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Abstract Page

COMPARISON OF TWO DIFFERENT VOLUMES OF 0.5% LEVOBUPIVACAINE FOR CLAVICULAR SURGERIES USING COMBINED INTERSCALENE AND SUPERFICIAL CERVICAL PLEXUS BLOCK

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ABSTRACT:

CONTEXT: The use of ultrasound in regional anaesthesia has resulted in reduction in local anaesthetic volume and adverse effects.

AIMS: 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.

SETTINGS AND DESIGN: randomized controlled double blinded interventional study

Methods and Material:60 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.

Statistical analysis used:Continuous variable by student's t test and non parametric data by fisher's exact test.

RESULTS: Adequacy of intraoperative anesthesia and analgesia was comparable in both the groups (p – 1.00). Phrenic nerve palsy was present in 6 patients of group H whereas none of the patients of group L developed phrenic nerve palsy (p – 0.023). There was no requirement of supplementation of analgesics in both the groups intraoperatively. The duration of postoperative analgesia was 5.78 ± 0.4 hours in group L and 5.7 ± 0.4 hours in group H (p -0.459)

CONCLUSIONS:

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

Key Messages:ultrasound guided combined interscalene and superficial cervical plexus block reduce local anaesthetic volume needed for adequate analgesia and complications associated with it.

Text

INTRODUCTION:

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 peripheral nerve 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[2].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.

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SUBJECTS AND METHODS:

After institutional ethical committee clearance, 60 patients of age group 18 years and aboveof ASA physical status I,II and weighing 50 kg and above who underwent elective internal fixation for clavicle fractures were selected and randomly allocated 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 patients who were administered20 ml of 0.5% levobupivacaine.Patients with respiratorydisease, 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 μg/kg and fentanyl 1 mcg/kg was given for sedation before the block. Ultrasound guided interscalene and superficial cervical plexus block was done by an anaesthesiologist having atleast 2 years experience in ultrasound guided nerve blocks. The block was done by using high frequency linear probe (logiq e series, GE, USA inc.) and peripheral nerve stimulator(lifetech eztim) with a 50 mm 22 G echogenic needle(pajunk inc.). With the patient in the supine position and with the head turned to the opposite side, the neck region was sterilized with povidone iodine solution. 1 ml of 2 % lignocaine was infiltrated over skin andbrachial plexus was visualized at root and trunk level between the anterior and medius scalene muscles at C6 level. The brachial plexus nerve roots C5 and C6 were identified as three rounded structures longitudinally (traffic light sign) and after identification, the echogenic needle was inserted in plane to the probe anterior to the scalenus medius 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 0.4 mA and 10 ml or 20 ml 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 5 ml 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 thermal sensation, pin prick and motor function. The block was considered to be adequate when there was absence of pain to pin prick and absence of thermal sensation and modified bromage scale of 0. Motor function was assessed by modified bromage scale.

MODIFIED BROMAGE SCALE:

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 resistance

1 – 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 breakthrough 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. For 95% confidence interval and 80% of power assuming 0% outcome in group L and 24% outcome in group H based on previous studies[8], the sample size was calculated as 28 patients for each arm using openepi.com.

RESULTS:

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Table 1 – Demographic characteristics

VARIABLE	**GROUPL**	**GROUPH**
Age (yrs)	34.06 ± 6.3	32.86 ± 7.79
Gender (n)		
Male	17	16
Female	13	14
ASA		
I / II	27 / 2	27 / 2
Weight (kg)	62.5 ± 6.2	64.8 ± 7.5
Height (cm)	163.8 ± 8.6	163.3 ± 7.3
Duration of surgery (minutes)	118.1 ± 18.3	114.4 ± 19.1
Failed block (n)	1	1

Table 2 – Primary and Secondary outcome statistics

VARIABLE	***GROUP L***	***GROUP H***	***P- VALUE***
Phrenic nerve palsy(n)	0	6	0.023*
Adequate Intra op anaesthesia and analgesia(n)	28	28	1.00
Duration of post op analgesia (hours)	5.78 ± 0.4	5.7 ± 0.4	0.459

* p value < 0.05(significant)

60 patients completed the study protocol, 29 in the high volume (group H) and 29 in the low volume (group L). There was failed block in 2 patients(one patient in each group) due to inadequate surgical anesthesia and they were excluded from the study. There were no significant differences in age,gender,weight,height,ASA physical status, duration of surgery in both the 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 or hemodynamic instability.

