

A Comparative Study Between Conventional and Ultrasound Guided Supraclavicular Brachial Plexus Block Using Levobupivacaine in Upper Limb Surgeries

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Abstract

Original Research Article

Supraclavicular brachial plexus block is a popular and easy technique for upper limb surgeries. Blind technique often requires multiple trial and error needle attempts, resulting in increase in procedure time, procedure related pain and complications including pneumothorax, which is very risky. In developing countries like India, ultrasound is a relatively new technique and is increasingly being used for performing nerve blocks. Hence, this study was planned for comparing the efficacy of conventional supraclavicular brachial plexus block with ultrasound-guided technique. After obtaining the Institutional ethical committee approval and patient consent 100 of ASA grade I and II and in the age group of 18-50 years patients were enrolled in this prospective randomized study. They were randomly allocated to Group c –conventional method (n=50) and Group us-usg guided method (n=50). Each patient received 25ml 0.5% levobupivacaine mixed with 5 ml isotonic saline water. The parameters compared between the two groups were lock execution time, time of onset of sensory and motor block, duration of sensory and motor block and hemodynamic state during period of study. Success rate and effective quality of block were more satisfactory with ultrasound technique than the conventional blind technique.

Keywords: Ultrasound guided block, supraclavicular block, levobupivacaine, upper limb surgeries.

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INTRODUCTION

Brachial plexus blockade is a time-tested technique for the upper limb surgeries [1]. The classical approach using paraesthesia technique being a blind technique may be associated with higher failure rate and injury to the nerves and vascular structures [2]. To avoid those problems use of peripheral nerve stimulator was started which allowed better localization of the nerves/plexus [3, 4]. However this technique may not be full proof with risk of injury to surrounding structures especially vascular structures, nerves and pleura leading to pneumothorax [5, 6]. Ultrasound for supraclavicular brachial plexus block has improved the success rate of block with excellent localization as well as improved safety margin [7]. La Grange *et al.* in 1978 were the first to perform the supraclavicular block through ultrasound blood flow detector [8]. Kapral *et al.* in 1994 published the first reported use of direct sonographic visualization for regional anesthesia [9].

This Prospective Randomized Comparative study was planned for comparing the efficacy of conventional supraclavicular brachial plexus block with ultrasound-guided technique. We used levobupivacaine, an enantiomer of racemic bupivacaine with less cardiotoxicity and neurotoxicity as local anaesthetic.

MATERIAL AND METHODS

The study was conducted after obtaining approval from institutional ethical committee and written informed consent from each patient. 100 patients aged 18 to 50 years, ASA grade I and II who had undergone upper limb surgeries lasting more than 30 min were recruited for this study. Patients were randomly divided into 2 Groups of 50 patients each as group C – for Conventional Supraclavicular Brachial plexus block and Group US – for USG guided Supraclavicular Brachial plexus block. In the operation theatre, patients were monitored with pulse oximetry,

non-invasive blood pressure and electrocardiogram. Inj Midazolam 0.05 mg/kg (IV), Inj. Glycopyrrolate 0.2mg (IV) Inj. Ondansatrom 4mg (IV) was given intravenously as pre-medication before block. Supraclavicular block was performed with patient in supine position and head turned to opposite side. No other sedation was given till evaluation of block was completed. With all aseptic precautions supraclavicular brachial plexus was performed using 25 ml of levobupivacaine 0.5% mixed with 5 ml of isotonic saline water. In group US, Sonosite M-Turbo ultrasound with HFL 38×13-16 MHz 40 mm broadband linear array probe was used for block. Block needle was inserted under real time ultrasound visualization. The area lateral and superficial to subclavian artery is explored. The needle is advanced inside ultrasound beam till the plexus is seen with characteristic honey comb appearance. At this point drug was injected following gentle aspiration and spread of drug and bulging of plexus was seen. In Group C, conventional

supraclavicular brachial plexus block was performed by eliciting paraesthesia in the forearm and hand and when paraesthesia was obtained the needle was withdrawn about 1–2 mm and the drug was injected. During this time taken for procedure, time for the onset of sensory block, motor block was noted. Surgery was started after confirming adequacy of the block. All patients were observed intra operatively as well as postoperatively for the complications. Intra operatively pulse rate, SpO₂ and NIBP was recorded till the end of surgery. All patients were followed up in Recovery until complete recovery of sensory and motor function of the operated limb. Chest X-Ray was done post operatively in all the patients. Statistical tests were applied to compare data and p-Value < 0.05 was considered statistically significant.

