

Brachial Plexus Block above the level of clavicle in Multi-Comorbid Patients with Difficult Surface Landmarks and Cervical Ankylosing Spondylosis

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Abstract

Blocks above the clavicle [BAC- interscalene and supraclavicular] are routinely performed with surface anatomical landmark, and recently with ultrasound. Landmark techniques involving mid-point of clavicle is routinely used. However, with abnormal topography of the clavicle anatomy, the landmarks are distorted. Both, neurostimulation and ultrasound face stiff challenges in patients with abnormal clavicle anatomy. In four patients, with abnormal clavicle, BAC was attempted for surgical corrections of proximal and shaft of humerus. Though landmark and ultrasound guided blocks were successful, we reveal the importance of alternative landmarks and possible complications that might may be associated with abnormal anatomical landmarks.

Keywords: Brachial Plexus Block, Multi-Comorbid Patients, Difficult Surface Landmarks, Cervical Ankylosing Spondylosis

Introduction

Blocks above the clavicle [BAC-interscalene and supraclavicular] are routinely performed with surface anatomical landmark, and with head rotation on the contralateral side. However, ultrasound [US] interventions have replaced the surface anatomical landmark [AL] [1]. The mid-point of clavicle is an important anatomical landmark for supraclavicular and infraclavicular brachial plexus blocks [2]. However, with abnormal topography of the clavicle anatomy, the landmarks will be distorted. Though neurostimulation [NS] might suggest needle-nerve contact [3] and ultrasound [US] would identify the neural targets, both modalities face stiff challenges in patients with abnormal clavicle anatomy. In four patients, with abnormal clavicle, BAC was attempted for surgical corrections of proximal and shaft of humerus. Patients were counselled regarding difficulty in block performance, airway management and possible cancellation of surgical procedure in event of a

complication. Though landmark and ultrasound guided blocks were successful, we reveal the importance of alternative landmarks and possible complications that might may be associated with abnormal anatomical landmarks.

Cases

The demographics and block techniques are compiled in table [1] and [2]. Modifications pertaining to case 1 to 4 are described. A '3' pillow ramp and a 23G hypodermic needle to evoke paresthesia in shoulder area was implemented in case 1. While, in case 2, with finger continuously palpating the subclavian artery [SCA], stimulating needle was introduced tangential to the SCA. Depth was gauged by palpation of the first rib which was the lower limit of the needle tip. A lateral decubitus and '3' pillow ramp was set up for US guided interscalene block. Airway access of l-gel through the oral cavity was evaluated in case of an unfortunate event. In case 4, the US linear probe was deployed almost

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Table 1: BMI-body mass index; DM-diabetes mellitus; PxHUM-proximal humerus, M-S HUM-mid shaft humerus; DCM-dilated cardiomyopathy; COPD-chronic obstructive disease; EF-ejection fraction; Spond-spondylosis; ORIF-open reduction internal fixation

Variables	Patient 1 [P1]	Patient 2 [P2]	Patient 3 [P3]	Patient 4 [P4]
Age	52	34	68	74
Gender	M	F	M	M
ASA	3	3	3	3
BMI	24.2	25	21.2	22.1
Co-Morbid	DM/HTN/COPD	HTN/COPD	DM/DCM-EF30%	ALCD/COPD
Fracture Type	Left PxHUM	Left M-S HUM	Right PxHUM	Left M-S HUM
Clinical Findings	Neck Stiffness	Abnormal Clavicle	Neck Stiffness	Abnormal Clavicle
Xray Neck Chest	Cervical Spond	Cervical Spond Vertical Clavicle	Cervical Spond	Vertical Clavicle
Surgical Procedure	Anterior ORIF	Anterior ORIF	Anterior ORIF	Anterior ORIF

vertical to clavicle in supraclavicular fossa for supraclavicular brachial plexus block. US did not reveal diaphragmatic paresis in case 3 and 4, while obviously was not evaluated in case 1 and 2.

Discussion

Anatomical landmark guided blocks are practised in remote and rural areas where anaesthesiologist do not have an access to peripheral neurostimulation and ultrasound modality. A perfect anatomical landmark expedites a successful block. With abnormal topography of clavicle, the relationship of the brachial plexus with the mid-point of clavicle is distorted and the needle tips would be located unrelated to brachial plexus. With phrenic nerve, subclavian artery and pleura in close proximity with the brachial plexus, unwanted adverse effects are plausible. Further, depth of the brachial plexus is important to avoid the punctures of vital structures. Alternative landmarks thus are suitable. However, palpation of the interscalene groove, first rib and the subclavian artery are reliable in patients [4], with skewed anatomical landmarks as demonstrated in our series.

