ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 10, Issue, 06(A), pp. 32746-32750, Jun, 2019

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

COMPARISON BETWEEN CONVENTIONAL TECHNIQUE AND ULTRASOUND GUIDED TECHNIQUE FOR INTERSCALENE BRACHIAL PLEXUS BLOCK IN UPPER LIMB SURGERIES

Anjna Badhan* and Gian Chauhan

Department Anaesthesiology and Critical Care, IGMC, Shimla, HP, India

DOI: http://dx.doi.org/10.24327/ijrsr.2019.1005.3536

ARTICLE INFO

Article History:
Received 4th March, 2019
Received in revised form 25th April, 2019
Accepted 23rd May, 2019
Published online 28th Jun, 2019

Key Words:

Regional anaesthesia,interscalene brachial plexus block(ISBPB), Conventional, Ultrasound(US).

ABSTRACT

Background and objectives: Interscalene brachial plexus block (ISBPB) is a well-established technique in anaesthetic practice in upper limb surgeries and with the help of ultrasound, as a guidance tool, has redefined the success rate. The aim of present study was to compare the conventional lower ISBPB technique taken from NYSORA by eliciting paraesthesia with the US guided ISBPBin upper limb orthopaedic surgeries in terms of time taken for the procedure, drug dosages, onset of sensory and motor blockade, grades of blockade, quality of the block, success rate and any complication.

Methods: After approval by the research ethics committee and written informed valid consent of the patients the proposed study was carried out in fifty ASA I and ASA II patients, aged between 18 and 60 years of either sex, undergoing unilateral upper limborthopaedic surgery at Indira Gandhi Medical College, Shimla. The study was conducted in a controlled prospective randomized manner divided in 25 patients in each group. In group C once the appropriate paraesthesia of the brachial plexus was elicited 35ml of LA (inj. Bupivacaine 0.5% 17.5cc+ inj.lignocaine 2% with adrenaline 17.5cc) was injected and ingroup US 20cc of LA (Injection bupivacaine 0.5% 10cc + lignocaine 2% with adrenaline 10cc) was injected. Sensory and motor blockade were assessed. At the end of the procedure, quality of block was assessed. Patients were followed up for the next 24h for any complication.

Results: Time taken for giving block and onset time for complete sensory and motor block was less in ultrasound guided group than conventional group.US guided block also has less failure rate and complications.

Conclusion: Ultrasound is safe and effective means of performing ISBPB with less time and more success rate.

INTRODUCTION

The term "Regional anaesthesia" was first used by Harvey Cushing in 1901 to describe pain relief by nerve block.[1] Regional nerve blocks are based on the concept that pain is conveyed by nerve fibers, which are amenable to interruption anywhere along their pathway.[2] Since its introduction by William Steward Halsted in 1885, who performed the block by exposing the roots, it has undergone many changes to arrive at a better technique. [3]

The interscalene approach is ideal for shoulder and upper arm surgeries at cricoid level withcomplications like epidural/subarachnoid injection, pneumothorax, blockade of the phrenic. In our study we followed the NYSORA technique which was low interscalene technique involving needle to be inserted more caudally than the cricoid level to avoid sparing of ulnar nerve and more lateral which makes puncture of carotid artery less likely. [4]

Ultrasound (US) visualization of anatomical structure is only method offering safe blocks of superior quality by optimal needle positioning. Hence, a study is planned for comparison of brachial plexus block by supraclavicular approach using conventional and US based technique.

Objectives: The main objectives of this study were to compare the effects of interscalene brachial plexus block using conventional blind technique and ultrasound guided technique in terms of:

- ✓ Time taken for the procedure
- ✓ Onset time for sensory and motor blockade
- ✓ Success rate
- ✓ Quality of the block

Corresponding author:* **Anjna Badhan
Department Anaesthesiology and Critical Care, IGMC, Shimla, HP, India

- ✓ Drug dosages
- ✓ Any complication

MATERIAL AND METHODS

In order to compare conventional and ultrasound guided technique for interscalene brachial plexus block in upper limb surgeries a prospective randomized controlled trial wasperformed at the department of Anaesthesiology at IGMC Shimla over a period of one year from 1st July 2015 to 30th June 2016.

