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CLINICAL CASES

Recurrent laryngeal nerve palsy after left-sided supraclavicular ultrasound-guided perivascular brachial plexus block. A unique case

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Abstract

Supraclavicular brachial plexus nerve block is ideal for surgical procedures of the upper limb. Ultrasound guidance continues to grow in popularity as a method of nerve localization, significantly improves the quality of nerve block with a lesser number of complications, it has the advantage of allowing real-time visualization of the plexus, pleura, and vessels along with the needle and local anesthetic spread, although complications cannot be eliminated completely. Ipsilateral recurrent laryngeal nerve (RLN) palsy is a rare complication associated with supraclavicular approach. The incidence of the RLN block occurring with supraclavicular approach is 1.3% of patients, but incidence of block with ultrasound-guided supraclavicular block is not known. There are two cases reported in the world literature, in Mexico there is no evidence in this regard. We discuss the first case report in Mexico and the third in the world of this rare complication which occurred while performing a left supraclavicular perivascular block performed under ultrasound guidance.

Keywords: *Left recurrent laryngeal nerve palsy. Left supraclavicular brachial plexus block. Ultrasound guidance.*

Introduction

Described as the "spinal of the arm," a supraclavicular brachial plexus nerve block (SCB) is performed at the level of plexus trunks formed by C5-T1 nerve roots, where almost the entire sensory, motor, and sympathetic innervations of the upper extremity are carried in just three nerve structures confined to a very small surface area, it is ideal for upper limb surgical procedures[1]. Intravascular injection, pneumothorax, hemidiaphragmatic paresis, cervical sympathetic block, and nerve injury are the common complications with this approach. Recurrent laryngeal nerve (RLN) palsy is a rare complication associated with this approach (1.3% incidence)[2]. Ultrasound (USG) guidance helps in performing nerve blocks with accuracy and has reduced the rates of complications. However, experience and acquaintance with the anatomy is highly required. RLN block and hoarseness of voice is a rare complication of this block and has been reported in case of right-sided block[3]. There are two cases reported in the world literature, the first case of left RLN palsy using USG for SCB plexus nerve block was reported by Naaz et al.[4], and the second by Lakhe et al.[5]. We discuss the first case report in Mexico and the third in the world of this rare complication which occurred while performing a left supraclavicular perivascular block performed under USG guidance.

Clinical case

A 49-year-old male patient with American Society of Anesthesiologists (ASA) Grade III had to undergo corrective

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surgery for a left radioulnar fracture (open reduction with internal fixation). Pre-operative investigations were found within normal limit. We planned to conduct the case under SCB plexus block supplemented with sedation. After explaining the procedure and taking consent he was taken inside the operation room. The standard ASA monitors were attached and baseline parameters were recorded. Taking all aseptic precautions, supraclavicular block was performed under USG guidance using high-frequency convex transducer just above the clavicle at approximately its midpoint. By in-plane technique, a 50-mm, 22-G needle was passed posterolateral to the brachial plexus in a lateral-to-medial direction. Being convinced with the location of needle, 20 mL of 0.75% ropivacaine plain and 10 mL of 1% lidocaine with epinephrine were instilled after repeated negative aspiration. The block was effective and the patient's left upper limb was anesthetized. Within 5 min, he also complained of difficulty in speech and there was hoarseness in his voice which was not there before. In next 15 min, hoarseness and cough became more severe. The patient became very anxious because of this. He had no other problems like breathlessness or drop in oxygen saturation. His hemodynamic parameters were unaltered and there were no electrocardiogram changes. As the patient became very anxious, we decided to sedate and ventilate him. A gentle laryngoscopy was done under sedation (propofol 50 milligrams, fentanyl 100 micrograms), as RLN involvement was suspected. On laryngoscopy, the left vocal cord was found immobile and abducted. Oxygen supplementation was continued (facial mask) and maintenance with sevoflurane. Surgery was started. The symptoms did not worsen, and vitals remained stable. Vigilant monitoring was continued. After the surgery, the patient was assessed and definitive finding of hoarseness of voice was confirmed with no difficulty in breathing. The patient was shifted to post-anesthesia care unit for observation. Oxygen supplementation was continued. The patient was observed for next 2 h before shifting to the flour. Her voice recovered completely after approximately 48 h.

