

The Safety of Liposomal Bupivacaine versus Standard Bupivacaine for Interscalene Block: A Case Report

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INTRODUCTION

- Interscalene brachial plexus blocks (ISB) for shoulder procedures decrease recovery room time, nonoperative time, intraoperative narcotics, and total hospital length of stay.¹
- ISBs improve postoperative pain control, decrease unplanned hospital admissions for severe pain, and decrease postoperative nausea and vomiting.¹
- Analgesic benefits of standard local anesthetics in ISB are usually finite to 24 hours or less.¹
- Liposomal bupivacaine (LB) consists of encapsulated liposomes that break down overtime, releasing perineural local anesthesia molecules.²
- LB has been marketed to possess long-acting analgesic properties that can last up to 72 hours and lower postoperative opioid consumption.²
- In ISBs, the local anesthetic diffuses over the anterior scalene muscle to the phrenic nerve resulting in hemidiaphragm paralysis.³
- In addition to extending analgesia, LB has the potential to prolong the duration of phrenic nerve paralysis leading to respiratory compromise.³
- The TCU IRB determined the case report is exempt from IRB/IACUC approval as defined by 45 CFR 46.102.

PURPOSE STATEMENT

- The purpose of this case report is to compare the risk of prolonged phrenic nerve blockade resulting in hemidiaphragm and ventilatory compromise against the benefit of prolonged analgesia with the use of LB versus standard bupivacaine in ISB.

CASE SUMMARY

- **History:** 36-year-old male, chronic pain, PTSD, without pre-existing pulmonary disease
- **Procedure:** Right tenodesis biceps repair with debridement
- **Preoperative:** Midazolam and fentanyl prior to ISB with 10 mL LB and 10 mL 0.5% bupivacaine using ultrasound
- **Intraoperative:**
 - Standard GETA induction.
 - Maintenance with volatile anesthetic and dexmedetomidine infusion to decrease risk of agitation.
 - Upon emergence, TOF 4/4.
 - Reversal with sugammadex 200 mg for tidal volumes of 200 mL, oxygen saturations of 91-92% on 100% FIO2 with abdominal breathing.
- Patient extubated patient to nonbreather face mask with 15L FIO2.



The use of liposomal bupivacaine for ISB may result in significant, prolonged phrenic nerve blockade, a risk that must be considered versus the benefit of prolonged analgesia

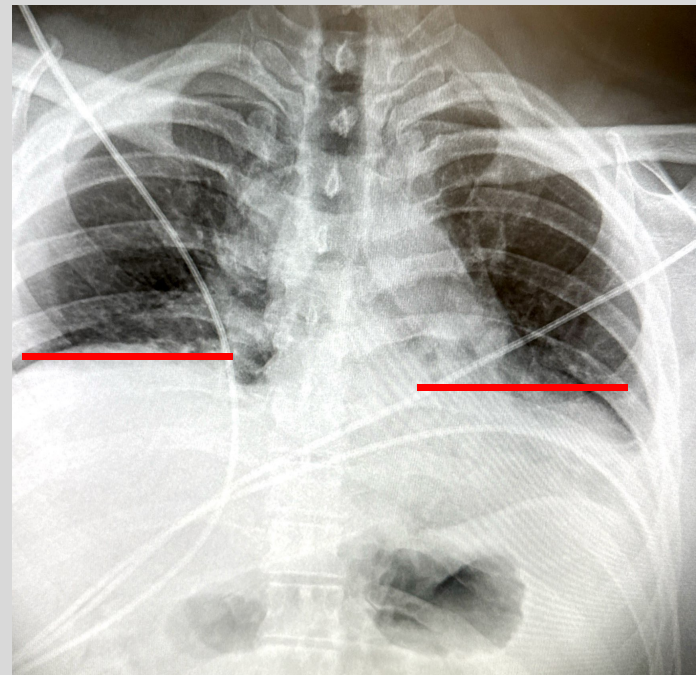


Figure 1. CXR in PACU. Moderate elevation of right hemidiaphragm superimposed on decreased lung volumes with pulmonary atelectasis. Perihilar and left basilar opacities. (Emphasis added to highlight hemidiaphragm)