Method of Collection of Data

Inclusion Criteria

- Patients of either sex, aged between 18-60 years
- Patients with ASA grade I and II physical status
- Elective upper limb surgeries

Exclusion Criteria

- Hypersensitivity to local anaesthetics
- Patients refusal or non-compliance
- Pre-existing neurological deficit
- ASA grade III and IV
- Patient with significant coagulopathy
- Skin lesion at the site of block
- Local sepsis
- Respiratory failure

Patient Group

The patients were randomly divided into two groups of 25 patients each

Group (US): US guided interscalene brachial plexus block
Group (C): conventional interscalene brachial plexus block

Preanaesthetic Evaluation

All the patients kept for surgery were undergone a preanaesthetic evaluation and written informed consent was taken one day prior to the surgery. They received tab*et al*prazolam 0.5mg at bed time and kept nil per orally as per the fasting guidelines.

Investigations*:* Hb, bleeding time, clotting time, serum urea and creatinine, blood sugar, ECG and chest X-ray posteroanterior view depending on age and associated comorbidities.

Resuscitation Equipments*:* The anaesthesia machine, emergency oxygen source pipe line oxygen supply, working laryngoscope appropriate size endotracheal tubes and connectors, working suction apparatus with a suction catheter, oropharyngeal airways, iv fluids, anaesthetic agents and resuscitation drugs were checked and kept ready.

Procedure: On operation table, after patient's identification, monitor was attached and oxygen saturation (SpO_2), noninvasive blood pressure, respiratory rate and ECG were recorded. Intravenous line was started with ringer lactate and midazolam 0.05mg/kg was given intravenously, before procedure. Starting time of procedure was recorded and then depending upon the group, block was carried out and end point of procedure was noted.

Position: The patient was kept supine with head slightly elevated away from the site to be blocked. Part was prepared for the block to be performed with iodine solution. A small pillow or folded sheet was placed below the shoulder to make the field more prominent.

Conventional- NYSORA technique (Group C)

Landmarks

- Clavicle
- Posterior border of the sternocleidomastoid muscle
- External jugular vein

Interscalene groove is palpated andlocal anaesthetic 2% of lignocaine 3 ml solution given on skin then needle inserted about 1-2cm in depth in caudal direction at lower level (two fingers above clavicle) of interscalene groove just anterior or posterior to external juglar vein. Once paraesthesia was elicited 35ml of local anaesthetic (injection Bupivacaine 0.5% 17.5cc+ injection lignocaine and ADR 2% 17.5cc) was injected slowly.

Ultrasound Guided Technique: Group (US)

Scanning Technique: The operator stand on the side of patient to be blocked. The ultrasound machine was at a comfortable ergonomic position on the opposite side of the patient.

Medial to Lateral Approach

The probe was initially placed near the midline at the level of cricoid cartilage and scanned laterally to identify the carotid artery and internal jugular vein. The sternocleidomastoid muscle overlies these structures. By moving the probe laterally, the anterior scalene muscle was seen below the lateral edge of the sternocleidomastoid. A groove containing the hypo-echoic nerve structures was usually identified but might require fine adjustments of the probe in a rotational or tilting motion.

Needle Insertion (In Plane Approach)

The needle was brought in the same plane as a probe so that the whole length of the needle could be visualized.

Drug Dose*:* 20cc of local anaesthetic (Injection bupivacaine 0.5%10cc +injection lignocaine and adr(1: 200000) 10cc was injected slowly with intermittent aspiration to rule out intravascular injection. A small amount of local anaesthetic was injected to hydrodissect and open up the fascial plane this allowed clearer visualization of the nerve structure. Local anaesthetic should ideally spread anterior and posterior to the nerve structure and surround the nerves as a doughnut shaped hypoechoic area.Assessment of sensory and motor blockade was done every minute till complete blockade acheived and the time was recorded.

