

Case Report

A New Anatomical Brachial Plexus Variation during Interscalene Block

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ABSTRACT

We aimed to present our anesthetic management for an ultrasound-guided (USG) interscalene block in the presence of a new brachial plexus variation in a 59-year-old male patient underwent shoulder arthroscopy. An accessory muscle between the anterior scalene (ASM) and middle scalene muscle (MSM) was viewed via ultrasound. When four roots that the accessory muscle separated into two groups, which should be normally present between the ASM and MSM were displayed, we decided to use nerve stimulator to perform block. The contraction response from the deltoid muscle group from both root groups was regarded as a possible new brachial plexus variation in the C5 nerve root. For interscalene block, 30 ml of 0.375% bupivacaine was used via multi-injection. We confirmed this new brachial plexus variation with magnetic resonance neurography for the first time in a patient. Interscalene block should be definitely performed under USG and when a new anatomical variation is suspected, roots should be separated with a nerve stimulator to increase the success of the block.

KEYWORDS: *Brachial plexus, interscalene block, regional anesthesia, ultrasonography, variation*

INTRODUCTION

The interscalene block which is performed by the most proximal approach of the brachial plexus (BP) has been an effective method to provide anesthesia and analgesia for patients undergoing orthopedic surgery due to shoulder diseases such as rotator cuff repair. An ultrasound-guided (USG) block aids visualization of the needle puncturing the sheath and the administration of the anesthetic surrounding the nerves circumferentially to ensure proper block placement and reduce block associated complications.^[1,2] Although several BP variations have been reported,^[3-6] we aimed to present a new one in a patient underwent shoulder arthroscopy with USG interscalene block.

CASE REPORT

A 59-year-old male ASA II patient underwent rotator cuff repair for shoulder arthroscopy via USG interscalene block. The patient had a history of hypertension and benign prostatic hyperplasia and using cardura (doxazosin) 4 mg daily. Laboratory results and physical examination of the neck region were normal. Patient gave consent for regional/general anesthesia and

required interventions like recording ultrasound views and/or further imaging studies and publication of this report as well.


After providing standard monitorization, 2 mg of midazolam and 50 mcg of fentanyl were administered intravenously. The patient's head and neck were positioned for block. After disinfection of the block region, ultrasound probe was directed laterally from the midline in the transverse oblique plane at the cricoid cartilage level. Instead of the BP roots, which should be between the anterior scalene muscle (ASM) and middle scalene muscle (MSM) in the normal anatomical structure, four nerve roots and an accessory muscle dividing these roots into 2 groups were visualized [Figure 1]. This was thought to be a new BP variation. Subsequently, a nerve stimulator was used to perform block. Contraction response between 0.3 and 0.5 mHz in the deltoid muscle group made us

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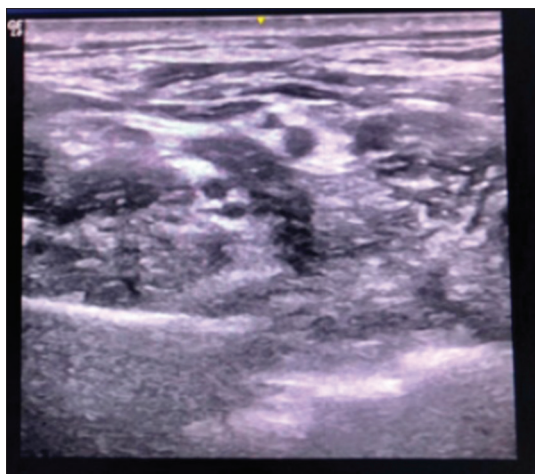


Figure 1: Variation of accessory muscle and nerve root

to think that there may be a variation in the C5 nerve root. For providing surgical anesthesia, total of 30 ml of 0.375% bupivacaine was given to both root groups via multi-injection. After motor and sensory block settled within half an hour, onset of surgery was allowed. During the surgery which lasted 70 minutes, the patient did not need any rescue analgesic. Motor and sensory blocks returned to normal at the postoperative 12th and 18th hours, respectively. Postoperatively, magnetic resonance (MR) neurography was performed to show asymmetrical branching of the C5 nerve root before forming the upper trunk [Figure 2]. Then, the patient was discharged one day after the operation.

