included range of motion, forward flexion, abduction, and external rotation. Patients were examined preoperatively and postoperatively at 6 weeks, 3, 6, and 12 months, and then annually.

Statistical analysis

A power analysis was calculated for NOU and OU, using cohorts based on a 7-point difference in postoperative ASES scores, and to have a power of 80% and an α of 0.05, at least 31 patients were needed in each group.

Independent sample *t* tests were used to compare demographic and outcomes scores between the 2 groups. Paired sample *t* tests were used to compare the improvement in outcomes within the NOU and OU groups, and χ^2 tests were performed to determine whether significant differences existed between subgroups for comorbidities and other demographic differences. All statistical analyses were performed using SPSS Statistics for Macintosh 24.0 (IBM, Armonk, NY, USA). A *P* value of ≤.05 was considered statistically significant for all tests.

Table I
Comparison of patient demographics and clinical characteristics

Variable	Nonopioid group (n = 48)	Opioid group (n = 31)	*P* value
Sex			
Male	34 (71)	17 (55)	
Female	14 (29)	14 (45)	
Medicaid	28 (58)	19 (61)	.819
Non-Medicaid	20 (42)	12 (39)	
Age at surgery, yr	49.5 ± 9.7	54.6 ± 9.1	.033
Follow-up, mo	6.3 ± 3.6	6.6 ± 3.5	.751
BMI, kg/m^2	29.6 ± 5.5	27.2 ± 6.9	.247
Diabetes	8 (16.7)	3 (9.7)	.513
Active smoking	13 (27.1)	11 (35.5)	.461
Morbid obesity	2 (4.2)	0 (0)	.517
Hypertension	20 (41.7)	14 (45.2)	.818
Depression	3 (6.3)	4 (12.9)	.424

BMI, body mass index.
Data are presented as number of patients (%) within the group or as the mean ± standard deviation for all patients.

Results

The study included 79 patients. There were 48 patients in NOU group and 31 in the OU group, with similar average follow-up duration of 6.4 ± 3.6 months ($P = .751$). These 2 groups differed in average age (NOU: 49.5 years; OU: 54.6 years; $P = .033$). The top prescribed narcotic medications included oxycodone, hydrocodone, and hydromorphone.

A comparison of the 2 groups found no statistically significant differences in demographic data, including, body mass index, insurance type (Medicaid or non-Medicaid), diabetes, smoking status, morbid obesity, hypertension, and depression (Table I). No significant differences were found between the OU and NOU groups in baseline patient-reported outcome scores or range of motion measurements (Table II).

Both groups significantly improved on all the patient-reported outcome scores from the preoperative to postoperative assessment (Table III). The NOU cohort had significantly better final postoperative patient-reported scores for ASES ($P < .001$), visual analog scale for pain ($P < .001$), Penn Shoulder Score ($P = .001$), and Subjective Shoulder Value ($P = .015$; Table IV). Both cohorts also significantly improved in forward flexion (NOU: $P \leq .001$; NO: $P = .047$; Table III). At the final postoperative analysis for range of motion measurements, only external rotation showed a statistically significant difference between the 2 cohorts ($P = .008$; Table IV).

Table II
Comparison of baseline preoperative patient-reported and functional outcome scores

Variable	Nonopioid group	Opioid group	*P* value
ASES	38.4 ± 19.6	32.6 ± 20.2	.233
VAS for pain	5.3 ± 2.7	5.9 ± 2.8	.439
PSS	31.9 ± 17.1	28.2 ± 17.4	.393
SSV	27.4 ± 22.7	38.2 ± 25	.143
Active range of motion			
Forward flexion, °	126 ± 45	136 ± 46	.359
Abduction, °	115 ± 58	141 ± 47	.096
External rotation, °	48 ± 31	51 ± 33	.681

ASES, American Shoulder and Elbow Surgeons score; *VAS*, visual analog scale; *PSS*, Penn Shoulder Score; *SSV*, Subjective Shoulder Value.
Mean data are presented for all patients.

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