The effect of resulting interscalene block was graded according to this grade system.

Grade 0: No success-change to GA(Failure)
Grade1: Block requires supplementary analgesia i:e incomplete block (But No GA needed)
Grade 2: Complete sensory and motor blockade (no GA needed)

The block was considered incomplete when any of the segments supplied by median, radial, ulnar and musculocutaneous nerve would not had analgesia even after 30

min of drug injection. These patients were supplemented with intravenous fentanyl (1-2 µg/ kg). Patients were monitored for hemodynamic variables such as heart rate, blood pressure and oxygen saturation every 5 min for half an hour and every 15 min there after intraoperatively till the end of surgery.

At the end of the procedure, quality of operative conditions was assessed according to the following numeric scale:

Grade 4: (Excellent) No complaint from patient
Grade 3: (Good) Minor complaint with no need for the supplemental analgesics
Grade 2: (Moderate) Complaint that required supplemental analgesia
Grade 1: (Unsuccessful) Patient given general anaesthesia

All Patients were Observed for any Side-Effects

1. Hematoma
2. Horner's syndrome
3. Pneumothorax
4. Post-block neuropathy
5. Epidural block
6. Phrenic nerve block
7. Total spinal anaesthesia

Data were collected every 3 min for first 15 min. Nextevery 5 min for 15 min and later every 10 min for30 min and every 15 min till the end of surgery.

Statistical Analysis: Results were statistically analyzed using Student's *t*-test and p-values calculated.

Observation and Results

After ethical approval and written informed consent a prospective, randomized, comparative study wasconducted in the Department of Anesthesiology ,IGMC Shimla, 50 patients of ASA I and II, aged between 18-60 years, scheduled for orthopaedic surgeries of upper limb.There were no clinical or statistically significant differences in the demographic profile of patients in either group.

$p > 0.05$= not significant(*), $p < 0.05$=significant(**), $p < 0.001$= highly significant(***)

Table Ia Age distribution of patients between the two groups

	Group	N	Mean	Std Deviation	p-value
Age (in years)	C	25	41.08	16.94	0.315
	US	25	45.88*	16.46*	

Table 1b Weight distribution of patients between the two groups

	Group	N	Mean	Std Deviation	p-value
Weight(kg)	C	25	66.24	11.07	0.370
	US	25	69.04*	10.81*	

Age and Weight

The mean age (in years) in group C was 41.08 ±16.94, and in group US was 45.88 ± 16.46. The mean weight (in Kg) in group C was 66.24 ± 11.07 and 69.04 ± 1081 in group US respectively. There was no significant difference in age and weight between the two groups (Table Ia and Ib, Figures Ia and Ib).

Table 1c Sex distribution of patients between the two groups

Sex	Group		Total	p- value
	C	US		
F	7*	12*	19	
M	18	13	31	0.145
Total	25	25	50	

Table II ASA grading of patients between the two groups

ASA GRADE	Group		Total	p- value
	C	US		
I	16	13	29	
II	9*	12*	21	0.39
Total	25	25	50	

Sex Distribution and ASA grading

The ratio of male versus female was 14:11 in group C and 13:12 in group US.The numbers of patients of ASA grade I were 16 in group C, 13 in group US whereas 9 patients in group C and 12 patients in group US were of ASA grade II.The sex distribution and ASA grading between two groups werefound to be comparable (Table Ic and II, Figures Ic and II).

Table III Time taken for block procedure and surgery time

Parameter	Group		p- value
	C	US	
Time taken for procedure (Min)	11.96 ± 1.77	7.84 ± 0.9***	0.000
Surgery Time (Min)	100.8 ± 21	97.2 ± 20.82*	0.546

The mean time for giving ultrasound guided interscalene brachial plexus block was 7.84 ± 0.9 minutes whereas 11.96 ± 1.77 minutes in conventional group.

