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Original Research

Comparison of two different volumes of 0.5% levobupivacaine for clavicular surgeries using combined interscalene and superficial cervical plexus block

Sarika Wadhwa

Assistant Professor, Department of Anaesthesiology, Krishna Mohan Medical College & Hospital, Mathura, Uttar Pradesh, India

ABSTRACT:

Aim: To compare the quality of analgesia and incidence of adverse effects using two different volumes of 0.5% levobupivacaine for clavicular surgeries by ultrasound guided combined interscalene and superficial cervical plexus block. **Material and Methods:** 120 patients undergoing clavicular surgery were randomized to receive ultrasound guided interscalene block of either 10 ml(group L)or 20 ml(Group H) of 0.5% levobupivacaine and 5 ml of 0.5% levobupivacaine for superficial cervical plexus block. Both the groups were assessed for quality of intraoperative and postoperative analgesia by sensory,motor block. Hemidiaphragmatic paresis was assessed by ultrasound guided diaphragmatic movement. **Results:** Adequacy of intraoperative anesthesia and analgesia was comparable in both the groups. Phrenic nerve palsy was present in 12 patients of group H whereas none of the patients of group L developed phrenic nerve palsy. There was no requirement of supplementation of analgesics in both the groups intraoperatively. The duration of postoperative analgesia was 5.68 ± 0.2 hours in group L and 5.4 ± 0.2 hours in group H. **Conclusion:** Comparable quality of intraoperative and postoperative analgesia and reduced incidence of hemidiaphragmatic paresis can be obtained with 10 ml compared to 20 ml of 0.5% levobupivacaine.

Key-words: Brachial plexus, levobupivacaine, nerve block, cervical plexus, ultrasonography.

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Corresponding Author: Sarika Wadhwa, Assistant Professor, Department of Anaesthesiology, Krishna Mohan Medical College & Hospital, Mathura, Uttar Pradesh, India

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INTRODUCTION

Clavicle fractures occur in 35% of shoulder girdle fractures. While nondisplaced fractures are usually treated conservatively, surgical fixation is preferred especially in young patients for optimal functional outcomes. Clavicular surgery can be performed under general or regional anesthesia with peripheral nerve blocks. Interscalene brachial plexus block is indicated for shoulder and clavicle surgeries but usually C3 and C4 supplementation is needed for complete surgical analgesia for shoulder and clavicle procedures. Landmark techniques using peripheralnerve stimulator required larger volumes and resulted in increased incidence of adverse effects like vascular puncture, horner's syndrome, diaphragmatic paresis due to phrenic nerve palsy[1]. After the introduction of ultrasound for regional anaesthesia, the volume needed for adequate analgesia was reduced. The incidence of adverse effects due to block was also reduced. This study aims to compare the quality of analgesia and incidence of adverse effects using two different volumes of 0.5% levobupivacaine for clavicular surgeries by ultrasound guided combined interscalene and superficial cervical plexus block.

Present study aimed to compare two different volumes of 0.5% levobupivacaine for clavicular surgeries using combined interscalene and superficial cervical plexus block

SUBJECTS AND METHODS

120 patients of age group 18 years and aboveof ASA physical status I,II and weighing 50 kg and above who underwent elective internal fixation forclavicle fractures were selected and randomlyallocated into two groups through lots after written informed consent. Patients were divided into 2 groups, group L(n=30)comprised of patients who were administered 10 ml of 0.5% levobupivacaine and group H(n=30)

comprised of patientswho were administered 20 ml of 0.5% levobupivacaine. Patients with respiratory disease, coagulopathy, psychiatric disease,neck infection,obesity [BMI(body mass index)> 30]and history of allergy to levobupivacaine were excluded from the study.