DISCUSSION

We have demonstrated a new anatomical BP variation in a patient who underwent USG interscalene block for shoulder arthroscopy. The variations reported so far in the literature were limited to the location of the nerve roots relative to the interscalene muscles.^[3-6] According to Harry *et al.*'s^[3] definition, the classical anatomical relationship between the BP and scalene muscles was present in only 35% of the parties on 51 cadavers. Among them, the most common variation was the penetration of the ASM by the C5 and/or C6 ventral rami. The rate of variations were; C5 and C6 roots may fuse before piercing ASM (15%) or the C5 root alone pierce the belly of ASM (13%) or the roots also may pierce ASM independently (6%) or the C5 root was found to be completely anterior to ASM (3%).^[3] In a prospective observational study, when 23 adult volunteers underwent head and neck examination, anatomic variations related to BP were detected in 6 out of 46 (13%). Three C5 ventral rami passed over while 3 others passed through the ASM.^[4] In another study, seventy-nine embalmed bodies were dissected bilaterally. The position of the roots and the



Figure 2: Coronal plane 3D MIP STIR SPACE colored MR neurography image shows an asymmetrical ramification of right C5 nerve root with two branches

subclavian artery relative to the ASM was documented. The standard position of the nerves and subclavian artery in the interscalene groove was present with a rate of 31.6%. Variant positions included the following passing through the belly of the ASM: C5 and C6 roots (46.8%), C5 root (15.2%) and, C5, C6, and C7 roots (2.5%).^[5]

In a recent study by Karmakar *et al.*,^[7] feasibility to accurately identify majority of the main components of the BP above the clavicle including the T1 ventral ramus and the formation of the inferior trunk using high resolution ultrasound was nicely demonstrated in 5 healthy volunteers despite limited data on visualization of T1 ventral ramus. Although it is very rare, aberrant version of the BP and accessory muscles has been documented.^[8,9] Brachial plexus variation related to position has been identified during USG interscalene block.^[6] However, we have demonstrated a root variation proximal to the merging of C5 and C6 nerve roots. If we had performed the block with only using a nerve stimulator, we could have administered the local anesthetic medication to the area after deltoid muscle contraction response without noticing the split of C5 nerve root into two that would result for additional analgesics and/or anesthetics requirement due to unsuccessful surgical anesthesia. If USG block was performed alone, the variation of the two roots of the C5 nerve could not be diagnosed/confirmed. This would also require salvage with anesthetics and/or analgesics due to failed block. Since many of these anatomical findings can lead to block failure, use of a nerve stimulator together with USG seems appropriate.

The presence of scalene muscle pathology and variant muscle in the upper trunk which might be underdiagnosed might cause of non-specific complaints

of arm, neck and/or shoulder was described via imaging. Since these patients with pain symptoms happened to have aberrant BP anatomy, diagnosing them to avoid potential development of postoperative neurologic symptoms would also be helpful in the orthopedic surgery setting.^[10]

In conclusion, USG interscalene block should be the rational practice likewise it is a universal approach for almost all peripheral blocks. Despite its rarity when an anatomical variation of BP is recognized by ultrasound, advanced imaging techniques may be required as a diagnostic tool to confirm it and using a peripheral nerve stimulator to distinguish neural structures in addition to ultrasound will provide successful surgical anesthesia.

Declaration of patient consent

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

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Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Chan VW. Applying ultrasound imaging to interscalene brachial plexus block. *Reg Anesth Pain Med* 2003;28:340-3.
2. Renes SH, Rettig HC, Gielen MJ, Wilder-Smith OH, van Geffen GJ. Ultrasound-guided low-dose interscalene brachial plexus block reduces the incidence of hemidiaphragmatic paresis. *Reg Anesth Pain Med* 2009;34:498-502.
3. Harry WG, Bennett JD, Guha SC. Scalene muscles and the brachial plexus: Anatomical variations and their clinical significance. *Clin Anat* 1997;10:250-2.
4. Kessler J, Gray AT. Sonography of scalene muscle anomalies for brachial plexus block. *Reg Anesth Pain Med* 2007;32:172-3.
5. Keet K, Louw G. Variation of the brachial plexus roots in the interscalene groove: Relevance in interscalene blocks. *Anatomy* 2019;13:40-8.
6. Kılıcaslan A, Gok F, Korucu IH, Ozkan A, Yılmaz R. Anatomical variations detected during ultrasound-guided interscalene brachial plexus block and clinical implications. *Marmara Med J* 2020;33:141-5.
7. Karmakar MK, Pakpirom J, Songthamwat B, Areeruk P. High definition ultrasound imaging of the individual elements of the brachial plexus above the clavicle. *Reg Anesth Pain Med* 2020;45:344-50.
8. Aggarwal A, Puri N, Aggarwal AK, Harjeet K, Sahni D. Anatomical variation in formation of brachial plexus and its branching. *Surg Radiol Anat* 2010;32:891-4.
9. Emamhadi M, Chabok SY, Samini F, Behzadnia H, Firozabadi FA, *et al.* Anatomical variations of brachial plexus in adult cadavers; A descriptive study. *Arch Bone Jt Surg* 2016;4:253-8.
10. Koh E. Imaging of non-specific complaints of the arm, neck, and/or shoulder (CANS): Role of the scalene muscles and piercing variants in neurogenic thoracic outlet syndrome. *Clin Radiol* 2021;76:940.e17-27.