

Phrenic Nerve Sparing Regional Technique as Primary Anesthetic for Shoulder Surgery in High Risk Patient



Kathy Zhang¹, Aaron Schweitzer¹, Lizbeth Hu¹, Anis Dizdarevic¹

¹Columbia University Irving Medical Center Department of Anesthesiology

50th Annual Regional
Anesthesiology and Acute
Pain Medicine Meeting

May 1-3, 2025 | Orlando, FL

50th ANNIVERSARY
ASRA PAIN MEDICINE

Introduction

The interscalene brachial plexus block remains the mainstay regional technique for shoulder surgery both as a primary anesthetic and for post operative pain control (1). However, its inherent risk of diaphragmatic paralysis secondary to ipsilateral phrenic nerve blockade makes its use challenging in patients with cardio-pulmonary comorbidities (2). Various strategies have been employed to attempt to reduce this risk including lower volume local anesthetic interscalene block alone (3) or various phrenic nerve sparing blocks. The challenge also lies in providing effective surgical anesthesia, when general anesthesia is unfavorable. Recent case studies have shown the PENG shoulder block to be another supplemental block for intraoperative and postoperative pain control (4). We present a case of a patient undergoing total shoulder replacement receiving a combination of low volume interscalene block, along with suprascapular, intercostobrachial, pericapsular nerve group (PENG), and proximal anterior axillary line field block for surgical anesthesia.

Methods

Patient informed consent was obtained for submission of a case report. As the case report is devoid of patient identifiable information, it is exempt from IRB review requirements per Columbia University policy.

Case Report

A 69-year-old male presented for left reverse total shoulder replacement. His past medical history was significant for hypertension, hyperlipidemia, smoking, obesity, chronic atrial fibrillation on rivaroxaban, amiodarone, and diltiazem, heart failure with ejection fraction 35-40%, sub-massive pulmonary embolism status post catheter assisted thrombolysis, and alcohol abuse with recent hospitalization for withdrawal, complicated by aspiration pneumonia requiring intubation. Given the patient's **significant cardiopulmonary comorbidities**, the decision was made to **pursue phrenic sparing nerve blocks as the primary anesthetic**, thus avoiding general anesthesia.

Case Report Continued

The patient received an ultrasound-guided left **interscalene block** (Figure 1) with 14 cc of 0.5% ropivacaine, lateral to the C5 root. Due to low volume of the interscalene block, a **supplemental anterior suprascapular block** with 6 cc of 0.5% ropivacaine was added. To cover potential incision extension, 8 cc of 0.5% ropivacaine was infiltrated **above the pectoral major muscle, below the lateral clavicle, and above the axilla, extending superficial cervical plexus coverage**. A **PENG block** with 6 cc of 0.5% ropivacaine was added to reduce the need for general anesthesia. Local anesthetic volume was based on spread adequacy under ultrasound.

The patient was **sedated with propofol and dexmedetomidine infusions**. The case proceeded uneventfully, and the patient required **no opioids** during the procedure or in the recovery unit. He reported **no shortness of breath or any signs of respiratory compromise**.

His post-operative course was uneventful. His pain was well controlled with over-the-counter medications and oxycodone. He was out of bed and ambulating with PT/OT on POD1 and was deemed stable for discharge.

Figures



Figure 1: Interscalene Block

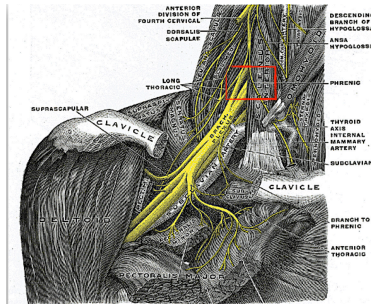


Figure 2: Brachial Plexus Anterior view

Discussion

In our case, the combination of a **lower volume interscalene block with supplemental blocks achieved effective surgical anesthesia with excellent post operative pain control**. Our patient did not exhibit any compromise of his respiratory function and had successful surgery under MAC sedation. This approach shows promise for future patients presenting for shoulder surgery with cardio-pulmonary comorbidities and needing avoidance of general anesthesia. Further decreasing the volume used for interscalene block would be recommended, to lessen the potential phrenic nerve involvement.

References

1. Tran DQ, Elgueta MF, Aliste J, et al Diaphragm-Sparing Nerve Blocks for Shoulder Surgery Regional Anesthesia & Pain Medicine 2017;42:32-38. Urmeý WF, Talts KH, Sharrock NE.
2. Urmeý WF, Talts KH, Sharrock NE. One hundred percent incidence of hemidiaphragmatic paresis associated with interscalene brachial plexus anesthesia as diagnosed by ultrasonography. Anesth Analg. 1991 Apr;72(4):498-503. doi: 10.1213/00000539-199104000-00014. PMID: 2006740.
3. Riazi S, Carmichael N, Awad I, Holtby RM, McCartney CJ. Effect of local anaesthetic volume (20 vs 5 ml) on the efficacy and respiratory consequences of ultrasound-guided interscalene brachial plexus block. Br J Anaesth. 2008 Oct;101(4):549-56. doi: 10.1093/bja/aen229. Epub 2008 Aug 4. PMID: 18682410.
4. Küpeli İ, Yazici Kara M. Anesthesia or analgesia? New block for shoulder surgery: pericapsular nerve group block. Braz J Anesthesiol. 2022 Sep-Oct;72(5):669-672. doi: 10.1016/j.bjane.2021.05.009. Epub 2021 Jun 9. PMID: 34118263; PMCID: PMC9515664.