After inclusion in the study, the patient was explained about the procedure. Routine monitoring included ECG (electrocardiography), oxygen saturation, etco2(end tidal carbon dioxide analysis) and non invasive blood pressure. Patients were given oxygen 6 litres/ min through facemask. Intravenous midazolam 30 g/kg and fentanyl 1 mcg/kg wasgiven for sedation before the block. Ultrasound guided interscalene and superficial cervical plexus block was done by ananaesthesiologist having atleast 2 years experience in ultrasound guided nerve blocks. The block was done by using highfrequency linear probe (logiq e series, GE, USA inc.) and peripheral nerve stimulator(lifetecheztim) with a 50 mm 22 Gechogenic needle(pajunkinc.). With the patient in the supine position and with the head turned to the opposite side, theneck region was sterilized with povidone iodine solution. 1 ml of 2 % lignocaine was infiltrated over skin and brachialplexus was visualized at root and trunk level between the anterior and medius scalene muscles at C6 level. The brachialplexus nerve roots C5 and C6 were identified as three rounded structures longitudinally (traffic light sign)and afteridentification, the echogenic needle was inserted in plane to the probe anterior to the scalenusmedius and the needle tip was placed over the posterior aspect of the nerve roots in the interscalene region. Peripheral nerve stimulation was done(frequency 2 Hz, pulse width 0.1 ms) with an initial current intensity of 1.5 mA and after obtaining a deltoid muscle response, it was reduced to 0.4mA and 10ml or 20ml of 0.5% levobupivacaine was given with respect to the corresponding group. After the interscalene block, superficial cervical plexus was visualized with ultrasound between the posterior border of sternomastoid and scalenus muscles which has a chain of bead appearance and 5ml of 0.5% levobupivacaine was given.

A blinded assistant unaware of the patient group was asked to assess the quality of block in terms of thermalsensation, pin prick and motor function. The block was considered to be adequate when there was absence of pain to pinprick and absence of thermal sensation and modified bromage scale of 0. Motor function was assessed by modified bromage scale.

MODIFIEDBROMAGESCALE

4–full power in relevant muscle group

3–reduced power but ability to move muscle group against resistance

2–ability to move relevant muscle group against gravity but inability to move against resistance1 – flicker of movement in relevant muscle group

0–no movement in relevant muscle group

The movement of diaphragm was assessed 1 hour before and15 min, 30 min, 1 hour and 4 hours after the block using ultrasound on the ipsilateral side of interscalene block for hemidiaphragmatic paresis. Adequate post operative analgesia was defined as complete absence of pain and rating of 0 in numerical rating scale. Duration of post operative pain relief was assessed based on the time of intravenous fentanyl given for break through pain after surgery.

Statistical analysis was done using SPSS version 15.0. Mean and standard deviation were used to analyse parametric data. Continuous variables were analysed by using student's t – test. Qualitative data were analysed using fisher's exact test. For95% confidence interval and 80% of power assuming 0% outcome in group L and 24% outcome in group H based onpreviousstudies[8], thesample sizewascalculated as28patientsfor each armusingopenepi.com.

RESULTS

Table1 –Demographic characteristics

VARIABLE	GROUP L	GROUP H
Age (yrs) Gender (n)Male Female ASA	32.08 4.3	30.86 6.79
I/II	34	32
Weight (kg) Height(cm)	26	28
Duration of surgery(minutes)	27 /2	27 /2
Failed block (n)	60.5 4.2	62.6 6.5
	162.8 6.6	164.3 6.3
	120.1 16.3	116.4 18.1
	1	1

Table2 –Primary and Secondary outcome statistics

VARIABLE	GROUP L	GROUP H	P-VALUE
Phrenicnervepalsy(n	0	6	0.012*
Adequate Intraopan aesthesia and analgesia(n)	28	28	1.00
Duration of postopanalgesia(hours)	5.68 0.2	5.4 0.2	0.56

*pvalue<0.05(significant)

120 patients completed the study protocol, 58 in the high volume (group H) and 58 in the low volume

(group L). There wasfailed block in 4patients(one patient in each group) due to inadequate surgical anesthesia and they were excluded from thestudy. There were no significant differences in age, gender, weight, height, ASA physical status, duration of surgery in boththe groups. Patient's demographic characteristics are presented in table 1. One patient in group H developed horner's syndrome. There was no incidence of local anaesthetic toxicity orhemodynamic instability.