RESULTS

Table-1: Comparison of Mean Age between Two Groups

	Group	N	Mean	Std. Deviation	Std. Error Mean	p value
Age(yrs.)	US	50	34.36	5.696	.805	.289
	C	50	35.62	6.111	.864	.289

There was no significant difference in age

Table-2: Comparison of mean WEIGHT of patients in two group

	group	N	Mean	Std. Deviation	Std. Error Mean	p value
Weight(kg)	US	50	63.88	5.201	.735	.251
	C	50	65.06	5.016	.709	.251

There was no significant difference in body weight between both groups

Table-3: Comparison of time taken for the procedure between two groups.

	group	N	Mean	Std. Deviation	Std. Error Mean	P value
Time taken for procedure	US	50	4.650	.4974	.0703	.0001
	C	50	9.380	.7530	.1065	.0001

As regard time taken to procedure in group C, it was 9.3 ± 0.75 min. and in group US it was 4.6 ± 0.49 min. There was a significant decrease in group US (shorter time) as compared to group C ($P < 0.05$)

Table-4: Comparison of onset of sensory blockade between the two groups

	group	N	Mean	Std. Deviation	Std. Error Mean	P value
Onset of sensory blockade	US	50	5.380	.5852	.0828	.0001
	C	50	5.960	.7814	.1105	.0001

Mean time of onset of sensory blockade in Group US is lower as compared to group C.

Table-5: Comparison of mean time taken for onset of motor blockade between two groups

	group	N	Mean	Std. Deviation	Std. Error Mean	p value
Onset of motor blockade	US	50	6.000	.5890	.0833	.0001
	C	50	9.340	.9607	.1359	.0001

Mean time of onset of motor blockade was significantly lower in Group US as compared to Group C.

Table-6: Comparison of mean duration of sensory blockade between two groups

	group	N	Mean	Std. Deviation	Std. Error Mean	p value
on of sensory blockade	US	50	279.50	10.637	1.504	.0001
	C	50	245.20	12.578	1.779	.0001

Mean duration of sensory blockade in US group was 279 ± 10 min & in C group was 245 ± 12 min. There was

significant increase in mean duration of sensory blockade in group US (longer time) as compared to group C ($p < 0.0001$).

Table-7: Comparison between mean duration of motor blockade between two groups

	group	N	Mean	Std. Deviation	Std. Error Mean	P value
duration of motor blockade	US	50	268.42	10.966	1.551	.0001
	C	50	228.40	13.116	1.855	.0001

Mean duration of motor blockade in US group was 268 ± 10 min & in C group was 228 ± 13 min. There was significant increase in mean duration of motor blockade in group US (longer time) as compared to group C ($p < 0.0001$)

Table-8: Comparison between mean pulses between two groups

	group	N	Mean	Std. Deviation	Std. Error Mean	P value
pulse	US	50	83.68	3.159	.447	.0001
	C	50	86.34	2.528	.358	.0001

Comparison between mean pulses was significant ($p < 0.0001$)

Table-9: Comparison of mean SBP between two groups

	group	N	Mean	Std. Deviation	Std. Error Mean	P value
SBP	US	50	115.24	3.048	.431	.422
	C	50	116.08	6.700	.948	.422

The mean SBP between two groups was not significant.

Table-10: Comparison of mean DBP between two groups

	group	N	Mean	Std. Deviation	Std. Error Mean	P value
DBP	US	50	81.44	3.052	.432	.001
	C	50	78.00	6.590	.932	.001

There was significant difference in mean DBP between two groups

Overall Effectiveness of the Block

The block was successful in 100% in Group US and 96% of patients in Group C.

Complications

Incidence of vessel puncture/hematoma was 4% in Group C compared to 0% in group US. There was no incidence of nerve injury and pneumothorax in both groups

DISCUSSION

Supraclavicular block provides dense anaesthesia of upper limb and was described as the "spinal of the arm" [10]. At this point, the brachial plexus is compact, which facilitate a single point injection and a small volume of solution produces rapid onset of reliable blockade of the brachial plexus. An additional advantage is that the block can also be performed with the patient's arm in any position. It can be done by conventional method using surface landmarks alone or with USG localization. In our study the mean time taken for the procedure was less in USG guided group and it is similar with results of Anthony *et al.* who reported that USG guided blocks were faster to perform [11]. Both the mean time of onset of sensory blockade and mean time of onset of motor block was lower in Group US and which is similar to the study done by Danelli *et al.* [12]. The mean duration of sensory and motor blockade was shorter in Group C

when compared to Group US which complies with the study done by Jagruti Satasiya *et al.* [13]. There was no clinically and statistically significant difference in pulse rate, systolic pressures between the two groups during all periods of the study. Incidence of vessel puncture/hematoma was 4% in Group C compared to 0% in group US. There was no incidence of nerve injury and pneumothorax in both the groups. Additional analgesia was required in one case in group C. Fortunately there was no any conversion to G.A. In our study successful block was defined as anaesthesia for a pain free surgery without need for supplemental anaesthesia. The block was successful in 98% of patients in Group C and 100% in Group US.

CONCLUSION

Ultrasound guided supraclavicular block for upper limb surgeries when compared to conventional technique has a rapid onset of both sensory and motor blockade, prolonged duration of blockade, reduced analgesic requirement both intra- and postoperatively, and increased success rate with fewer complications.

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