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Distal peripheral neuropathy after open and arthroscopic shoulder surgery: an under-recognized complication

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Hypothesis: Distal peripheral neuropathy (DPN) is an under-reported complication after anatomic total shoulder arthroplasty (TSA), reverse shoulder arthroplasty (RSA), and arthroscopic rotator cuff repair (RCR).

Methods: We conducted a retrospective review of patients undergoing shoulder arthroplasty or arthroscopic RCR by 4 shoulder surgeons during a 2-year period. The primary outcome measure was the diagnosis of DPN, defined as carpal tunnel syndrome, cubital tunnel syndrome, ulnar tunnel syndrome, and distal radial sensory neuropathy. Patient demographics and clinical course of DPN were recorded. Mean follow-up was 21, 15, and 12 months for TSA, RSA, and RCR, respectively.

Results: Postoperatively, 6 of 85 TSA (7.1%), 7 of 57 RSA (12.3%), and 21 of 753 RCR (2.79%) patients were diagnosed with DPN. The most common neuropathy was cubital tunnel syndrome for TSA and RSA and carpal tunnel syndrome for RCR. The risk of DPN was higher for shoulder arthroplasty (TSA and RSA) compared with the RCR group. After nonsurgical treatment of DPN, complete resolution of symptoms occurred in 33.3% of TSA, 42.86% of RSA, and 71.43% of RCR patients. However, 16.7% of TSA, 14.3% of RSA, and 4.76% of RCR patients with DPN required surgical decompression; 100% of the patients undergoing surgical decompression had complete resolution of symptoms.

Conclusion: DPN is a relatively common complication after shoulder surgery. When it occurs, DPN will often resolve with nonoperative management. Surgical decompression is an effective treatment option in refractory cases.

Level of evidence: Level IV, Case Series, Treatment Study.

Keywords: Neuropathy; shoulder surgery; rotator cuff; arthroplasty

IRB Approval Authority: Ilyas Rajput, MD, Chair of the AtlantiCare Regional Medical Center Institutional Review Board. IRB Study Protocol Number: ARMC RP# 12-036EX.

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Nerve injury is a known complication after both open and arthroscopic shoulder surgery. Whereas most neurologic complications are localized to the shoulder region, including brachial plexopathy, musculocutaneous nerve injury, suprascapular nerve injury, and axillary nerve injury, distal peripheral neuropathy (DPN) has been described.[1,5,6,8,10-14,16] Although no direct causality has been established, there are many factors that may contribute to DPN after shoulder surgery, including limb manipulation and traction, preoperative interscalene brachial plexus blocks, fluid extravasation during arthroscopy, postoperative swelling, and prolonged immobilization.[1,5,6,8,10-14,16]

DPN related to median, ulnar, and radial nerve disease after shoulder surgery is not well studied. Existing reports identify DPN in 0% to 0.24% of anatomic total shoulder arthroplasties (TSAs),[6,8,10] 0.9% to 5.2% of reverse total shoulder arthroplasties (RSAs),[6,16] and 0% to 2% of arthroscopic shoulder procedures; no reports isolate arthroscopic rotator cuff repairs (RCRs).[9,13,14]

The purpose of our study was to evaluate the occurrence of DPN on the operative limb after arthroscopic and open shoulder surgery. We hypothesized that DPN is a common yet often overlooked complication after TSA, RSA, and arthroscopic RCR.

Materials and methods

After approval by our institutional review board, a retrospective review was conducted of the inpatient and outpatient records for all individuals undergoing TSA, RSA, or RCR performed by 4 fellowship-trained sports or shoulder surgeons from 2010 to 2012. Patients with preexisting neurologic symptoms or known cervical radiculopathy were excluded. We further excluded patients diagnosed with DPN outside the standard follow-up period of 6 months after shoulder surgery. A total of 85 TSA, 57 RSA, and 753 RCR patients were included in this study.

Patient demographics including age, gender, handedness, and workers' compensation claims were recorded. A comprehensive analysis of the preoperative and postoperative course was performed, including onset, duration, treatment, and resolution of symptoms. Onset was defined as the first presentation of symptoms or examination findings consistent with DPN documented by the attending surgeon. For the purpose of this study, DPN was defined as carpal tunnel syndrome (CTS), cubital tunnel syndrome (CubTS), ulnar tunnel syndrome, and distal radial sensory neuropathy (DRS). The diagnosis of DPN was established by subjective complaints of numbness or weakness in a specific nerve distribution, confirmed by physical examination or a nerve conduction velocity study.

Statistical analysis by logistic regression and Fisher exact test was performed to determine the odds ratio for DPN after TSA, RSA, and RCR. We also compared DPN with respect to age and gender and whether the patient presented with a current workers' compensation claim.

Procedural details

Preoperatively, all patients undergoing TSA and RSA received an interscalene nerve block for postoperative pain control. All patients underwent surgery in the beach chair position with use of the McConnell arm positioner. The TSA postoperative protocol consisted of 2 weeks of sling use, with immediate passive range of motion starting on postoperative day 1. Active-assisted range of motion began at 2 weeks, and strengthening began at 6 weeks. At 4 months, patients were released from activity restrictions. The RSA postoperative protocol consisted of sling immobilization for 2 weeks, followed by progressive range of motion and strength training. At 4 months, patients were released with permanent weight restriction of 25 to 30 pounds. Patients were seen for regular postoperative follow-up at 2 weeks, 6 weeks, 3 months, 6 months, and 1 year.

Preoperatively, all patients undergoing RCR received an interscalene block for postoperative pain control. Three surgeons (M.P., B.T., F.T.) used lateral positioning with a standard 7 pounds of traction (602 cases). The other surgeon (L.A.) performed RCR in the beach chair position with the assistance of the McConnell arm positioner (151 cases). The RCR postoperative protocol included 4 to 6 weeks of sling immobilization followed by progression from passive to active range of motion. Strength training was started at 3 months. At 6 months, patients were released from activity restrictions. Regular postoperative follow-up was performed at 2 weeks, 6 weeks, 3 months, 6 months, and 1 year.

Because of the retrospective nature of this study, there was no established protocol for the treatment of DPN after shoulder surgery. Initial management was under the discretion of the primary surgeon and included bracing, activity modification, physical therapy, and corticosteroid injections. In refractory cases, patients were referred to a hand surgeon, physiatrist, or neurologist for further evaluation and treatment.

Results

General diagnostic information

The diagnosis of DPN was made by subjective complaints of numbness, tingling, or weakness, which were confirmed by objective findings of numbness or weakness in the specific nerve distribution. By subjective and physical examination findings alone, 62% of patients in all groups (TSA, RSA, and RCR) were diagnosed with DPN; 38% of patients were diagnosed by subjective and physical examination findings of DPN confirmed by nerve conduction studies. All patients who underwent surgical decompression of the DPN had a diagnosis of DPN confirmed by a nerve conduction study.

Anatomic total shoulder arthroplasty

At an average postoperative follow-up of 21 months, 6 of 85 patients (7.1%; standard error, 2.42%) undergoing anatomic TSA had been diagnosed with 8 DPNs. Specifically, 4 cases of CubTS, 2 cases of CTS, and 2 cases of DRS were found [Table I]. Symptoms related to DPN were first documented at a mean of 83 days from the time of surgery (range, 28-123 days). All patients were treated with a course of conservative treatment including activity modification, splinting, physical therapy, and, if