The difference among these was statistically highly significant (p-value=<0.000) implying that a significantly higher time was taken for giving conventional interscalene brachial plexus block as compared to ultrasound guided. The mean time for surgical procedure was 100.8 ± 21 and 97.2 ± 20.82 for C and US group respectively which was not statistically significant. (Table IV, Fig. IVa and IVb)

Table V Onset of sensory and motor block

Onset of block	Group	N	Mean	Std Deviation	P-value
Sensory and Motor block(min)	**C**	25	15.56	2.58	0.0001
	US	25	11.68***	0.94***	

The mean onset time for complete sensory and motor was found 15.56 ± 2.58 minutes in C group, whereas 11.68 ± 0.94 minutes in US group. There was highly significant difference on statistical comparison of the two groups, indicating that ultrasound guided interscalene brachial plexus block had an early onset of sensory and motor block compared to conventional interscalene brachial plexus block. (Table V, Figure V)

Table VI Inter-group comparison of Grades of block

Grades of block	Group		Total	p- value
	C	US		
Grade 0	2	0*	2	
Grade 1	10	4*	14	0.040
Grade 2	13	21*	34	
Total	25	25*	50	

The block was considered incomplete when any of the segments supplied by median, radial, ulnar and musculocutaneous nerve did not have analgesia even after 30 min of drug injection. These patients were supplemented with intravenous fentanyl (1-2 µg/ kg).

In conventional group out of 25 patients Grade 0,1 and 2 were found in 2,10 and 13 patients respectively whereas in ultrasound group out of 25 patients Grade 0,1and 2 found in 0,4 and 21 respectively. In US group maximum patients (21) were found in Grade II whereas in group C only 13 patients were found in Grade II i.e. complete sensory and motor blockade found in maximum patients in US group.

There was significant statistical difference in grade of block between the two groups indicating that ultrasound guided block had better sensory and motor blockade. (Table VI, Figure VI)

Hemodynamic Parameters

There was no clinically and statistically significant difference in heart rate, mean blood pressures and SpO2 between the two groups during all periods of the study.

Table VII Inter-group comparison of Block Quality Grade

Grades of quality	Quality of block	Group		Total	p value
		C	US		
1	Unsuccessful	2	0*	2	0.082
2	Moderate	10	4*	14	
3	Good	8	11*	19	
4	Excellent	5	10*	15	
	Total	25	25*	50	

The grades of quality in group C were found to be unsuccessful block in 2 patients, moderate in 10 patients, good in 8 patients and excellent in 5 patients whereas in US group block not unsuccessful in any patient, moderate in 4 patients, good in 11 patients and excellent in 10 patients.

We found that more patients came under good and excellent grades of quality in US groupbut the difference in two study groups was found to be statistically insignificant. (Table VII and Figure VII)

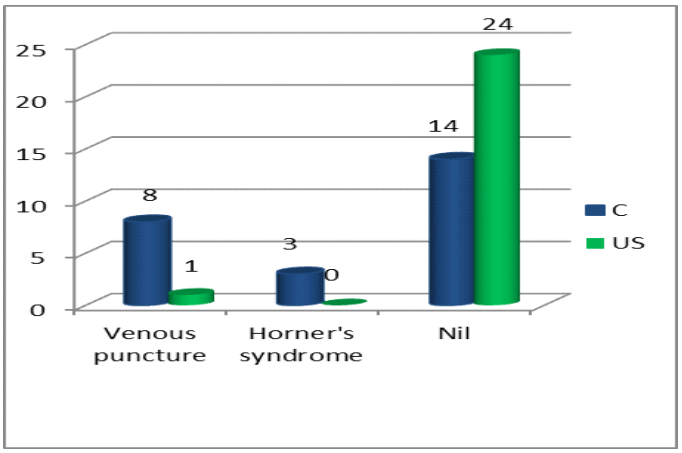
Side Effects

All patients were observed for any side-effects like venous puncture, horner's syndrome, pneumothorax, post-block neuropathy, epidural block, phrenic nerve block, total spinal anaesthesia.

