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COMPARING SUPRACLAVICULAR BLOCK OF BRACHIAL PLEXUS USING ULTRASOUND GUIDANCE ANDNERVE STIMULATION WITH A TECHNIQUE USING ANATOMICAL LANDMARKS AND NERVE STIMULATION – A RANDOMIZED PROSPECTIVE STUDY

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ABSTRACT

BACKGROUND AND OBJECTIVES: The aim of the study is to compare the efficacy and execution time of supraclavicular block of brachial plexus using ultrasound guidance and nerve stimulation compared with a supraclavicular block that used anatomical landmarks and nerve stimulation

METHODS: A prospective randomized study conducted on 40 ASA I andII patients undergoing upper limb surgeries undersupraclavicular brachial plexus block. The study was started after receiving institutional ethical committee approval and informed written consent. They were randomly divided into two groups.

US- 20ml of 0.5% bupivacaine+20 ml of 2% lignocaine with 1 in 2,00,000 epinephrine.

NS-20ml of 0.5% bupivacaine+ 20 ml of 2% lignocaine with 1 in 2,00,000 epinephrine

RESULTS: Demographic parameters were comparable in both groups. Onset of sensory and motor blockade in US group were shorter than in NS group and the difference was statistically significant . The number of needle attempts was lesser in group US (Mean1.2) compared to the group NS (Mean2.2).

CONCLUSIONS: Ultrasound with nerve stimulation allowed statistical and clinically significant decrease in procedure time, quicker onset and provided better success rate than a nerve stimulator guided method alone.

KEYWORDS : Ultrasound, Nerve Stimulator, Supraclavicular Block.

INTRODUCTION:

Earlier nerve blocks were performed using anatomical landmarks as a guide to insert the needle and elicit paresthesia. This might carry a risk of nerve damage ,paresthesias and is only a subjective sensation experienced by the patient. It may be unpleasant for the patient also.The accuracy of surface landmark technique can be improved using nerve stimulator or ultrasound. The use of nerve stimulator was described by Von perches in 1912.Nerve stimulators have sought to add an objective end point to aid nerve location. They apply a small amount of weak, direct current(DC) to the needle by an oscillating current generator.The nerve is then stimulated to produce a motor response. An appropriate motor response corresponding to the motor innervations of the desired nerve to be blocked has been shown to improve the success rate of the block. The threshold current is the lowest current which can produce a motor response. A value between 0.2 to 0.5 mA has been suggested to ensure a successful block. Nerve stimulators aredesigned to be constant current generators. The current between anode and cathode is kept constant irrespective of the impedance of the surrounding tissue. The current output ranges from0.01 to 5mA which is controlled by a dial on the PNS. The usual PNS settings are pulse duration of 0.1ms, frequency of 2HZ and current starting at 1 MA.

The logical requirement of a block to work requires the deposition of local anaesthetic in a circumferential distribution around the target nerve so that the drug blocks nerve conduction effectively .For this to prevail it is imperative to have a visual guidance that permits us to visualize the nerve in relation to collateral structures, the needle as it being advanced towards the nerve, and also spread of local anaesthetic. Ever since advancement in ultrasound technology has led to the widespread use of this modality as a guidance tool in regional Anesthesia. Vincent W.S.Chan et al evaluated ultrasound technology for supraclavicular brachial plexus block and needle position was further confirmed by nerve stimulation before injection.Ultrsound guidance enables the anaesthetist to secure an accurate needle position and to monitor the distribution of local anaesthetic in real time.

ADVANTAGES OF ULTRASOUND GUIDANCE:

Real time visualization of nerves and anatomical structures
Avoidance of inadvertent intraneuronal and intravascular injection ,
Reduction in dosage of local anaesthetic,
Faster onset, longer duration of blocks,
Improved quality of block.

AIM:

To compare the efficacy and execution time of supraclavicular block of brachial plexus using ultrasonic guidance and nerve stimulation compared with a supraclvicular block that used anatomical landmarks and nerve stimulation.

MATERIALS AND METHODS:

A prospective randomized study conducted on 40 ASA I and II, patients undergoing upper limb surgeries under supraclvicular brachial plexus block. The study was started after receiving institutional ethical committee approval and informed written consent. They were randomly divided into two groups.

US- 20ml of 0.5% bupivacaine+20 ml of 2% lignocaine with 1 in 2,00,000 epinephrine

NS-20ml of 0.5% bupivacaine+ 20 ml of 2% lignocaine with 1 in 2,00,000 epinephrine

INCLUSION CRITERIA:

Elective surgical procedures from middle 1/3 of humerus to hand, ASA I and II, Age 18-60 years.

EXCLUSION CRITERIA:

Patient refusal, coagulopathies, local infections,H/O significant neurological, psychiatric, neuromuscular, cardiovascular, pulmonary, renal, hepatic disease.