Adequacy of intraoperative anesthesia and analgesia was comparable in both the groups. Hemidiaphragmatic paresis was present in 12 patients of group H and none of the patients of group L which was statistically significant (p – 0.012). There was no requirement of supplementation of analgesics in both the groups intraoperatively. The duration of postoperativeanalgesia was 5.68 □ 0.2 hours in group L and 5.4□ 0.2 hours in group H (p -0.56). The statistical parameters of primaryand secondary outcomes are given in table2.

DISCUSSION

Open clavicle surgery with internal fixation needs careful anesthetic management. The sitting position and the difficult airway access during surgery pose challenges to the anesthesiologist. Anesthesiologists prefer regional anesthesia with ultrasound-guided superficial cervical plexus block combined with an interscalene brachial plexus block to avoid the complications associated with general anesthesia. Horner's syndrome and phrenic nerve palsy are complications related to interscalene brachial plexus block that persuade anesthesiologists to perform selective nerve blocks using new approaches.

The results of our study demonstrate that ultrasound guided combined interscalene and superficial cervical plexus blockprovides comparable quality of analgesia and reduced incidence of phrenic nerve palsy. Two patients in group H(highvolume) developed horner's syndrome. Therefore 10 ml (low volume) of 0.5% levobupivacaine given by ultrasound guidance for interscalene brachial plexus block gives comparable quality of intraoperative and postoperative analgesia withreduced incidence of adverse effects. Combined interscalene and superficial cervical plexus block can be used for clavicular fractures for intraoperative and postoperative analgesia[3]. Not only can it be used for postoperative analgesia but can also beused a sole anaesthetic for clavicular surgeries too according to recent studies[4]. Since clavicular innervation is poorly defined in literature, supplementation with superficialcervical plexus is required for adequate analgesia for claviclesurgeries[5].

McNaught et al. conducted a study comparing ultrasound and nerve stimulation and determined the minimum effective volume required for effective interscalene block[6] and Falcaoetal. Also determined the minimum volume required for adequate postoperative analgesia with 0.5% bupivacaine as 2.34 to 4.29 ml[7]which was similar to our study with respect to reduction in local anaesthetic volume but the difference was that they used nerve block along with general anesthesia forpostoperative analgesia whereas we used interscalene and superficial cervical plexus block as the primary anaesthetic technique which was there as on they required very lesser volume of local anesthetic. We had hemidiaphragmatic paresis in 6 patients of group H(high volume) whereas none of the patients in group L(low volume) developed nerve palsy. Earlier studies comparing high vs low volume of local anaesthetic showed increased incidence of hemidiaphragmatic paresis in high volume group[2,8,9]. The use of ultrasound has been found to be a reliable non invasive technique of diagnosing hemidiaphragmatic paresis in patients who have been performed interscalene block in few studies[10,11].

In present study, the average duration of post operative pain relief in both the groups were comparable and the mean duration of post operative analgesia in both the groups wer e5.5 hours. Further studies are needed to confirm the lower volume required to produce adequate quality of analgesia and reduced incidence of hemidiaphragmatic paresis.

Pani N et al in their study suggested that the addition of dexamethasone to levobupivacaine in SCBP blockade prolonged time for first rescue analgesia and reduced the requirement of rescue analgesics with faster onset and prolonged duration of sensory and motor block.[12]

CONCLUSION

Combined interscalene and superficial cervical plexus block with 10ml of 0.5% levobupivacaine gives adequate intraoperative and postoperative analgesia with reduced incidence of hemidiaphragmatic paresis.

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