Ultrasound guided suprascapular and supraclavicular nerve block in combination with continuous perineural brachial plexus block for operative management of upper limb multiple fractures: a case report

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ABSTRACT

We report a case of multiple upper limb fractures resulting from a road traffic accident, wherein the patient declined general anesthesia. Instead, we successfully administered anesthesia using ultrasound-guided supraclavicular and suprascapular nerve blocks, combined with continuous perineural brachial plexus block. The surgical procedure was successfully completed within six hours, and no complications were encountered.

KEYWORDS

supraclavicular nerve, suprascapular nerve, Ultrasound guided brachial plexus block.

INTRODUCTION

The Supraclavicular brachial plexus block is commonly employed for surgical procedures below the shoulder. However, when the local anesthetic spreads into the interscalene groove, it can result in the blockage of the suprascapular nerve, thereby enabling surgery around the shoulder to be performed.[1] The dispersion of local anesthetic in prevertebral fascia can block supraclavicular nerve, branch of superficial cervical plexus facilitating surgery over clavicle.[2] Ultrasound-guided nerve blocks play a crucial role in not only ensuring effective anesthesia delivery but also in minimizing the amount of local anesthetics required. It is important to note that a single-shot nerve or plexus block may not be suitable for surgeries expected to last for an extended duration. The continuous infusion of a local anesthetic through a perineural catheter allows for the maintenance of anesthesia during the surgery, and it can also be retained in place to provide post-operative analgesia. We report a case of multiple upper limb fracture where surgery performed under ultrasound guided continuous perineural brachial plexus block in combination with suprascapular and supraclavicular nerve block.

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CASE REPORT

A 46-year-old male, ASA physical status I, was admitted to the emergency department after being involved in a motorbike accident. Upon arrival, the patient was conscious however he had a history of brief Loss of consciousness. He complained of severe pain and limited range of motion in the left shoulder and elbow regions. Physical examination revealed tenderness, swelling, and deformity in the left shoulder and elbow areas. The neurological examination was normal, and no signs of vascular compromise were evident.

Imaging studies, including X-rays and CT scans, revealed a comminuted fracture of the clavicle, comminuted fracture of the humerus, and fractures of both the radius and ulna bones. CT head was normal. These findings confirmed the diagnosis of a left-sided floating shoulder and floating elbow injury.

The patient refused general anesthesia, leading to a challenging surgical decision-making process. The patient was provided with detailed counseling regarding the pros and cons of different procedures, after which he provided informed consent. After careful consideration and further consultation with the surgical and anesthesia teams, the patient provided informed consent for the procedure to be performed under regional anesthesia with sedation. The successful open reduction internal fixation procedure performed without general anesthesia is described herein.

At Operation room intravenous line was secured on the right dorsum of hand with 16G cannula patient was monitored with the standard monitoring devices. Oxygen at 1 liter per minute was given via nasal prong. Patient was kept in supine position with head rotated to contralateral side of limb to be operated. 5-12 MHz Linear probe was placed on supraclavicular fossa. Subclavian artery, first rib and pleura were identified. Adjacent to the artery, above the rib all three distal trunks of brachial plexus were identified figure 1. Nerve stimulating needle was inserted in plane with the probe piercing brachial plexus sheath. Evoked motor response was achieved at current of 0.2 mA at 1 Hz frequency. Total 12 ml of 1.5% lidocaine with adrenaline was instilled surrounding each trunk with 4 ml. After injecting the local anesthetic, the probe was moved in cephalad direction to visualized interscalene groove figure 2. At this point as subclavian artery and first rib became disappeared, further 10 ml of same local anesthetic was administered in the groove. The needle was withdrawn meanwhile the probe was move down so that subclavian artery and first rib were visible determining brachial plexus. Here 2ml of 2% lidocaine was injected to raise skin wheal and 18-gauge and catheter {B. Braun) was placed perineurally at plexus using 20-G Touhy epidural needle. Then the probe was placed at midpoint of posterior border of sternocleidomastoid muscle at level of thyroid cartilage to identify supraclavicular nerve. 10 ml of 0.33% bupivacaine was instilled in the plane of pre-vertebral fascia superficial to scalene medius. Adequacy of optimal condition for surgery was evaluated checking motor and sensory function and was achieved in ten minutes. The loss motor function was evaluated for each individual nerve i.e., loss of wrist extension for radial nerve, loss abduction of finger for ulnar nerve, loss of elbow flexion for musculocutaneous nerve and loss of wrist flexion for median nerve. Sensory function was checked as loss of temperature sensation by spirit swab in dermatomes supplied by each individual nerve. Then, Dexmedetomidine was started as titrated dose at 0.2 to 0.5 microgram/kg/min to maintain Richmond sedation scale {RSS} minus 2. Surgery was allowed to start. After one and half hours of the initial block, bolus dose of 0.33% of bupivacaine 10 ml was administrated via catheter and infusion of 0.25% Bupivacaine at rate of 3ml/hour was started as continuous anesthesia.

