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Acute Respiratory Distress Following Ultrasound-Guided Supraclavicular Block

Maged Guirguis, MD,* Rami Karroum, MD,* Alaa A. Abd-Elsayed, MD, MPH,† Loran Mounir-Soliman, MD*

**Department of Anesthesiology, Cleveland Clinic, Cleveland, OH*
†Department of Anesthesiology, University of Cincinnati, Cincinnati, OH

ABSTRACT

Background: Brachial plexus blocks have become very common for patients undergoing upper extremity surgery. We report a case in which the patient developed ipsilateral phrenic nerve paralysis and acute respiratory failure following supraclavicular nerve block.

Case Report: A 61-year-old female diabetic, morbidly obese patient presented for a repeat debridement of necrotizing fasciitis on her left arm. She received a left-sided supraclavicular brachial plexus block. Within a few minutes, the patient began to experience acute dyspnea, anxiety, and oxygen saturation of 90%. Breath sounds were diminished in the left hemithorax. Arterial blood gases revealed evidence of acute respiratory acidosis. The chest x-ray was normal. After induction, we intubated the patient. Subsequent arterial blood gases showed marked improvement in respiratory acidosis. We believed left phrenic nerve paralysis to be the cause of the distress. The patient was extubated in the surgical intensive care unit the following day, and infusion of ropivacaine 0.2% was started. The catheter was removed afterward secondary to its occlusion.

Conclusion: Phrenic nerve injury leading to respiratory distress is a rare complication of supraclavicular brachial plexus block. Anesthesiologists should be ready for emergency intubation when performing this kind of block.

Address correspondence to
Maged Guirguis, MD
Department of Anesthesiology
Anesthesiology Residency Office - E30
Cleveland Clinic
9500 Euclid Ave.
Cleveland, OH 44195
Tel: (440) 290-2420
Fax: (216) 445-0605
Email: guirgum@ccf.org

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INTRODUCTION

Brachial plexus blocks have become popular for providing effective anesthesia and analgesia in patients undergoing upper extremity surgery.[1] A review of 1,001 supraclavicular blocks performed by staff and resident anesthesiologists showed no major complications.[2] Although phrenic nerve block is a common adverse event associated with the supraclavicular approach for brachial plexus block (Figures 1 and 2), this effect has no important clinical repercussions in most cases. We report a case of supraclavicular nerve block in a morbidly obese patient that resulted in ipsilateral phrenic nerve paralysis and acute respiratory failure.

CASE REPORT

A 61-year-old female diabetic, morbidly obese patient with a body mass index of 41 kg/m^2 presented for a repeat debridement of necrotizing fasciitis on her left arm. We knew her to be difficult to intubate, but her previous anesthesia record revealed that she was easy to ventilate and had been successfully intubated using a GlideScope (Saturn Biomedical Systems, Inc, Burnaby, British Columbia, Canada). In the preoperative holding area, we administered a left-sided supraclavicular brachial plexus block (Figure 3) under ultrasound guidance and placed an indwelling catheter. Then we injected 12.5 mL of 0.5% ropivacaine and 12.5 mL of 1% mepivacaine to achieve the block. The patient experienced appropriate analgesia and anesthesia in the left upper extremity. However, within a few minutes, she began to experience acute dyspnea and anxiety. Pulse oximetry decreased from 100% to 90%. Breath sounds were diminished in the left hemithorax. We initially placed the patient on a nonrebreather oxygen mask. Her arterial blood gases revealed evidence of acute respiratory acidosis but not hypoxemia, and an urgent chest x-ray did not show evidence of pneumothorax.

