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Comparison between Combined Supraclavicular-Interscalene Block versus Interscalene Block Under Ultrasound Guidance in Patients Undergoing Humerus Shaft Fracture Surgery

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Abstract: Fractures of proximal upper extremity present a challenge to the anaesthesia provider when administering a regional anaesthetic because the dermatomal distribution of the upper extremity requires more local anaesthetic coverage than any single Brachial plexus nerve block can provide. In our study we have demonstrated the ability to reduce local anaesthetic volumes to achieve equipotent results as well as reduce side effects associated with certain blocks. A randomized controlled prospective study consisting of 60 patients (ASA I and II) who were allocated into Group A (Interscalene + Supraclavicular block) Group B (Interscalene block). Inj. Midazolam 0.5–2 mg I.V. as premedication. Using standard monitors, the blocks were performed with ultrasound and 22-gauge insulated needle. The anaesthetic solution consisted of 0.5% Bupivacaine 30 ml given in each Group. In Group a 20 ml of drug was given in interscalene block and 10 ml of drug was given in Supraclavicular block. Better patient comfort and motor blockade was observed in combined block. Incidence of Horner's syndrome was less in patients with combined block. Brachial plexus blocks performed under ultrasound guidance can be used in combination, to safely reduce analgesic and anaesthetic requirements, to obtain complete postoperative pain coverage of the upper extremity without placing the patient at additional risk of local anaesthetic toxicity.
Keywords: Ultrasound, Interscalene block, Supraclavicular block, Brachial Plexus, Upper limb.

INTRODUCTION

Fractures of the proximal upper extremity present a challenge to the anaesthesia provider when administering a regional anaesthetic because the dermatomal distribution of the upper extremity requires more local anaesthetic coverage than any single Brachial plexus nerve block can provide.

When regional anaesthesia is an option, the advantages of ultrasound-guided regional anaesthesia over traditional landmark and nerve stimulation methods are well documented. Improved onset times, block quality, and success rates, as well as decreased procedure times are all documented benefits of performing a regional anaesthetic with ultrasound guidance [1-3].

Additionally, studies have demonstrated the ability to reduce local anaesthetic volumes to achieve equipotent results as well as reduce side effects associated with certain blocks [4-6]. A single Brachial plexus regional technique may not provide the comprehensive dermatome distribution necessary.

The Interscalene block (ISB) is the preferred procedure for surgeries involving the shoulder and upper arm [7]. However, it is commonly accepted that this block may inadequately block C8 and T1 (the lower trunk), seen clinically as ulnar sparing [8].

The Supraclavicular block (SCB) is commonly used for procedures involving the upper extremity, excluding the shoulder because the suprascapular nerve branches off the upper trunk and is often missed [9].

This study shows how ultrasound guidance allowed the performance of both blocks without increasing the dose of local anaesthetic, while still providing complete coverage of the entire upper extremity.

MATERIALS AND METHODS

After approval of medical ethical committee and written informed consent, 60 patients who presented for surgery of the Humerus shaft fracture were randomized into two groups:
Group A: (Interscalene + Supraclavicular block)
Group B: (Interscalene block)

Both performed with the use of ultrasound localization.

Exclusion criteria included

- Clinically significant coagulopathy.
- Infection at the injection site, allergy to local anaesthetics.
- Severe pulmonary pathology.
- Age <18 years.
- Mental incapacity or language barrier precluding informed consent.
- A body mass index more than 35 kg/m^2.
- Pre existing motor or sensory deficit in the operative limb.

Light sedation with Midazolam 0.5–2 mg I.V. was provided as needed before performance of the block. No other sedation was administered until the evaluation of the block was completed.

After application of standard anaesthesia monitors, the blocks were performed with USG guided, 22-gauge insulated needle. The anaesthetic solution consisted of 0.5% Bupivacaine 30 ml given in each group. In group A 20 ml of drug was given in interscalene block and 10 ml of drug was given in Supraclavicular block.

For both blocks, the nervous and vascular structures were optimally visualized and the stimulating needle was inserted perpendicular to the skin surface, oriented towards the presumed nervous structures. Appropriate needle position was confirmed before local anaesthetic was injected.

All blocks were performed by the same anaesthesiology resident, while supervised by a senior anaesthesiologist. Block performance-related pain was evaluated immediately after removal of the needle by asking the patient to verbally quantify the level of pain using a score between 0 and 10. 0 meaning no pain and 10 meaning excruciating pain

The extent of motor and sensory blockade was evaluated by an anaesthesiologist who was not involved in the Brachial plexus block 20 min after the injection of the local anaesthetics. Using an alcohol swab, the sensory blockade of the C5 to T1 dermatomes of the shoulder [14] was graded on a scale from 0 (loss of cold sensation) to 100 (intact sensation).

The motor blockade was evaluated by rating the muscle contraction forces corresponding to 4 nerves (elbow and wrist extension [radial nerve], finger abduction [ulnar nerve], wrist flexion [median nerve], and elbow flexion [musculocutaneous nerve] on a scale of 0 to 6.