The duration of surgery was six hours and intra-operative vitals were within normal. At the end of surgery during closure of skin dexmedetomidine infusion was stopped. After completion of surgery patient was shifted to PACU (post anesthesia care unit). 0.125% Bupivacaine at the rate of 2 ml/hour was continued via catheter for post-operative analgesia. Injection ketorolac twice daily and Inj. paracetamol 1 gram twice daily were given as a part of multimodal analgesia. Inj. pethidine 25mg was prescribed as rescue analgesia. The catheter was withdrawn on the post-operative day three. The patient was discharged home on postoperative day seven.

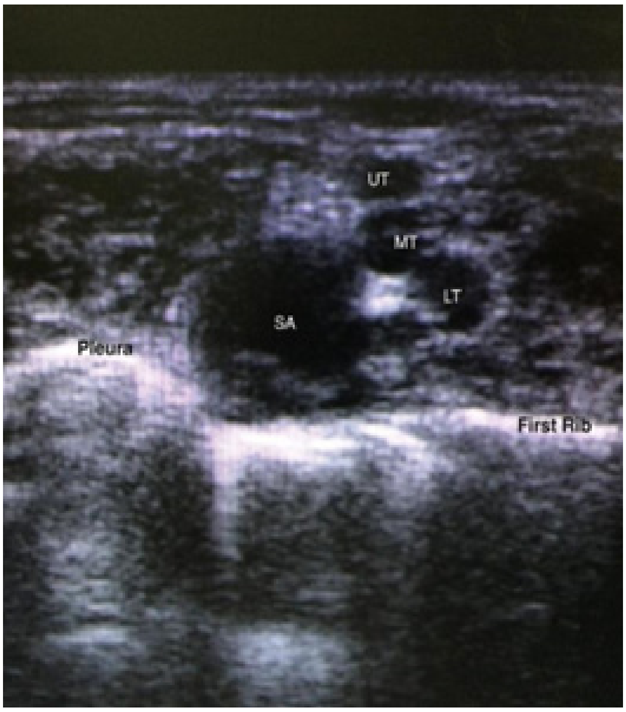

Figure 1: UT: upper trunk; MT: middle trunk; LT lower Trunk; SA: subclavain artery.

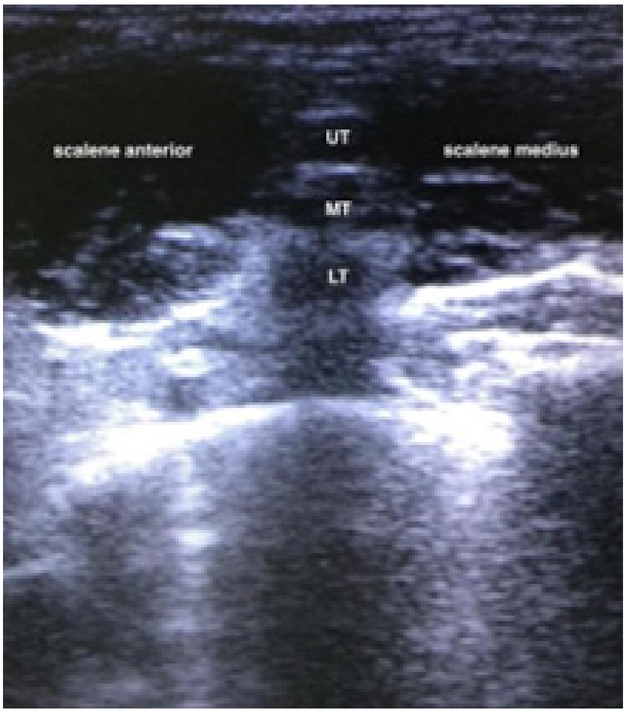

Figure 2: Interescalene groove. UT: upper trunk, MT: middle trunk, LT: Lower trunk.