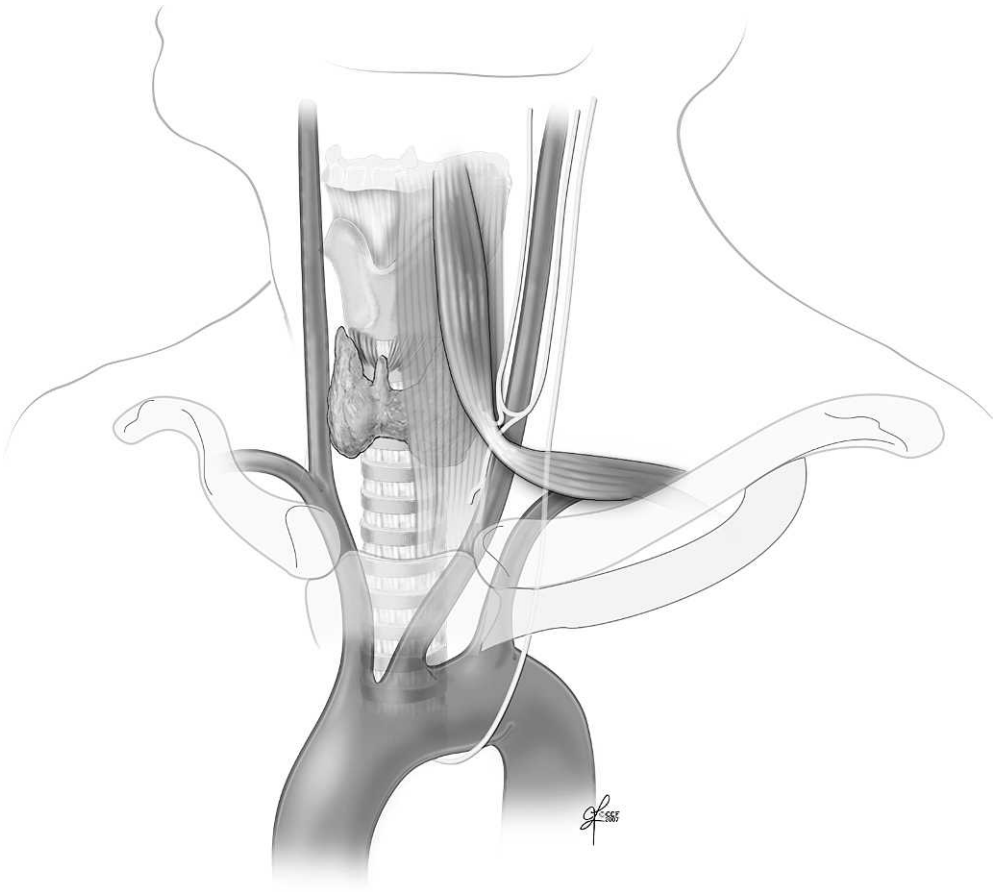

Figure 1. Phrenic nerve course in relation to the neck.

After a rapid-sequence induction with etomidate and succinylcholine, we easily intubated the patient using a GlideScope. We placed her on pressure-controlled mechanical ventilation and started a propofol infusion. She was transferred to the surgical intensive care unit (SICU) in stable condition. Subsequent arterial blood gases showed marked improvement in respiratory acidosis. A repeat chest x-ray did not show evidence of pneumothorax. We believed left phrenic nerve paralysis to be the cause of the respiratory failure.

The patient was extubated in the SICU the following day, and ropivacaine 0.2% was infused around the nerve through the previously placed catheter at 10 cc per hour. The anesthetic allowed for debridement and dressing changes at the bedside for 3 days. The catheter was removed afterward secondary to its occlusion.

DISCUSSION

Phrenic nerve palsy is a frequent complication of supraclavicular brachial plexus block, occurring in 67% of cases.[4] The adjacent spread of local anesthetic presumably interferes transiently with normal functioning of the nerve. Healthy patients can compensate for the transient decrease in ventilatory function and usually experience only mild symptoms. In contrast, patients with cardiopulmonary comorbidities often cannot tolerate a reduction in respiratory function. Hood and Knoblanche[5] have described pulmonary failure following brachial plexus block in rare cases of patients with severe pulmonary disease or contralateral phrenic nerve palsy.

The use of ultrasound guidance, alteration of the anesthetic agent, low-volume infiltration, and digital pressure superior to the injection site have not significantly reduced the incidence of phrenic nerve palsy; however, Rau et al[6] report a case in which using a bent-needle technique might have decreased the incidence of phrenic nerve palsy.

The incidence of obesity is increasing in the United States.[7] Obesity has negative effects on pulmonary functions.[8-10] The decreased ventilatory reserve documented in obese patients may contribute to difficulty tolerating transient hemidiaphragmatic