Patient was preoperatively assessed and procedure was explained. On arrival of the patient in the Operation theatre, monitors like pulse oximeter, NIBP, ECG were connected and the baseline values were recorded. An intravenous access was obtained in the opposite arm. Patients were positioned supine with a shoulder roll under the patient and the head turned away from the side to be blocked and the ipsilateral arm adducted to depress the clavicle. The neck was prepared with povidone iodine solution and draped with sterile towels. A line was drawn laterally from the cricoid cartilage to cross the sternocledomastoid at its midpoint. The interscalene groove was located behind the midpoint of the posterior border of the muscle. The interscalene groove was then followed distally towards the clavicle. Approximately 1 to 1.5 cm above the midpoint of the clavicle, the pulsation of the subclavian artery was made out in the interscalene groove.

After local infiltrations of 1 ml of 2% lignocaine intradermallyin the interscalene groove 22 G, 5 cm short bevelled unipolar insulated needle connected to nerve locator was directed caudally towards the ipsilateral nipple and posteriorly.End point of the nerve locator was a motor response with an output lower than 0.6 mA. To avoid intravascular injection aspiration was done every 3-5 ml of study drug injected.

In the US group block performed similarly using a7.5 – 10 MHZultrasonic scanning head. Under sterile aseptic precautions, in the coronal oblique plane the probe was kept in the supraclvicular fossa. The pulsating hypo echoing subclavian artsy was visualized and confirmed by colour Doppler. The entire brachial plexus were identified as a honeycombed hyper and hypoechoic structure lateral to the subclavian artery, above first rib and pleura. The nerve bundle was confirmed with an electrical stimulation eliciting a motor response of wrist motion with a current < 0.6 MA. The needle was entered through an in-plane approach, the local anaesthetic solution was injected after careful aspiration and spread was seen encircling the trunks.

EVALUATION OF THE BLOCK:
Block execution time was defined as interval between the first needle insertion and its removal at the end of the block. Immediately following the administration of block, patient was evaluated for the onset of sensory and motor blockade every minute. Sensory block evaluated by temperature sensation using ether soaked cotton in the skin dermatomes C4-T2.Onset of motor block was assessed by loss of forearm flexion and extension,thumb and second digit pinch, thumb and fifth digit pinch. Only patients with complete motor block were included in the study. Analgesic failure was managed with local anaesthetic supplementation or GA. Local anaesthetic toxic reactions like circumoral numbness, tinnitus, twitching, and convulsions etc., as well as complications associated with technique like intravascular injection, intrathecal or epidural injection and pneumothorax were looked for.

All the data were subjected to statistical analysis. The parameters of age, sex were analysed using Chi-square test. Block execution time for motor and sensory blockade, and the success rates were analysed with Levene's test t-test and statistical significance estimated.

OBSERVATIONS AND RESULTS:
Patients in US group had a shorter block execution time mean (5.25 mins) than group NS and the difference was statistically significant. Onset of sensory and motor blockade in the group US was shorter than group NS. The number of needle attempts was lesser in group US (1.2 mins) compared to the group NS (2.2minutes) and the difference was statistically significant. The success rate was higher with the use of ultrasound guided nerve stimulation. No complications were seen in the two groups.

ONSET OF SENSORY BLOCKADE IN MINUTES MEAN ONSET OF SENSORY BLOCK IN THE TWO GROUPS

Group	N	Mean(minutes)	SD
US	20	5.90	1.16
NS	20	8.05	1.14

STATISTICAL ANALYSIS OF ONSET OF SENSORY BLOCKADE

Levene's test		T test for equality of means		
F	Significant	t	df	p value
0.061	0.806	-5.883	38	0.000

Onset of sensory blockade in the group US was shorter than group NS and the difference was statistically significant.

ONSET OF MOTOR BLOCKADE IN MINUTES MEAN ONSET OF MOTOR BLOCK IN THE TWO GROUPS

Group	N	Mean(minutes)	SD
US	20	3.65	0.875
NS	20	5.15	0.875

STATISTICAL ANALYSIS OF ONSET OF MOTOR BLOCKADE

Levene's test		T test for equality of means		
F	Significant	t	df	p value
0.026	0.872	-5.420	38	0.000

Onset of motor blockade in the group US was shorter than group NS and the difference was significantly significant.

NUMBER OF NEEDLE ATTEMPTS MEAN OF NUMBER OF NEEDLE ATTEMPTS

Group	N	Mean(minutes)	SD
US	20	1.2	0.41
NS	20	2.2	0.76

STATISTICAL ANALYSIS OF NEEDLE ATTEMPTS

Levene's test		T test for equality of means		
F	Significant	t	df	p value
9.354	0.004	-5.137	38	0.000

The number of needle attemptswas lesser in the group US compared to the group NS and the difference was significantly significant.