Table VIII Inter-group comparison of Side Effects

	Group C (incidence)	Group US (incidence)
Venous puncture	8(32%)	1(4%)
Horner's Syndrome	3(12%)	NIL
Pneumothorax	NIL	NIL
Epidural block	NIL	NIL
Phrenic nerve block	NIL	NIL
Total spinal anaesthesia	NIL	NIL
Post Block Neuropathy	NIL	NIL

In C group 8(32%) patients had venous puncture and 3(12%) patients developed horner's syndrome whereas in US group only 1(4%) patient had venous puncture and no other complications. While none of the patient in either group had pneumothorax, haematoma, epidural anaesthesia, total spinal anaesthesia, phrenic nerve block, local anaesthetic toxicity or post block neuropathy. (Table VIII)



DISCUSSION

Regional anaesthesia makes a simple demand that the right dose of the right drug is to be given in the right place.Regional anaesthesia techniques provide important advantages as compared to general anaesthesia, including excellent pain control, reduced side-effects, and shortened stay in the post-anaesthesia care unit. [5]

In the past, electrical stimulation or paraesthesia, both of which relied on surface landmark identification.However, landmark techniques have limitations of variations in anatomy and nerve physiologies, as well as equipment accuracy, have had an effect on success rates and complications.Brachial plexus block is an easy and relatively safe procedure for upper limb surgeries.

The real-time ultrasound guidance has been used to localize the peripheral nerve or plexus, accurate needle placement and verification of local anaesthetic spread in the appropriate tissue planes.During the past decade,ultrasound guidance has become the reference standard and an effective mode of safe and accurate regional anaesthesia.

Each patient was subjected to complete general physical examination and systemic examination. Basic demographic characters like age, sex and weight were noted and were found to be comparable.

In our study mean time taken for giving ultrasound guided interscalene brachial plexus block was 7.84 ± 0.9 minutes whereas it was 11.96 ± 1.77 minutes in group C which is highly significant and similar results were shown in study conducted by Kirti Ahuja *et al* andThomas LC *et al*.[6,7]

We observed in our study that the mean time for surgical procedurebetween two groups (Table III and figure III) was comparable (p >0.05) with values of 100.8 ± 21 and 97.2 ± 20.82 for C and US group respectively.

In present study the mean time for complete sensory and motor was found to be 15.56 ± 2.58 minutes in C group, whereas 11.68 ± 0.94 minutes in US group indicating that ultrasound guided interscalene brachial plexus block had an early onset of sensory and motor block. Similar results were found in study conducted by Kirti Ahuja *et al*(2016). [6]In present study we observed the grading of block and found that ultrasound guided interscalene brachial plexus block had better sensory and motor blockade compared to conventional interscalene brachial plexus block. In US group maximum patients (21) were found

in Grade II whereas in group C only 13 patients were found in Grade II i.e. complete sensory and motor blockade found in maximum patients in US group.

Our results were comparable to various others studies by Kirti Ahuja *et al* in 2016, Thomas LC *et al*, they also found that ultrasound guided blocks provide complete sensory and motor blockade and less incidence of patchy effect or block failure.