A head rotation on the contralateral side is suggested for anatomical landmark guided BAC. In particular, a 30 degrees' contralateral head rotation is suggested for successful needle tip [length <2.5 cm] position during an interscalene block [5]. Similar rotation is attained during ultrasound guided BAC for ease of needle placement. However, in 2 patients with cervical ankylosing spondylosis, neck rotation was minimal to impossible.

The shoulder and proximal humerus are innervated by suprascapular [C5; C6], axillary [C5; C6; C7], lateral pectoral [C5; C6; C7] and subscapularis nerves [C5; C6; C7] and the skin by the C4 through superficial cervical plexus [11]. Though, a debate exists if shoulder paraesthesia as an end-point during interscalene block, both are considered optimal. With deltoid muscle contractions at 0.4 Ma as an endpoint, more than 20 ml is mandatory for adequate block. However, phrenic nerve paresis is evident with volumes more than 20ml. Ultrasound has improved

Table 2: ISB-interscalene block; SCBPB-supraclavicular brachial plexus block; PNS-peripheral nerve stimulation; mA-miliampere; LA-local anaesthetic;ml-millilitre;

	Block Type	Modality	LA volumes	Block Efficacy	Adverse Events
P1	Left ISB	Paraesthesia at C6 of shoulder	22ml	adequate	none
P2	Left SCBPB	PNS-flexion of fingers at 0.4mA	25ml	adequate	none
P3	Right ISB	USG at c5-6	08ml	adequate	none
P4	Left SCBPB	USG intra-cluster	15ml	adequate	none

block efficacy in terms of time to needle placement, needle tip visualization and discerning spread of local anaesthetic around the brachial plexus [6]. Volumes as low as 5ml, which do not lead to phrenic paresis have been successfully utilized for awake shoulder surgeries [7]. In our case series we injected 20 ml in paraesthesia [shoulder area] evoked interscalene block and 8 ml with ultrasound for a similar block.

A ramp-up with pillows (Fig. 1f) would be required as was done in two patients with restricted cervical spine movements in severe cervical spondylosis and ultrasound guided blocks were administered in lateral decubitus position, since the patients could not turn their head on the opposite side. In one patient each supraclavicular brachial plexus block was administered with palpation of first rib and the subclavian artery as the anatomical landmark. The brachial plexus is superior and lateral to the subclavian artery and situated on the first rib. Palpation of the subclavian artery assists in directing the needle tangential superior and lateral to the artery, and palpation of rib identifies a rough estimate of the depth [8]. In the hollow supraclavicular fossa with a vertical clavicle, probe placement was parallel to clavicle as in parasagittal infraclavicular, the brachial plexus topography was unchanged, but the needle tip positioning was challenging. Probe placement changed from oblique coronal parasagittal. With needle placement from cephalad to caudal (Fig. 1a), local anaesthetic is injected in several sessions in the intra-cluster area of middle trunk-divisions of brachial plexus, with intermittent aspiration for blood. Volume

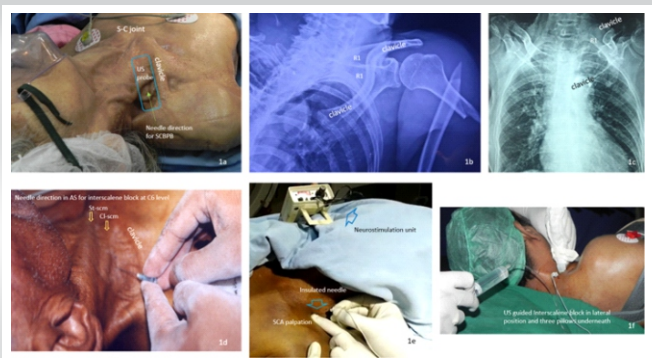


Figure 1: S-C = sternoclavicular joint; US-ultrasound; SCBPB-supraclavicular brachial plexus block; R1-rib; St-scm=sternal head of sternocleidomastoid; Cl-scm=Clavicular head of sternocleidomastoid;SCA=subclavian artery;

finding studies mention the minimum effective anaesthetic volume in 50% and 95% of patients were 23 ml and 42 ml, respectively. However, in elderly it was 11.9 ml [10].