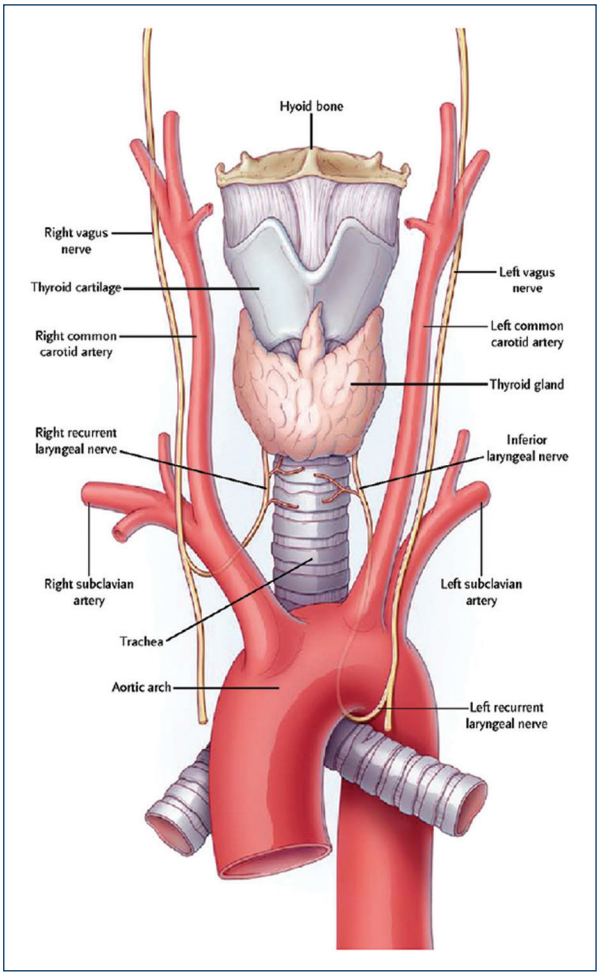

Figure 1. Anatomical relationship of recurrent laryngeal nerve right and left. Downloaded from nejm.org.

Discussion

The SCB also referred to as "spinal of the arm" is popular for surgeries of the upper limb. USG has gained popularity in regional anesthesia as it is safe, reliable, and precise[6]. The sensitivity of ultrasound to guide administration of local anesthetic (LA) is ranged from 85% to 92%, and the specificity around 90% to 95%[7]. In developing countries like Mexico, due to the unavailability of resource, we continue to rely on the blind surface landmark technique. The most feared complication of this technique is pneumothorax with a prevalence of 0.5-6%[8]. With an ultrasound-guided supraclavicular approach, the risk of pneumothorax is significantly reduced. However, nerve injury and vascular puncture are possible with all approaches. It is true that the risk of pneumothorax has decreased dramatically, but it has not been eliminated. When a supraclavicular block is performed, a phrenic nerve block can occur at a rate of up to 60% depending on the technique and the volume of LA used. The supraclavicular approach is contraindicated in patients at risk of contralateral phrenic nerve damage or with severe lung disease. In the supraclavicular approach, the needle must always be well-visualized because the injection site is close to the pleura. This technique requires strong ultrasound experience[9]. The incidence of complications related to peripheral nerve blocks is reported to be low, approximately 3%

