

Acute Severe Bronchospasm Due to Phrenic Nerve Palsy Following Superficial Cervical Plexus Block – A Case Report

Respected Editor,

The diaphragm accounts for 75% of the growth in lung volume with regular inspiration. Healthy patients may remain asymptomatic with unilateral blockade of the phrenic nerve since they are capable of making up for a brief decrease in ventilatory function. However, this is not tolerated by patients with respiratory compromise. Phrenic nerve palsy (PNP) has been reported after interscalene brachial plexus block (incidence 100%) as well as following supraclavicular brachial plexus block (incidence 65%).^[1,2] The phrenic nerve is also located close to the superficial cervical plexus and risks blockade during the plexus block. It has not been so far investigated, however, bilateral superficial cervical plexus blocks continue to be utilized for thyroid procedures.^[3,4]

A 68 years old, 80 kg male patient with a body mass index of 28 kg/m² diagnosed with occult carcinoma and secondaries in the lung and liver, required excision of a 2 cm × 3 cm left supraclavicular lymph node. In addition, he suffered from chronic obstructive lung disease with modified medical research council Grade 2 dyspnea. The patient also had bilateral pitting pedal edema, likely due to anemia and hypoproteinemia. His pulse rate was 96 beats per min, blood pressure was 110/70 mmHg, rate of respiration was 24/min, and oxygen saturation in the room air was 89%. Echocardiography revealed Grade 1 diastolic dysfunction, and pulmonary function tests indicated a moderate restrictive and obstructive pattern with no reversibility. The partial pressure of oxygen in arterial blood was 60 mmHg.

To minimize interference with the patient's physiology, we decided to do an ultrasound-guided superficial cervical plexus block to anesthetize the lateral portion of the neck.

In the operation theater, standard monitoring was initiated, and 5 L/min of oxygen was supplemented using nasal prongs raising the saturation to 98%. The patient was positioned supine with a 15° head up tilt and head turned contralateral.

Using the high-frequency linear array transducer (13-6 MHz) of Edge II (FUJIFILM Sonosite, Inc. Bothell, USA), the superficial cervical plexus was identified below the prevertebral fascia, and a 23-G Quincke spinal needle was used to deposit 6 mL of 2% lignocaine with adrenaline. Shortly after the block, the patient became restless with labored breathing, active accessory respiratory muscles, and chest pain. Respiratory rate increased to 35–40/min, and saturation dropped to 90%. Heart rate (HR) rose to 120 beats/min and extensive bilateral rhonchi were heard on auscultation. No ST segment or T-wave changes were noted on electrocardiogram. To address these symptoms, injection deriphyllin (etofylline 84.7 mg + theophylline 25.3 mg) and hydrocortisone 100 mg were given intravenous and salbutamol nebulization was initiated. He suffered an episode of bradycardia (HR of 40/min) and hypotension (noninvasive blood pressure 80/30 mmHg), which was controlled by injecting atropine 0.6 mg and mephentermine 6 mg. Symptoms gradually resolved over the next 15 min. We went ahead with surgery as the area was well anesthetized and an excision biopsy was needed for planning the treatment. The excision took around 45 min. Postoperative recovery was uneventful.

Intraoperative anesthesia emergencies can be sudden, progressing rapidly, and posing life-threatening risks. When troubleshooting the cause in our patient, we initially focused on potential issues related to the block. Pneumothorax was ruled out due to the block's superficial location. The transient nature of the complication suggests a direct link to the injected local anesthetic. We suspected PNP could have triggered the event and examined

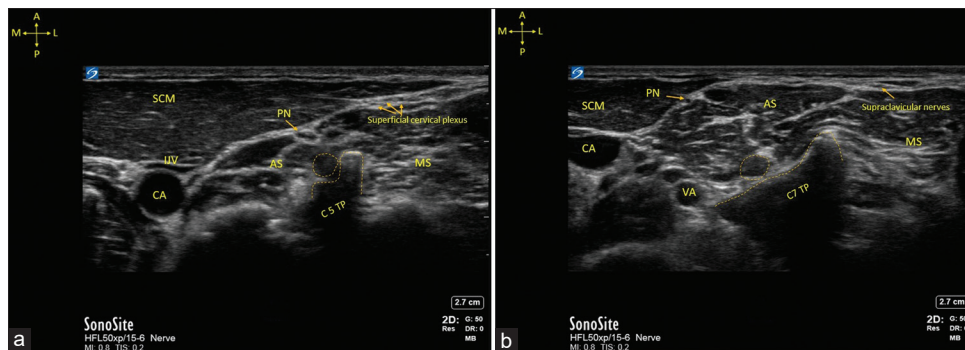


Figure 1: (a) Shows the proximity of superficial cervical plexus to the phrenic nerve at the level of C5 level. The C5 ventral rami is seen emerging from the C5 transverse process. SCM- sternocleidomastoid, AS – anterior scalene, MS- middle scalene, PN- phrenic nerve, CA- carotid artery, IJV- internal jugular vein, TP- transverse process, (b) Shows the Phrenic nerve widely separated from the supraclavicular nerves at the C7 level. The C7 ventral rami is seen emerging from the C7 transverse process which has only a posterior tubercle. The vertebral artery is also seen outside the transverse process. SCM- sternocleidomastoid, AS – anterior scalene, MS- middle scalene, PN- phrenic nerve, CA- carotid artery, VA-vertebral artery, TP- transverse process

left hemidiaphragmatic movement using ultrasound. There was no movement of the ipsilateral diaphragm. While PNP following interscalene and supraclavicular blocks leading to bilateral bronchospasm have been reported, not all patients with PNP exhibit bronchospasm.^[5,6] The specific triggers for bronchospasm in these cases remain unclear. Since Horner's syndrome was not present in our case, we were able to rule out the blockade of T1–T4 bronchodilator fibers caused by involvement of the sympathetic chain. Given the patient's preexisting respiratory compromise, we speculate that distress and anxiety resulting from hemidiaphragmatic palsy precipitated the bronchospasm. The severe bronchospasm had in turn led to air trapping, dynamic hyperinflation, and compromised ventricular filling causing hypotension and bradycardia. The bronchospasm was responsive to the initiated treatment. However, any decrease in mentation due to accumulation of carbon dioxide or cardiovascular collapse due to auto positive end expiratory pressure (PEEP) would have warranted intubation.

A selective supraclavicular nerve block is a viable phrenic nerve-sparing alternative to superficial cervical plexus block for anesthetizing lateral side of the neck. Supraclavicular nerves diverge and deviate laterally from the plexus, whereas phrenic nerve runs medially giving the advantage of a greater distance between the two [Figure 1]. Nevertheless, it needs practice and expertise to identify and trace the small structures.

Our case, marked by transient bronchospasm due to unilateral phrenic nerve involvement, despite the use of a relatively low volume of local anesthetic after a superficial cervical plexus block, appears unique and unreported.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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