6: normal muscle force;
5: slightly reduced muscle force;
4: greatly reduced muscle force;
3: slightly impaired mobility;
2: greatly impaired mobility;
1: near complete paralysis; and
0: complete paralysis [15]

The side effects of the block (Horner's syndrome, hoarseness, and subjective dyspnoea, which can be caused by ipsilateral stellate ganglion, recurrent laryngeal nerve, and phrenic nerve block, respectively) and the procedural time (time between insertion and removal of the nerve-stimulating needle) were also recorded.

Surgical anaesthesia was defined as surgery without patient discomfort or the need for supplementation of the block. If the patient still experienced pain despite supplementation, general anaesthesia was induced by the attending anaesthesiologist using his preferred technique.

A post-block chest radiograph was obtained if a patient complained of respiratory distress. The duration of post-block analgesia was defined as the interval of time between block completion and ingestion of the first postoperative analgesic.

RESULTS

60 patients participated in the study. No patient underwent general anaesthesia due to pain that was not relieved by Brachial plexus block and analgesics.

There were no significant differences in the demographic data between the 2 groups (Table 1).

Table-1: Showing comparison of Demographic Characteristics

	Group A (n=30)	Group B (n=30)	P Value
Age (Years)	52.83	53.43	0.55
Gender (M/F)	19/11	17/13	0.23
Weight (Kgs)	59.33	59.7	0.30
Height (Cms)	160.53	160.16	0.73

Table-2: Showing comparison in Procedure time, Degree of sensory, Degree of motor block and incidence of Horner's syndrome

Variables	Group A	Group B	P value
Procedural Time (secs)	235	187	0.79
Degree of sensory block			
C5	0(0-0)	0(0-0)	0.45
C6	0(0-0)	0(0-0)	0.45
C7	0(0-10)	0(0-5)	0.3
C8	40(30-80)	50(40-70)	0.25
T1	40(5-60)	55(10-70)	0.31
Degree of motor block			
Musculocutaneous Nerve	0(0-0)	0(0-0)	0.45
Radial Nerve	0(0-0)	0(0-2)	0.06
Median Nerve	0(0-1)	1(1-2)	<0.001
Ulnar Nerve	0(0-1)	2(2-3)	<0.001
Horner's Syndrome	16(53.33%)	22(73.33%)	<0.05

Procedural time in both groups was comparable. Procedural time was longer in group A but it was not significant.

Degree of sensory block in both groups was comparable. There was no significant difference in the sensory block in any nerve.

Degree of motor block in both groups was comparable. There was no significant difference in blockade of musculocutaneous nerve and radial nerve but there was significant difference in blockade of median and ulnar nerve.

Incidence of Horner's syndrome was higher in group B. The difference is significant.

Table-3: Showing comparison of Duration of surgery and Duration of Anesthesia and Post-operative analgesia

Variables	Group A	Group B	P value
Duration of surgery (mins)	129	132	0.29
Duration of anaesthesia & post-operative analgesia (mins)	434.16	366.70	0.87

Duration of surgery was comparable in both groups. There was no any difference noted.

Duration of anaesthesia and post-operative analgesia was comparable in both groups. Duration of analgesia was longer in group A but it was not significant.

DISCUSSION

Advocating the addition of regional anaesthesia to surgical procedures of the upper extremity cannot be understated. In addition to the benefits of reduced opioid requirements, authors have shown decreased postoperative stays and greater patient satisfaction [10, 11].

Patients with Humeral fractures present a unique challenge to anaesthesia providers because no single Brachial plexus block adequately covers the entire distribution of the upper extremity. Although the ISB is suitable for surgeries of the shoulder and upper extremity, this block commonly misses the C8-T1 roots (lower trunk), resulting in dermatomal sparing of parts of the arm [12, 13].

The supraclavicular approach was chosen as the second block because of the superficial nature at which the Brachial plexus lies and the compact nature of the trunks/divisions at this level. The shallow level of the nerves allows for a more parallel needle approach to the transducer, which generates a greater reflection, enabling easier needle visualization. Because the nerves are compact at this level, a smaller amount of local anaesthetic can be directed at the lower area of the plexus, increasing the possibility of a dense block of the lower trunk.

Additionally, the SCB was chosen over the other 2 options because a lesser volume would adequately block the desired target, and it requires the needle to be redirected less, thus reducing the potential for complications [14, 15].

Although it provides a rapid and complete block that benefits from the compact topographic arrangement of the Brachial plexus trunks, SCB had been reluctantly performed in the past due to an associated high incidence of pneumothorax (0.6% to 6%) [17, 18] and, to a lesser extent, inadvertent vascular puncture with resultant local anaesthetic toxicity [19]. However, the introduction of ultrasound to the practice of regional anaesthesia has led to a remarkable reduction in these complications [20].

CONCLUSION

Finally, given the proximity of the two blocks in relation to one another, a single preparation could be accomplished for both procedures, reducing both the procedure time and the possible need for patient repositioning to perform the second block.

Patient comfort was better in combined block and motor blockade was adequate in combined block. Incidence of Horner's syndrome was less in patients with combined block. So patient comfort was again better.