Adequacy of intraoperative anesthesia and analgesia was comparable in both the groups. Hemidiaphragmatic paresis was present in 6 patients of group H and none of the patients of group L which was statistically significant (p – 0.023). There was no requirement of supplementation of analgesics in both the groups intraoperatively. The duration of postoperative analgesia was 5.78 ± 0.4 hours in group L and 5.7 ± 0.4 hours in group H (p -0.459). The statistical parameters of primary and secondary outcomes are given in table 2.

DISCUSSION:

The results of our study demonstrate that ultrasound guided combined interscalene and superficial cervical plexus block provides comparable quality of analgesia and reduced incidence of phrenic nerve palsy. One patient in group H(high volume) 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 with reduced 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 be used a sole anaesthetic for clavicular surgeries too according to recent studies[4]. Since clavicular innervation is poorly defined in literature, supplementation with superficial cervical plexus is required for adequate analgesia for clavicle surgeries[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 Falcao et al. 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 for postoperative analgesia whereas we used interscalene and superficial cervical plexus block as the primary anaesthetic technique which was the reason 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 our 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 were 5.5 hours. Further studies are needed to confirm the lower volume required to produce adequate quality of analgesia and reduced incidence of hemidiaphragmatic paresis.

CONCLUSION:

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

REFERENCES:

1. Sarah J. Madison, Brian M. Ilfeld. Peripheral Nerve Blocks. Morgan and mikhail's clinical anaesthesiology. 5th ed. United States: McGraw-Hill; 2013. p. 975.
2. Riazi S, Carmichael N, Awad I, Holtby RM, McCartney CJL. Effect of local anaesthetic volume (20 vs 5 mL) on the efficacy and respiratory consequences of ultrasound-guided interscalene brachial plexus block. Br J Anaesth. 2008;101:549-556.
3. Tran de QH, Tiyaprasertkul W, González AP. Analgesia for clavicular fracture and surgery: a call for evidence. Reg Anesth Pain Med. 2013 Nov-Dec;38(6):539-43. PubMed PMID: 24121609.
4. Valdés-Vilches LF, Sánchez-del Águila MJ. Anesthesia for clavicular fracture: selective supraclavicular nerve block is the key. Reg Anesth Pain Med. 2014 May-Jun;39(3):258-9. PubMed PMID: 24747317.
5. Kline JP. Ultrasound-guided placement of combined superficial cervical plexus and selective C5 nerve root catheters: a novel approach to treating distal clavicle surgical pain. AANA J. 2013 Feb;81(1):19-22. PubMed PMID: 23513319.
6. McNaught A, Shastri U, Carmichael N, Awad IT, Columb M, Cheung J, et al. Ultrasound reduces the minimum effective local anaesthetic volume compared withperipheral nerve stimulation for interscalene block. Br J Anaesth 2011 Jan;106(1):.124-130
7. Falcão LF, Perez MV, de Castro I, Yamashita AM, Tardelli MA, Amaral JL. Minimum effective volume of 0.5% bupivacaine with epinephrine in ultrasound-guided interscalene brachial plexus block. Br J Anaesth. 2013 Mar;110(3):450-5. PubMed PMID: 23195326.
8. 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
9. Verelst P, van Zundert A. Respiratory impact of analgesic strategies for shoulder surgery.Reg Anesth Pain Med. 2013 Jan-Feb;38(1):50-3. PubMed PMID: 23132510.
10. Urmey WF, Talts KH, Sharrock NE. One hundred percent incidence of hemidiaphragmatic paresis associated with interscalene brachial plexus anesthesia as diagnosed by ultrasonography. Anesth Analg. 1991 Apr;72(4):498-503. PubMed PMID: 2006740
11. Urmey WF, McDonald M. Hemidiaphragmatic paresis during interscalene brachial plexus block: effects on pulmonary function and chest wall mechanics. Anesth Analg. 1992 Mar;74(3):352-7. PubMed PMID: 1539813.