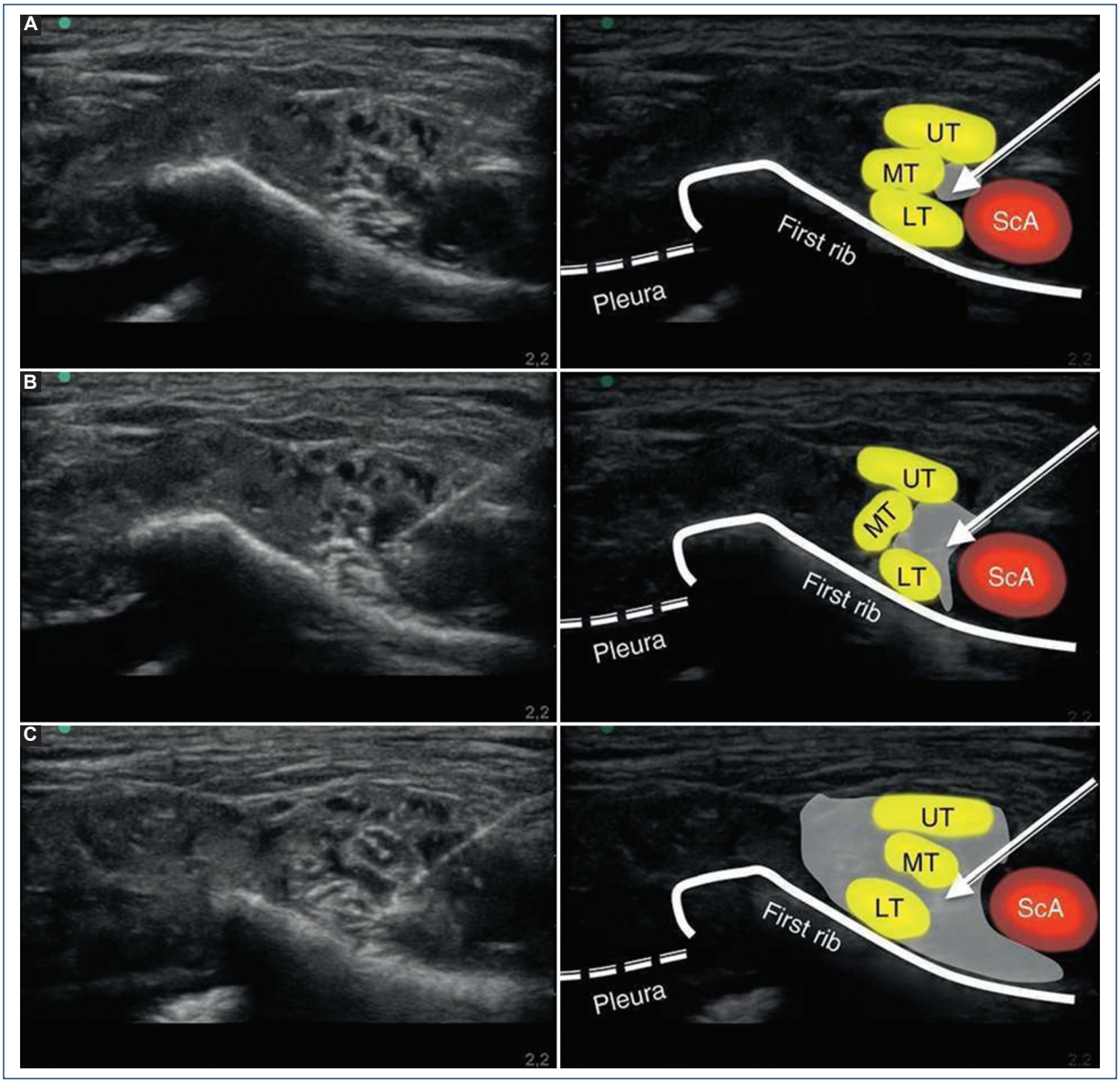

Figure 2. Ultrasound image captured during the administration of the supraclavicular block using a medial approach on the anatomic specimen. **A:** position of the needle at the injection site. **B:** ultrasound image during the 10 ml injection. **C:** ultrasound image after completing the 20 ml injection.
ScA: subclavian artery; UT: upper trunk; MT: middle trunk; LT: lower trunk. The arrow points toward the position of the neurostimulation needle. The gray shade shows the distribution of the volume injected at the injection site evaluated with ultrasound. From Herrera AE. et al 2017[10].

within 4-6 weeks after surgery, approximately 2-4/10,000 within 1 year. In addition, recent reports suggest that most neurological complications detected postoperatively may be related to surgery, rather than regional anesthesia, and that many regional anesthesia-related neurological injuries tend to be reversible. However, our patient had permanent neurologic injury associated with a SCB plexus block, suggesting that developments in peripheral nerve blocks such as ultrasound and improvements have not completely eliminated the possibility of serious complications[11]. Safety is closely related to a range of professional competencies, including operator knowledge, attitudes, and skill. A key skill includes keeping the needle in the plane of the ultrasound beam and identifying important structures such as the first rib, pleura, and blood vessels[12].

