

C5 Anomaly and Scalene Muscle Variation- Case Report

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Abstract

The brachial plexus is formed by the ventral primary rami of the lower four cervical and upper thoracic nerve roots, with variable contribution from C4 (prefix) & T2 (postfix). Anatomical variations are from the roots to the cord level. A better understanding of such variations is crucial for achieving successful results in regional anaesthesia.

Keywords: Brachial plexus, Anatomical variation, Dual guidance

Introduction

Anatomical variations of the brachial plexus have been corroborated through various cadaveric reports, emphasising anomalies in the plexus's formation, branching patterns, and relationships with other structures [1]. Possible variations can range from minor differences in the origin of terminal nerves to more significant alterations like the presence of extra roots or the absence of certain components [2]. A clear perception of these variations is essential in the execution of nerve blocks

We present the successful administration of regional anaesthesia in a patient posted for clavicle surgery.

Case Report

A 44-year-old male ASA 1 was admitted to our hospital with a history of a fall. On further evaluation, he had sustained a left clavicular fracture as shown in (Fig. 1). No surgical history in past. Lab investigations, including ECG and chest x-ray, were all within normal limits. He was posted for an open reduction and fixation for a mid-shaft comminuted fracture of the clavicle. We planned for a Supraclavicular and Upper trunk block (SCUT block). On the day of surgery, NBM confirmed and informed consent was taken. Once the patient was

in OT, all ASA-specific standard non-invasive monitors (Heart rate, blood pressure & oxygen saturation) were attached. The patient was placed in the supine position. The back was supported by a cushion and head was placed on a thin pillow, which allowed natural extension of the neck and supraclavicular fossa. Ergonomically, the block performer sat at the head-end, placing the ultrasound machine in front. Scans were performed with the high frequency linear array transducer (HFL 50, 15 – 6 MHz), of the X-Porte Ultrasound system (FUJIFILM SonoSite, Inc, Bothell, USA). A 22-gauge 50 mm echogenic needle (B Braun Stimuplex Ultra 360) was used for local anaesthetic (LA) deposition near the target nerves. The needle was attached to a 1-ml graded 20-ml syringe. An equal mixture of 2% lignocaine and 0.5% bupivacaine was loaded for block administration. On scout scanning, a hypoechoic structure traversing between the upper and middle trunks was visualised (Fig. 2). We presumed it to be a vascular structure, so a Doppler scan was performed; however, no signal was detected from the hypoechoic structure Figure 3. On dynamic scanning, we discovered it to be the scalene muscle, which was traversing between the upper and middle trunk. Under aseptic precautions 50 mm echogenic needle was introduced from lateral to medial.

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Figure 1: Mid-shaft fracture clavicle

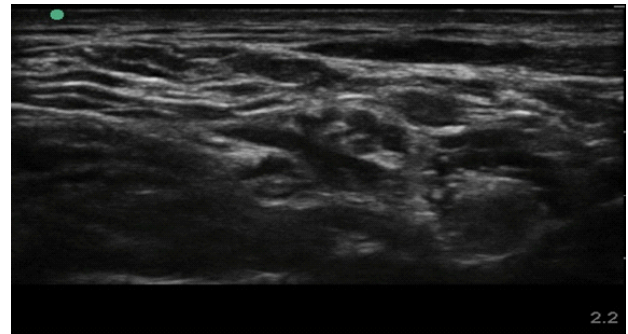


Figure 2: Hypoechoic structure between the upper and middle trunks, is the scalene muscle designated as the scalene bridge

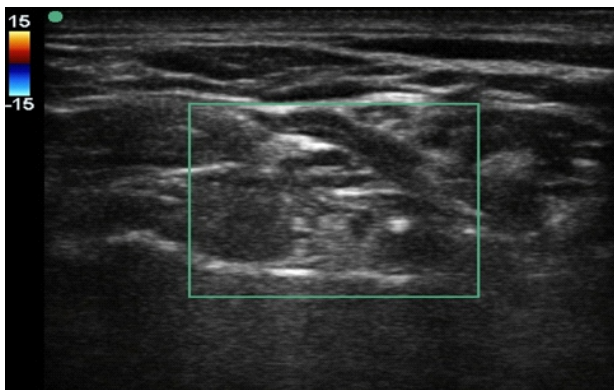


Figure 3: Non-vascular structure as per color mode

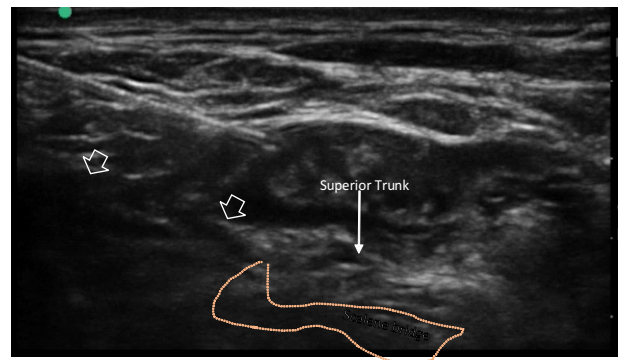


Figure 4: Circumferential spread of drug around the superior trunk

The needle was placed below the upper trunk 0.5 ml aliquot of drug was given after negative aspiration showed spread to the muscle plane so needle was redirected, and 5 ml of LA was administered as 0.5 ml aliquots after negative aspiration to the UT as shown in figure 4. The SCN were identified as small hypoechoic clusters immediately after they exited between two layers of the deep cervical fascia. The SCN cluster was blocked with 3 ml of LA administered as 0.5 ml aliquots after negative aspiration.