In summary, we present further evidence that peripheral nerve blocks used for surgery of the upper extremity offer clear benefits over general anaesthesia alone.

Additionally, Brachial plexus blocks performed under ultrasound guidance can be used in combination, to safely reduce analgesic and anaesthetic requirements during surgery, to obtain complete postoperative pain coverage of the upper extremity without placing the patient at additional risk of local anaesthetic toxicity.

REFERENCES

1. McCartney CJ, Lin L, Shastri U. Evidence basis for the use of ultrasound for upper-extremity blocks. Regional anesthesia and pain medicine. 2010 Mar 1;35(2):S10-5.
2. Mariano ER, Cheng GS, Choy LP, Loland VJ, Bellars RH, Sandhu NS, Bishop ML, Lee DK, Maldonado RC, Ilfeld BM. Electrical stimulation versus ultrasound guidance for popliteal-sciatic perineural catheter insertion: a randomized controlled trial. Regional anesthesia and pain medicine. 2009 Sep 1;34(5):480-5.
3. Abrahams MS, Aziz MF, Fu RF, Horn JL. Ultrasound guidance compared with electrical neurostimulation for peripheral nerve block: a systematic review and meta-analysis of randomized controlled trials.*Br J Anaesth.* 2009;102(3):408-417.
4. McNaught A, Shastri U, Carmichael N, Awad IT, Columb M, Cheung J, Holtby RM, McCartney CJ. Ultrasound reduces the minimum effective local anaesthetic volume compared with peripheral nerve stimulation for interscalene block. British journal of anaesthesia. 2010 Nov 8;106(1):124-30.
5. Klaastad O, Sauter AR, Dodgson MS. Brachial plexus block with or without ultrasound guidance. *CurrOpinAnaesthiol.* 2009;22(5):655-660.
6. Casati A, Baciarello M, Cianni SD, Danelli G, De Marco G, Leone S, Rossi M, Fanelli G. Effects of ultrasound guidance on the minimum effective anaesthetic volume required to block the femoral nerve. British journal of anaesthesia. 2007 May 3;98(6):823-7.
7. Brown DL. *Atlas of Regional Anesthesia.* 3rd ed. Philadelphia, PA: Elsevier Saunders. 2006:39-43.
8. Nadeau M-J, Lévesque S, Dion N. Ultrasound-guided regional anesthesia for upper limb surgery. *Can J Anesth.* 2013;60(3):304-320.
9. Conroy P, Awad I. Ultrasound-guided blocks for shoulder surgery. *CurrOpinAnesthesiol.* 2011;24(6):638-643.
10. Hadzic A, Williams BA, Karaca PE, Hobeika P, Unis G, Dermksian J, Yufa M, Thys DM, Santos AC. For outpatient rotator cuff surgery, nerve block anesthesia provides superior same-day recovery over general anesthesia. Anesthesiology: The Journal of the American Society of Anesthesiologists. 2005 May 1;102(5):1001-7.
11. Mirza F, Brown AR. Ultrasound-guided regional anesthesia for procedures of the upper extremity. Anesthesiology research and practice. 2011;2011.
12. Brown DL. *Atlas of Regional Anesthesia.* 3rd ed. Philadelphia, PA: Elsevier Saunders. 2006:39-43.
13. Nadeau M-J, Lévesque S, Dion N. Ultrasound-guided regional anesthesia for upper limb surgery. *Can J Anesth.* 2013;60(3):304-320.
14. Koscielniak-Nielsen ZJ, Dahl JB. Ultrasound-guided peripheral nerve blockade of the upper extremity. *Curr Opin Anaesthesiol.*2012;25(2):253-259.
15. Soares LG, Brull R, Lai J, Chan VW. Eight ball, corner pocket: the optimal needle position for ultrasound-guided supraclavicular block. *Reg Anesth Pain Med.* 2007;32(1):94-95.
16. Sandhu NS, Caplan LM. Ultrasound-guided infraclavicular brachial plexus block. *Br J Anaesth.* 2002;89(2):254-259.
17. Brown DL, Bridenbaugh LD. The upper extremity somatic block. In: Cousins MJ, Bridenbaugh PO, eds. Neural Blockade in Clinical Anesthesia and Pain Medicine. Philadelphia: Lippincott Williams & Wilkins, a Wolters Kluwer business. 2009:316–342.
18. Moore DC, Bridenbaugh LD, Eather KF. Block of the upper extremity. Arch Surg. 1965;90:68–72.
19. Warren JA, Thoma RB, Georgescu A, Shah SJ. Intravenous lipid infusion in the successful resuscitation of local anesthetic-induced cardiovascular collapse after supraclavicular brachial plexus block. Anesthesia & Analgesia. 2008 May 1;106(5):1578-80.
20. Perlas A, Lobo G, Lo N, Brull R, Chan VW, Karkhanis R. Ultrasound-guided supraclavicular block: outcome of 510 consecutive cases. Regional anesthesia and pain medicine. 2009 Mar 1;34(2):171-6.