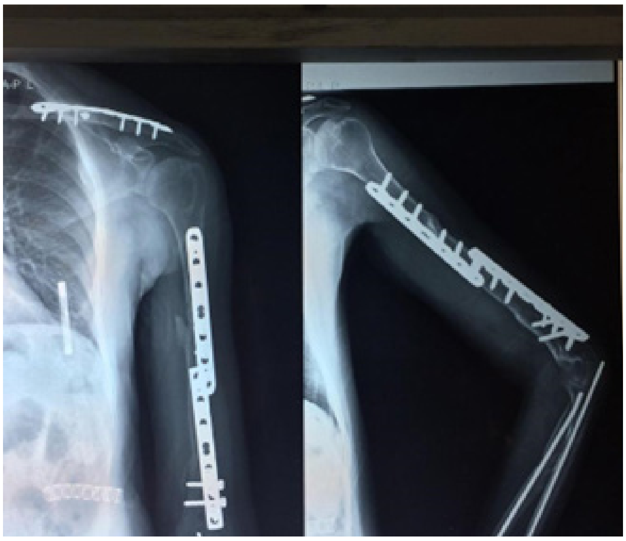

Figure 3: post-operative X-ray image

DISCUSSION

In this case we blocked the supraclavicular nerve to achieve anesthesia over the clavicular area, deposited local anesthetic at the interscalene groove to block brachial plexus in combination with the suprascapular nerve to blockade over shoulder, arm, and forearm. We inserted a brachial plexus continuous perineural catheter to maintain intraoperative anesthesia and postoperative analgesia.

The single-shot brachial plexus block can be used as an anesthetic tool for surgeries involving the humerus and areas below it. The description of various ultrasound techniques for the plexus block has made peripheral nerve blocks an effective and reliable alternative in anesthesia practice. These techniques also enable the precise identification of nerves, allowing for adequate anesthetic effects with lower volumes of local anesthetic. By limiting the local anesthetic volume within safety limits, multiple nerves or plexuses can be blocked. With this in mind, a total of thirty-two ml of local anesthetic was used to block three different nerve plexuses through two skin penetrations. Optimal surgical conditions were achieved, and surgeries involving the clavicle, humerus, radius, and ulna were performed while maintaining anesthesia for six hours.

The supraclavicular (C3, C4) nerve, which is a terminal branch of the superficial cervical plexus, gives rise to three branches that can be individually blocked, providing anesthesia to the cutaneous areas around the anterolateral aspect of the neck and the superolateral aspects of the shoulder, including the clavicle, sternoclavicular, and acromioclavicular joints. The nerve is located within the prevertebral fascia on the scalene medius muscle. There are two advantages to this approach. First, both the C3 and C4 nerves can be blocked, and second, the blockade of the phrenic nerve can be avoided. Additionally, by avoiding puncture of the sternocleidomastoid muscle, needle insertion pain can be minimized.[2]

The brachial plexus block via supraclavicular approach may not provide complete analgesia over the shoulder region. In cases like we described the deposition of local anesthetic in the interscalene groove can also block the suprascapular nerve, offering anesthesia over the shoulder region. Therefore, this nerve block can be combined with the brachial plexus block to perform surgery on the shoulder and proximal humerus. Moreover, by approaching the interscalene groove using the supraclavicular fossa as a landmark, needle penetration through the scalene medius can be prevented, reducing the chances of injury to the dorsal scapular and long thoracic nerves.[3]

A perineural brachial plexus catheter was placed using the supraclavicular approach since the fixation of the radius and ulna fractures was planned after completing the clavicle and humerus fixation.[4] While the interscalene approach is generally considered superior to the supraclavicular approach due to the higher incidence of pneumothorax associated with the latter, the use of ultrasound has made both approaches almost equally effective for upper limb surgery. On the other hand, the risk of catheter dislodgement is higher with the interscalene approach. Therefore, placing a perineural catheter via the supraclavicular approach would be suitable for continuous infusion for postoperative analgesia. We didn't encounter any complications during treatment and the patient was discharged home.

CONCLUSION

A perineural catheter in the supraclavicular brachial plexus, combined with a block of the suprascapular and supraclavicular nerves (branches of the superficial cervical plexus), can offer optimal anesthesia for a wide range of surgeries spanning from the clavicle to the distal upper limb and can be alternative to general anesthesia.

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