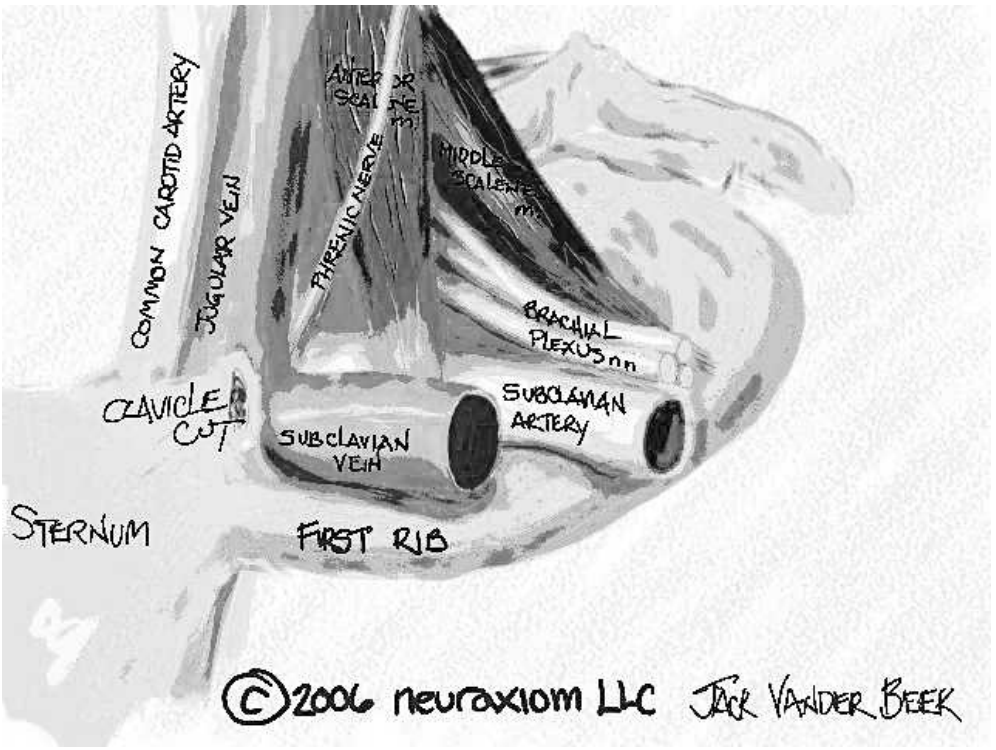

Figure 2. Phrenic nerve course in relation to the brachial plexus. (Reproduced with permission from Vander Beek J. Supraclavicular brachial plexus. 2006. http://www.neuraxiom.com/html/supraclavicular_bp.php.)

paresis. In nonobese patients, the same complication may not manifest as respiratory distress.

While supraclavicular blocks have become increasingly important in high-volume ambulatory surgical practices, they are not without risk. In patients with morbid obesity, specifically abdominal adiposity, anesthesiologists should consider other anesthetic options. Franco and colleagues[11] stated that obesity

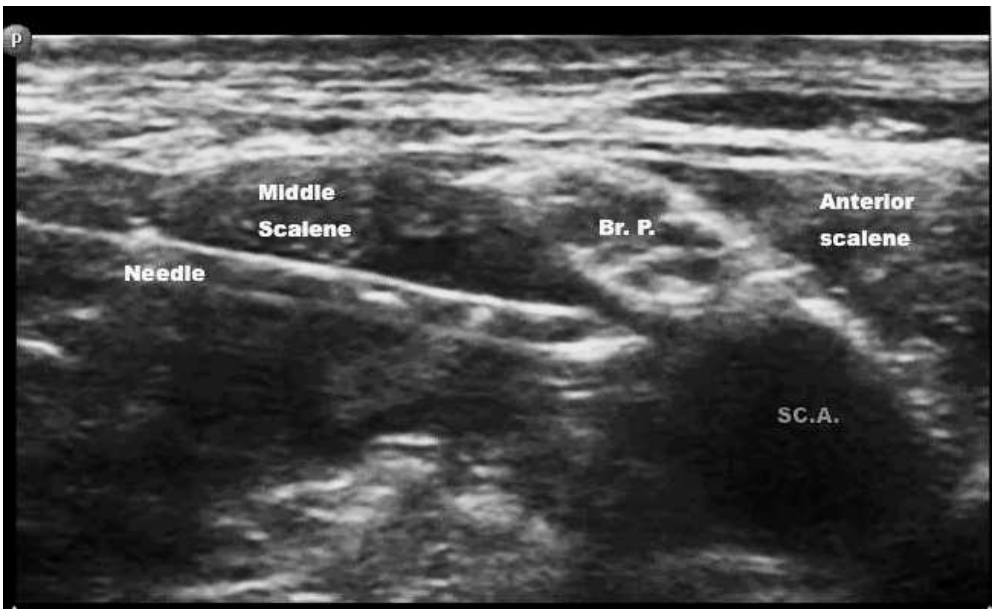

Figure 3. Supraclavicular technique for brachial plexus block.
Br.P., brachial plexus block; SC.A., subclavian artery

increases the difficulty and decreases the success rate of a supraclavicular block. The increase in difficulty was demonstrated by a decrease in the rate of block completion by residents and by a decrease in residents' ability to elicit an ideal fingers response.[11] Acceptable alternatives for regional pain control include local anesthesia, Bier block, infraclavicular brachial plexus block, and axillary brachial plexus block—all of which have less potential for causing phrenic nerve palsy.[1]

Recommendations for anesthesiologists are as follows:

- Evaluate the airway prior to performing the peripheral nerve block.
- Review the previous anesthesia record before performing a nerve block. In our case, the record revealed important information we subsequently used to secure the patient's airway on an emergency basis.
- Be ready to perform emergency intubation if the nerve block leads to respiratory complications.
- Remain cautious while performing brachial plexus blocks in patients with known respiratory disease.

CONCLUSION

Phrenic nerve injury leading to respiratory distress is a rare complication of supraclavicular brachial plexus block. Evaluation of the airway before performing the block is important because anesthesiologists must be ready for emergency intubation when they perform this kind of block.

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