Case Report

Can bilateral bronchospasm be a sign of unilateral phrenic nerve palsy after supraclavicular brachial plexus block?

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Abstract

Ultrasound-guided peripheral nerve blocks facilitate ambulatory anesthesia for upper limb surgeries. Unilateral phrenic nerve blockade is a common complication after interscalene brachial plexus block, rather than the supraclavicular block. We report a case of severe respiratory distress and bilateral bronchospasm following ultrasound-guided supraclavicular brachial plexus block. Patient did not have clinical features of pneumothorax or drug allergy and was managed with oxygen therapy and salbutamol nebulization. Chest X-ray revealed elevated right hemidiaphragm confirming unilateral phrenic nerve paresis.

Key words: Bronchospasm, phrenic nerve blockade, supraclavicular block, ultrasound guided

Introduction

Brachial plexus block used for upper limb surgery avoids the use of general anesthetics, provides excellent analgesia, and facilitates ambulatory surgery. Phrenic nerve palsy is a common complication after both interscalene and supraclavicular brachial plexus blocks,[1-3] but is more common with the interscalene approach. We report unilateral phrenic nerve paresis along with severe respiratory distress and bilateral bronchospasm following ultrasound-guided (USG) supraclavicular brachial plexus block.

Case Report

A 58-kg, 56-year-old woman was scheduled for emergency debridement and tendon repair of right hand. Patient was a known hypertensive on therapy with amlodipine 10 mg once a day for 5 years. She had no other comorbidities. Her preoperative vitals were pulse rate of 84/min and blood pressure 150/90 mmHg in supine position. Routine biochemical/hematological investigations and electrocardiogram (ECG) were within normal limits.

After taking informed consent for supraclavicular block, the patient was shifted to the operation room. Monitoring with electrocardiogram, noninvasive blood pressure monitoring, and pulse oximetry was initiated. Her vitals were stable. An 18G intravenous (IV) cannula was secured and midazolam 2 mg IV was given. Under strict aseptic precautions, USG right supraclavicular brachial plexus block was given with a 5-cm nerve block needle, using mixture of local anesthetic 10 ml 0.5% bupivacaine and 10 ml of 2% lignocaine with 1:200,000 adrenaline. Adequacy of the block was observed within 10 min of its administration. About 15 min after the block, the patient became restless, complained of breathing difficulty, and became tachypneic with audible wheeze. There was tachycardia, mild rise in blood pressure, and progressive desaturation. Auscultation of chest revealed a bilateral decrease in air entry and rhonchi were heard. Patient was propped up and given oxygen supplementation with facemask which improved the oxygen saturation (SpO_2) from 70% to 85%. Two doses of salbutamol nebulization were given, but there was no further improvement in SpO_2. Fluoroscopy did not reveal pneumothorax. There were no features of Horner's syndrome, rashes, or drug allergy. The procedure was deferred and patient was shifted to intensive care unit.

Patient received salbutamol nebulization and maintained SpO_2 of 92% with 60% oxygen supplementation delivered by Venturi facemask. Chest X-ray showed features of right

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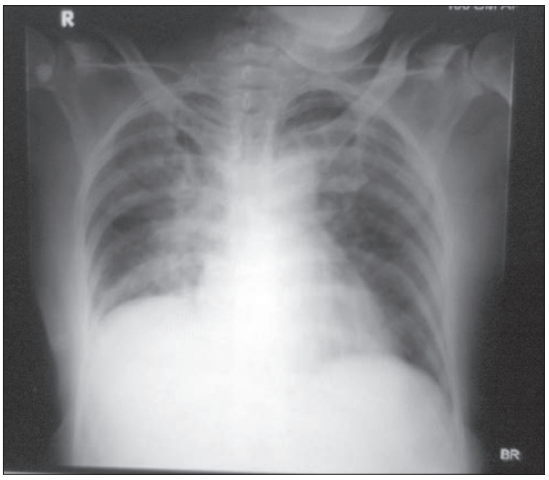

Figure 1: Evidence of phrenic nerve palsy after the supraclavicular block

phrenic nerve paresis [Figure 1] One hour post block, she became more comfortable, vitals were stable with improved breath sounds bilaterally, and oxygen supplementation was gradually withdrawn. The repeat chest X-ray showed normalization of the elevated right hemidiaphragm and patient was maintaining saturation on room air. Later, she underwent the procedure electively under general anesthesia uneventfully.

Discussion

Incidence of phrenic nerve paresis after interscalene block is greater than supraclavicular,[1-3] probably because the injection point is more cephalad and closer to the cervical plexus in the interscalene approach. Despite a decrease in pulmonary function after phrenic nerve palsy, healthy patients may remain asymptomatic as they are able to compensate for the transient decrease in ventilatory function.[4]

The close proximity of the phrenic nerve to the site of these injections may lead to spread of local anesthetics to the nerve.[5] Anatomical variation can also lead to phrenic nerve paresis after supraclavicular block.[6] Close to its origin, the phrenic nerve may give a communicating branch to C5 root of brachial plexus. Such an anatomical variation gains importance in supraclavicular nerve block.[7]

Studies have shown decrease in spirometric volumes after interscalene block, resulting from diaphragmatic paresis. Most patients remain asymptomatic though it causes inability to fully inspire to total lung capacity, with resultant decrease in all pulmonary volumes and flows.[4,8] Although the phrenic nerve is blocked in brachial plexus block by both interscalene and supraclavicular approaches, the effects on reduction in forced vital capacity (FVC) is different. With interscalene block the incidence of diaphragmatic hemiparesis is 100% and it is accompanied by a 25% reduction in FVC.[2] However, with supraclavicular block, although 50% patients have diaphragmatic paresis, there is no reduction in FVC.[9] One incident of phrenic nerve block leading to dyspnea and reduced air entry after supraclavicular block in an obese patient has been reported. Transient hemidiaphragmatic paresis may not be tolerated by obese as their ventilatory reserves are low.[5] Bronchospasm after interscalene block in nonasthmatics patients has been reported[10] and can occur in presence of phrenic nerve block and reduction in ventilatory parameters following interscalene block.

There may be multiple causes of bronchospasm in this patient. The local anesthetics when injected in interscalene groove may have spread to opposite side if midline septa were deficient and may have spread upward and downward as far as T_4 segments.[11] Blockade of T_1–T_4 sympathetic nerve supply may precipitate bronchoconstriction due to parasympathetic overactivity. In our patient, although the drug was injected in supraclavicular plexus, such a spread cannot be ruled out. Recurrent laryngeal nerve can be blocked if the injection is too deep along the posterior border of sternocleidomastoid and this can lead to bronchospasm.[12]

Respiratory distress in the case reported was due to unilateral phrenic nerve paresis. In case respiratory distress occurs immediately following a supraclavicular block, phrenic nerve paresis should also be considered and measures to deal with unanticipated respiratory distress must be initiated.

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