The patient was sedated with IV midazolam 2 mg and was arousable during the surgical procedure. Surgery lasted for 90 minutes, patient was haemodynamically stable throughout the surgery. As a routine protocol, surgeon administered 10 ml of 1:2 lac adrenaline in 0.9% saline along the incision line. No tachycardia was observed on incision, and patient was comfortable and pain-free in the postoperative period as well.

Discussion

The BP originates from the intervertebral foramen, formed by the five ventral rami of C5-8 and T1 spinal nerves. Adjacent to the medial border of the middle scalene muscle, the roots form the respective trunk. The roots and trunks traverse through the interscalene groove. As the trunks course posterior to the clavicle, each trunk bifurcates into an anterior (flexor) and posterior (extensor) division at the

lateral border of the first rib. Divisions then reunite into cords and form the terminal nerves to the upper limb [3]. Recent literature has affirmed that the plexus has diverse anatomical variability than has traditionally been recognised [1]. Variation in the Brachial plexus can have a prevalence rate of 66.7%. The anomalies have been detected at the level of (1) Root (2.1%); (2) Trunk (8.5%), Division (2.1%) and Cord (4.3%). The commonest variation was the penetration of the anterior scalene (ASM) by the C5 and/or C6 ventral rami (15%); C5 root passing ASM 3%, as observed in our case [2, 3].

Anatomical variations occur because of the breach in the normal process of embryology. Ventral rami budding originates from the neural tube, giving rise to the future brachial plexus [3]. The developing brachial plexus splits the scalene muscles into anterior and middle components. Adult orientation of the BP is observed by the 50th day. Any disturbance in mesenchymal cells, neuronal growth cones & circulatory factors gives origin to anatomical variation [3, 4, 5].

As an anaesthesiologist, awareness of anatomical variation is imperative, as it can influence the outcome of regional anaesthesia. A neurostimulation guided interscalene block would have led to a failed or inadequate block [3]. The reason being stimulation of either the C5 or C6 rami and subsequent

deposition of local anaesthetic. The scalene bridge would have hindered the movement of LA from one to the other rami. Though, USG promises in capturing the pure existence of anatomical variation as it provides real-time visualisation while depositing the local anaesthetic agent, it is imperative to understand anatomic variations exist in certain patterns. In the above case scenario, we would like to highlight that the scalene muscle traversing between the upper and middle trunk did provide a protective cover over the cervical rami. Targeting independent rami and LA deposition would be the key to successful block.

Conclusion

Cadaveric studies and USG have facilitated in having in-depth knowledge of anatomical variation. Though a dual guidance nerve block technique helps us in depositing the right amount of drug at the right plane, eventually improving the success of regional anaesthesia. Awareness of anatomical variation helps us in replanning our own technique in administering safer blocks to our patients.

References

1. Patel NT, Smith HF. Clinically Relevant Anatomical Variations in the Brachial Plexus. *Diagnostics* (Basel). doi: 10.3390/diagnostics13050830. PMID: 36899974; PMCID: PMC10001373. 2023 Feb 22;13(5):830.
2. Han, Yueyin & An, Mingjie & Zilundu, Prince & Zhuang, Zhuokai & Chen, Junyu & Jiang, Zhen & Gu, Liqiang & Yang, Jiantao & Wang, Dong & Xu, Dazheng & Zhou, Li-Hua. (2024). Anatomical variations of the brachial plexus in adult cadavers: A descriptive study and clinical significance. *Microsurgery*. 44. 10.1002/micr.31182. https://www.researchgate.net/publication/380924213_Anatomical_variations_of_the_brachial_plexus_in_adult_cadavers_A_descriptive_study_and_clinical_significance
3. ATOTW 369 – Anatomical variation of the brachial plexus and its clinical implications (26th Dec 2017) P 1-9. <https://resources.wfsahq.org/atotw/anatomical-variation-of-the-brachial-plexus-and-its-clinical-implications/>
4. Buch – Hansen K. Uber Varietaten des Nervus Musculocutaneus und deren Beziehungen. *Anatomischer Anzeiger*. 1955; 102:187-203.
5. Developmental anomalies at the thoracic outlet: An analysis of 200 consecutive cases Makhoul, Raymond G. et al. *Journal of Vascular Surgery*, Volume 16, Issue 4, 534 – 545.

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

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