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Predicting quality of early postoperative recovery following interscalene block for outpatient arthroscopic shoulder surgery: secondary analysis of a randomized controlled trial

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INTRODUCTION

Single injection interscalene block (ISB) is commonly used during ambulatory arthroscopic shoulder surgery for effective postoperative analgesia and reliable surgical anesthesia.[1] Yet, side effects of ISB, such as temporary unilateral phrenic nerve paralysis and rebound pain, could negatively impact recovery.[1,2]

Postoperative recovery is best assessed using validated, multidimensional patient reported outcome measures[3] like the Quality of Recovery-15 questionnaire (QoR-15).[4] The QoR-15 is increasingly used in anesthesia research, but previous work has usually reported unadjusted scores for intervention and comparator groups.[3] A better understanding of how common patient, surgical, and anesthetic characteristics affect quality of recovery is needed to guide future research.

Our objective in this study was to identify independent predictors of postoperative day one QoR-15 among commonly collected patient, surgical and anesthetic characteristics. We hypothesized that dexamethasone would be associated with an increased QoR-15 score, based on the original trial results.

METHODS

Our research ethics board approved this secondary analysis of randomized trial data collected between September 2017 and April 2018 in adult patients undergoing arthroscopic shoulder surgery. The original single-centre, double-blinded trial compared analgesic block duration after ISB with 30 cc of 0.5% bupivacaine and one of three intravenous adjunct regimens: 50 µg of dexmedetomidine, 4 mg of dexamethasone or both adjuncts.

All candidate predictor variables were defined before analysis. A pain-free first postoperative night was defined as an analgesic block duration exceeding 0800 hr on

postoperative day one, based on concerns about nocturnal rebound pain[2] and QoR-15 featuring two sleep-related questions.

The primary outcome of this study, QoR-15, was a secondary outcome in the original study. It was assessed by telephone interview on postoperative day one. A multivariable model was constructed using Group Least Absolute Shrinkage and Selection Operator (LASSO) analysis.[5] It is more likely to find the true relevant predictors and make better out-of-sample predictions than traditional forward and backward variable selection because it simultaneously selects variables and estimates parameters in one step. A disadvantage of group LASSO is that no *P* values or confidence intervals are provided, as the complex sampling distributions are conditional on the selection process.

RESULTS

In the original trial, dexamethasone significantly increased analgesic block duration *vs* dexmedetomidine. In this secondary analysis, 194 of 197 randomized patients were included and 112 experienced a pain-free first postoperative night. The mean QoR-15 score was 118.0 (standard deviation, 19.3) and the median was 121 [range, 41–150]. The minimum possible score is 0 and the maximum 150, with higher scores indicating better quality of recovery.

In univariate analysis, randomization to dexamethasone led to a 9.8 point (95% confidence interval, 3.3 to 16.3; *P* = 0.003) increase in QoR-15 *vs* dexmedetomidine. The minimum clinically important difference for the QoR-15 is 8 points.[4] In multivariable analysis, the adjusted coefficient for experiencing a pain-free first postoperative night had the greatest effect on QoR-15 (7.9-point improvement). Adjusted coefficients for randomization to dexamethasone (0.4 points), block duration (0.01 points per hour) and other predictors were much smaller (Figure).

DISCUSSION

Intravenous dexamethasone 4 mg led to a clinically important improvement in postoperative day one QoR-15 compared to 50 mg of intravenous dexmedetomidine. In multivariable analysis, this effect appears to be mediated by an increased likelihood of analgesic block duration extending beyond the first postoperative night in patients who received dexamethasone. Differences in analgesic block duration or other mechanisms specific to the adjuvants were much less important. QoR-15 contains multiple questions related to sleep, physical comfort, and emotional state.[4] Interactions between these domains and quality of recovery may be responsible for the threshold effect of a pain-free first night.

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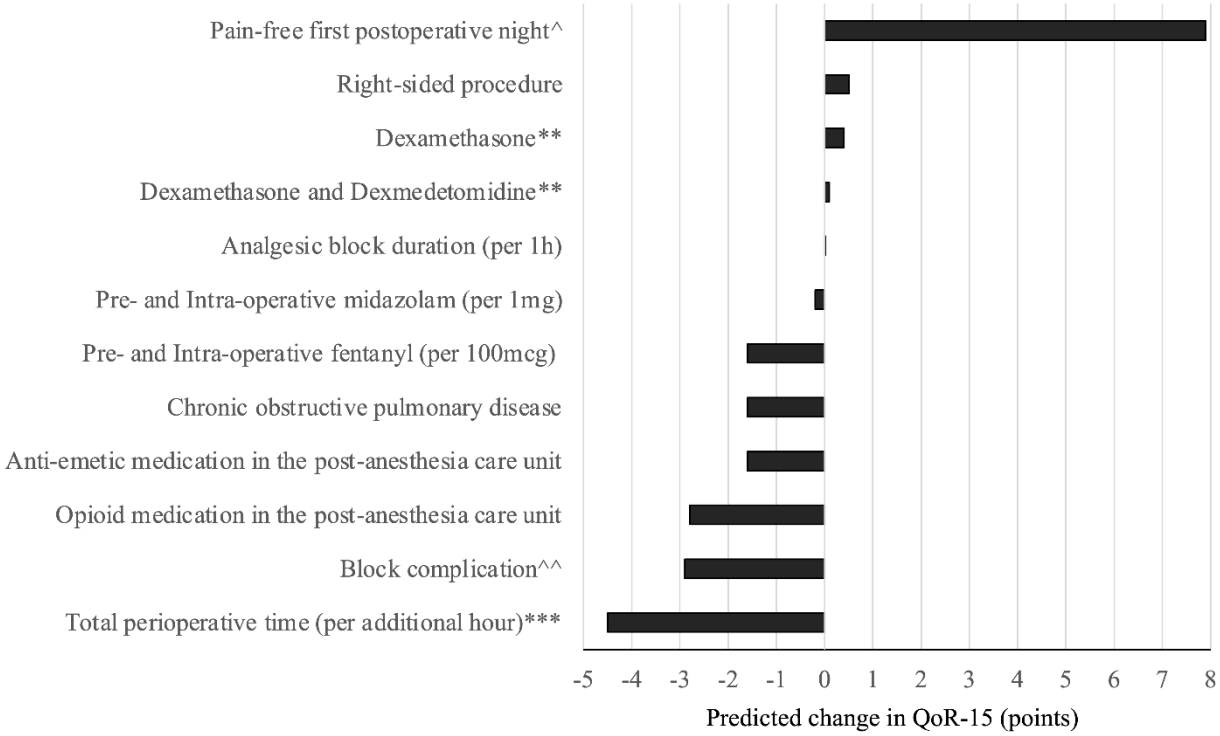
Figure Multivariable model coefficients from Group Least Absolute Shrinkage and Selection Operator (LASSO) analysis of postoperative day on QoR-15 scores*



*Positive and negative coefficients imply improved and worsened recovery, respectively. The Group LASSO method does not provide confidence intervals or *p* values but offers better predictive properties than forward or backward regression, especially with large numbers of candidate predictor variables.

^A pain-free postoperative night was defined as an analgesic block duration that exceeded 0800h on postoperative day one.

**The randomization groups in the original trial were 50mcg intravenous dexmedetomidine (reference group), 4mg intravenous dexamethasone, or both adjuvants.

^^Block complications consisted of transient paresthesias (n = 4), bradycardia (n = 2), intermittent atrial bigeminy, Horner's syndrome and repeated moving and coughing during the block (n = 1 each).

***Total perioperative time included time from interscalene block insertion to postoperative discharge from the facility.