BLOCK EXECUTION TIME(BET)MEAN BLOCK EXECUTION TIME IN MINUTES IN THE TWO GROUPS STUDIED

Group	N	Mean(minutes)	Median	SD
US	20	5.25	5.0	1.164
NS	20	8.6	9.0	1.187

STATISTICAL ANALYSIS OF BLOCK EXECUTION TIME DISTRIBUTION

	Df	F	P value
Chi-square test	38	0.092	0.000

Patient in the US group had a shorter block execution time than group NS and the difference was statistically significant

DISCUSSION:
The supraclvicular approach for blockade of brachial plexus was first described by Kulenkampf in1911.The classical approach of eliciting paresthesia using anatomical landmarks may be associated with higher failure rates, injury to nerves/vascular structures or risk of pneumothorax. The sonographic image can be used in real time to guide the injection needleminimizing the risk of contact with pleural dome and subclavian artery. Recent studies have shown that direct visualisation of the distribution of local anesthetics with high frequency probes can improve the quality and avoid the complications of the nerve blocks. In two recent editorials, Greheeand colleagues and Peterson discussed various aspects of usingUSG to identify nerve structures in regional anesthesia.

In the present study,ultrasound guidance would increase the proportion of blocks allowing pain free surgery without supplementation or need for GA, decrease the execution times, shorten onset of sensory and motor block and reduce the complications.

VOLUME OF DRUG USED:
In the prospective study by Stephen R.Williams et al, the anesthetic solution consisted of equal volume of 0.5 % Bupivacaine and 2%lignocaine with 1in 200000 epinephrine administered upto40 ml for ultrasound guided supraclavicularblock.VincentW.S.Chan et al in their study USG nerve stimulation for supraclvicular block also used 20 ml of 0.5 % bupivacaine and 20 of lignocaine 2 %with 1 in 200000 epinephrine.

BLOCK EXECUTION TIME:
In the study by Williams et al, the average time necessary to perform USG guidednerve stimulation was significantly shorter (5+/-2.4 minutes).In the present study the block execution time in US group was 5.25 minutes and NS group it was 8.6 minutes and the difference was statistically significant.

NUMBER OF NEEDLE ATTEMPTS:
The number of needle attempts was 1.2 in group US and 2.2 in group NS. The difference was statistically significant. The study by Chan et al shows that use of ultrasound minimizes the number of needle attempts for nerve localisation.

ONSET OF SENSORY BLOCK:
The onset of sensory blockade in group US was quicker (5.90 minutes) than NS (8.05 minutes) and the difference was statistically significant.

ONSET OF MOTOR BLOCK:
The onset of motor blockade in group US was quicker (3.65minutes)

than NS (5.15 minutes) and the difference was statistically significant.

SUCCESS RATE:

A successful block was defined as anaesthesia sufficient for pain free surgery without supplementation. Blocks in the US group were successful in 19 out of 20 cases (95%) and in the NS group 18 of 20 cases (90%) and the difference was statistically significant.

CONCLUSION:

From the study it can be inferred that ultrasound guided supraclvicular brachial plexus block was clinically useful for accurate nerve localisation and to minimise the number of needle attempts. Its use along with nerve stimulation allowed statistical and clinically significant decrease in procedure times, quickened onset and provided better success rate than a nerve stimulator guided subclavian perivascular approach.

REFERENCES

1. Brown: Atlasof regional anesthesia 3rd edition.
2. Miller's Anesthesia8th edition.
3. Lee's synopsis of Anesthesia 2006.
4. VincentW.S.Chan et al, USG guided supraclvicular block Anaesthesia Analg 2003:97:1515-7.
5. P.Marhofer–ultrasound guidance in regional anesthesiaBJA 2005:94:7-17.
6. TereseT.Hirlocker-ultrasound guided regional; In search of the holy grail, vol 104, no 5, May 2006 International Anesthesia research society.
8. Karpal S-USG supraclvicular approach for regional Anesthesia of brachial plexus, AnesthesiaAnalg 1994:78:507-13.
9. Winni AP, Collins-The subclavian perivascular technique of brachial plexus Anesthesia.10.Franco CD Vieira ZE subclavian brachial plexus blocks. Success with a nervestimulator.RegionalAnesthesia and pain medicine 2000: 25 (1):41 -46.
10. Gray AT ultrasound guided regional anaesthesia ; current state of the art Anesthesiology.
11. Yang WT, ChuiPT -Anatomy of the brachial plexus revealed by sonography and the role of sonographic guidance in anaesthesia of brachial plexus1998:171:1631-6.
12. Williams et al- USG guided supraclvicular block 2003:97: 1518-23.