We observed grades of quality and found that more patients came under good and excellent grades (84%) of quality in US group in comparison to C group which indicate that quality of block was better in US group. But the difference in two study groups was found to be statistically insignificant so both groups were found to be comparable in quality of block similar to results shown inGajendra Singh *et al*. [8]

In the present study comparison of side effects in two groups were statistically insignificant (p-value 0.074) i.e. side effects in both groups were comparable. We observed that in C group 3 patients (6%) developed Horner's syndrome whereas in US group no patients develop such complication while none of the patient in either group had pneumothorax, epidural anaethesia, total spinal anaesthesia, phrenic nerve block, local anaesthetic toxicity or post block neuropathy as found inMohamed Hamed *et al* and BisSShop *et al*.[9,10]

Similarly Liu SS *et al* also found that fewer complications with US guided interscalene block.[11]

Kapral *et al* studied 40 patients (ASAI-III) in 1994 and observed no complications such as pneumothorax, puncture of a major blood vessel, paresis, or irritation of the plexus, the recurrent laryngeal nerve, or the phrenic nerve in his study of US guided supraclavicular approach brachial plexus blockade. [12]

CONCLUSION

Ultrasound guided technique is safe and effective means of performing ISBPB with complete blockade and excellent success rate. Secondly this technique require less time, anaesthetic solution volume and needle pricks and also has less complications.

References

1. Atkinson RS, Rushwan GB, Lee AJ. Synopsis of Anaesthesia; Regional technique.10th ed.;1987,593-4.
2. Raj PP. Text Book of Regional Anaesthesia; Historical aspects of regional anaesthesia. 1st ed.;2002,3.
3. Halsted w. Pracital comments on the use and abuse of cocaine; suggested by its invariably successful emplogyment in more than a thousand minor surgical operations. Survey of Anesthesiology. 1984;28(2):156.
4. [Internet].2016;November,29.Available from: http://www.nysora.com/.../ultrasound-guided.../3014-ultrasound-guided-interscalene-brach.
5. S. G. Memtsoudis, X. Sun, Y. L. Chiu *et al*., "Perioperative comparative effectiveness of anesthetic technique in orthopedic patients," Anaesthesiology, 2013;118(5):1046–1058.
6. Ahuja K, Dureja J, Chaudhary G, Middha S, A Comparative Evaluation of Techniques in Interscalene Brachial Plexus Block: Conventional blind, Nerve Stimulator Guided and Ultrasound Guided. Annals of International medical and Dental Research. 2016;2(3).61-65.
7. Thomas LC, Graham SK, Osteen KD, Porter HS, Nossaman BD. Comparison of ultrasound and nerve stimulation techniques for interscalene brachial plexus block for shoulder surgery in a residency training environment: A randomized, controlled, observer-blinded trial. Ochsner J. 2011;11:246–252.
8. Singh G, Mohammed YS. Comparison between conventional technique and ultrasound guided supraclavicular brachial plexus block in upper limb surgeries. IJSS. 2014;2(8):169-76.
9. Dr. Med. Peter Geiger. (2009). INTERSCALENE BLOCK A Comparison between Electrostimulation and Ultrasound-Guided Techniques. (Doctoral dissertation). Retrieved from http:// www.rku.de/files/qsb2010_mbr.pdf.
10. Bishop JY, Sprague M, Gelber J, *et al*. Interscalene regional anesthesia for shoulder surgery. J Bone Joint Surg Am 2005;87:974–979.
11. Liu SS, Zayas VM, Gordon MA, Beathe JC, Maalouf DB, Paroli L, *et al*. A prospective, randomized, controlled trial comparing ultrasound versus nerve stimulator guidance for interscalene block for ambulatory shoulder surgery for postoperative neurological symptoms. Anesth Analg. 2009;109:265–271.
12. Kapral S, Krafft P, Eibenberger K, Fitzgerald R, Gosch M, Weinstabl C. Ultrasound-guided supraclavicular approach for regional anesthesia of the brachial plexus. Anesth Analg 1994;78:507-513.

How to cite this article:

Anjna Badhan and Gian Chauhan., 2019, Comparison Between Conventional Technique and Ultrasound Guided Technique for Interscalene Brachial Plexus Block in Upper Limb Surgeries. *Int J Recent Sci Res.* 10(06), pp. 32746-32750.
DOI: http://dx.doi.org/10.24327/ijrsr.2019.1006.3536

****