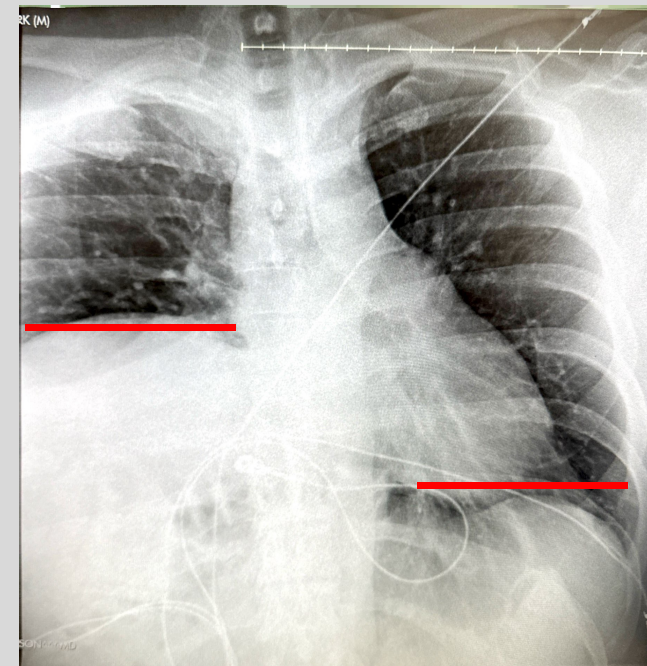


Figure 2. CXR on POD 1 revealed improved aeration of left lung with persistent elevation of right hemidiaphragm and airspace disease at right lung base. (Emphasis added to highlight hemidiaphragm)

CASE SUMMARY CONTINUED

- **Postoperative:**
 - BiPAP administered in PACU for SpO₂ 88%. Chest X-ray (CXR) obtained (fig. 1) which revealed moderate elevation of right hemidiaphragm superimposed on decreased lung volumes.
 - Patient admitted overnight. Repeat CXR on postoperative day (POD) 1 (fig. 2) revealed improved aeration of left lung with persistent elevation of right hemidiaphragm.
 - Patient discharged on POD 1.

METHODS

- PubMed and CINAHL databases were searched.
- Search terms included ISB, Exparel, LB, phrenic nerve.
- 63 articles resulted. Of these articles, 3 randomized controlled trials (RCT), 2 systematic reviews with meta-analyses, 1 noninferiority trial, and 1 retrospective study were analyzed.
- Exclusion criteria consisted of patient refusal, pre-existing lung disease, coagulopathy, non-English speakers, allergy to local anesthetics, and chronic pain.

CRITICAL APPRAISAL

- ISBs for orthopedic surgeries of the upper limbs significantly minimizes postoperative pain.³
- Phrenic nerve palsy resulting in hemidiaphragm paresis is a likely adverse event of ISB.⁴
- RCT by Berg et al was the only study to investigate diaphragmatic function after an ISB with LB compared to bupivacaine only.³
- LB combined with bupivacaine may lead to greater decreases in diaphragmatic function tests compared to bupivacaine alone 24 hours after block administration.⁶
- The decrease in opioid consumption was ruled clinically insignificant in healthy participants.³
- Decreases in opioid consumption were noted with the use of LB but the total decrease in the amount of opioids consumed failed to reach clinical significance.⁵⁻⁷

CASE CRITIQUE

- No assessment of preoperative lung volumes or effort
- Provider used ultrasound-guided imaging with out-of-plane technique in application of ISB.
- Use of dexmedetomidine infusion during the surgical procedure potentially increased sedation postoperatively.

CONCLUSIONS

- Limited benefit of LB to outweigh the increased reductions seen in diaphragmatic excursion with LB
- Future research should evaluate the difference in diaphragmatic function with LB compared to standard bupivacaine in the application of ISBs.
- Future research should compare the specific adverse events that occur with LB versus standard bupivacaine.

RECOMMENDATIONS FOR PRACTICE

- In patients who present with increased risk of postoperative ventilatory compromise, LB should be avoided in the application of ISB.