Though we did not report hemi-diaphragmatic paresis, phrenic nerve paresis of 100% and 60% has been reported with volumes of 20 ml or more of local anaesthetic injected in interscalene and supraclavicular areas, leading to moderate to severe distress [11]. However, with US the volumes for surgical anaesthesia for proximal humerus have decreased significantly [7]. Moreover, with ultrasound, needle to nerve approximation, spread of local anaesthetic in real time and limiting the spread into unwanted areas by needle repositioning is achieved [12].

We thoroughly understood the gravity of situation in event of emergency intubation, hence, had arranged and drilled supraglottic airway management. The combined scenario of

multi-comorbid patient with a difficult airway and anatomical landmark for brachial plexus block is an arduous task. We caution BAC in patients with probable difficult intubation should be practised only by anaesthesiologist expert in nerve blocks with all modalities [anatomical landmark, neurostimulation, ultrasound] and in the presence of specialist in difficult airway management. An extra helping hand is mandatory for safe clinical outcomes.

Conclusion

We conclude in situation of difficult airway and anatomical landmarks; BAC should be implemented with extreme caution even by an expert, skilled at nerve blocks and airway management. If in doubt and uncertain and if not contraindicated an endotracheal general anaesthesia prior to BAC would be suitable.

References

1. Katherine M. Shaffer Spread of local anesthetic during an ultrasound-guided interscalene block: does the injection site influence diffusion? *Acta Anaesthesiol Scand* 2011; 55: 664–669.
2. Franco CD: The subclavian perivascular block. *Tech Reg Anesth Pain Manage* 1999;3: 212–216.
3. Haleem, Shahla; Siddiqui, Ahsan K.; Mowafi, Hany A. Nerve Stimulator Evoked Motor Response Predicting a Successful Supraclavicular Brachial Plexus Block; *More Anesthesia & Analgesia*. 110(6):1745-1746, June 2010.
4. Dupre, L.-J., Danel, V., Legrand, J.-J., and Stieglitz, P.: Surface landmarks for supraclavicular block of the brachial plexus. *Anesth Analg* 1982; 61:28-31.
5. Anand M. Sardesai, Roger Patel, Nicholas M. Denny, David K. Menon, Adrian K. Dixon, Martin J. Herrick, Alan W. Harrop-Griffiths; Interscalene Brachial Plexus Block: Can the Risk of Entering the Spinal Canal Be Reduced? A Study of Needle Angles in Volunteers Undergoing Magnetic Resonance Imaging. *Anesthesiology* 2006; 105:9–13.
6. Albrecht, J. Mermoud, N. Fournier, C. Kern and K. R. Kirkham A systematic review of ultrasound-guided methods for brachial plexus blockade *Anaesthesia* 2016, 71, 213–227.
7. Gautier P, Vandepitte C, Ramquet C, DeCoopman M, Xu D, Hadzic A. The minimum effective anesthetic volume of 0.75% ropivacaine in ultrasound-guided interscalene brachial plexus block. *Anesth Analg*. 2011 Oct;113(4):951-5.
8. Gregg A. Korbon, Harold Carron and Christopher J. Lander, First Rib Palpation: A Safer, Easier Technique for Supraclavicular Brachial Plexus Block *ANESTH ANALG* 1989;68:682-5.
9. Duggan E, El Beheiry H, Perlas A, Lupu M, Nuica A, Chan VW, Brull R. Minimum effective volume of local anesthetic for ultrasound-guided supraclavicular brachial plexus block. *Reg Anesth Pain Med*. 2009 May-Jun;34(3):215-8.
10. Pavičić Šarić J, Vidjak V, Tomulić K, Zenko J. Effects of age on minimum effective volume of local anesthetic for ultrasound-guided supraclavicular brachial plexus block. *Acta Anaesthesiol Scand*. 2013 Jul;57(6):761-6.
11. Verelst P, van Zundert A. Respiratory impact of analgesic strategies for shoulder surgery. *Reg Anesth Pain Med*. 2013 Jan-Feb;38(1):50-3. doi: 10.1097/AAP.0b013e318272195d. PMID: 23132510. 12.
12. Plante T, Rontes O, Bloc S, Delbos A. Spread of local anesthetic during an ultrasound-guided interscalene block: does the injection site influence diffusion? *Acta Anaesthesiol Scand*. 2011 Jul;55(6):664-9.

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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