Although rare, RLN palsy has been documented in 1.3% of cases of classical SCB[13]. It has mostly been

reported in the right-sided block which is well explained by its relationship with the right subclavian artery (SCA). The right and left RLNs follow different courses[14] (Fig. 1). The right RLN encircles the right SCA and is in its close proximity. Hence, there are chances of its involvement in rare cases when a large amount of LA is deposited near the artery where the RLN is located. Hence, when the drug is deposited near SCA, there remains the possibility of involvement of RLN due to close proximity of the neurovascular structure, and more so when a large volume of the drug has been deposited[15]. However, the left RLN is much medial in relation to the left SCA running closer to trachea and esophagus. It is the left vagus nerve which runs near the SCA. The mechanism by which the nerve block occurred in our case was the exclusive block of the fibers of RLN present in the vagus nerve or unilateral vagus nerve as the drug deposited moved medial to the SCA and since the RLN is located farther. Visualization of the tip of the needle throughout the procedure is of utmost importance as this prevents the puncture of unwanted structures preventing complications and increases the chances of success of the procedure by deposition of LA at exact location[16-18] (Fig. 2). The fascial sheath surrounding the brachial plexus is a determinant for the spread of LA. The sheath is a derivative of the deep cervical fascia and terminates by merging with the medial intermuscular septum of the arm. The LA injected spreads up and down the nerves in a longitudinal manner and circumferential spread are limited by the fascial sheath. When the large volume of LA is injected, there is a possibility of proximal spread of excessive drug involving RLN and attributing the hoarseness of voice[19]. As it happened with our patient the volume of the drug used might have been an additional contributing factor for the excessive spread. There is a remote possibility of aberrant left RLN (incident 0.04%) when it is known as non-recurrent inferior laryngeal nerve, it runs closer to the SCA and is always associated with aberrant vessels such as arteria lusoria, right aortic arch, and situs inversus[20]. Cases have been reported of respiratory obstruction as a result of unilateral SCB plexus block. In our case, it was self-limited; it only caused a feeling of discomfort in the patient. For similar reason, interscalene brachial plexus block should be avoided[21,22]. Various techniques have been described to limit the spread of injected LA into the brachial plexus[23]. These include the use of tourniquet position of the arm, use of massage of the area for around 5-10 min, multiple injection techniques, digital pressure proven by Gupta et al.[8], and elevated the head end of the bed by 30°. Based on the radiological evidence, digital pressure has been touted as an effective method to halt progression of LA into areas of the brachial or cervical plexus during brachial plexus block[24].

The mechanism by which the nerve block occurred in our case was the exclusive block of the fibers of RLN present in the vagus nerve or unilateral vagus nerve as the drug deposited moved medial to the SCA and since the RLN is located farther. This case can be explained as a case of block of medial fibers of vagus nerve, that is, fibers of left RLN present in vagus nerve or unilateral vagus nerve block. In our patient, digital pressure was not applied after SCB as we were using USG-guided technique. We propose that digital pressure would have prevented the excessive spread proximally which would have prevented the involvement of RLN.

Conclusion

The left RLN palsy is a unique complication of the supraclavicular block. It is temporary and self-limiting most of the time but it is distressing for the patient for being unable to phonate. When performing nerve blocks, care should be taken to inject lesser dose of LA because these days nerve blocks are performed using ultrasound and the location where the drug is deposited is more accurate. The tip of the needle should be visualized right from introduction till the whole of the drug is injected so that drugs may not be deposited elsewhere and chances of complications are minimized. Specific training strategies are recommended, including techniques to optimize needle visualization. The digital pressure, the elevation of the head end of the bed 30°, using a lower volume of drugs and use of USG might mitigate the complication. The basic rules of safe practice remain very important, training, anatomical knowledge, and meticulous technique, including slow injection of LA with regular syringe aspiration and maintenance of verbal contact with the patient.

Further studies are required to determine the incidence of the discomforting and extremely rare complication, this being the third case reported in the world literature and the first in Mexico.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that no patient data appear in this article. Furthermore, they have acknowledged and followed the recommendations as per the SAGER guidelines depending on the type and nature of the study.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of images, graphics, tables, or their corresponding captions.

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