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Our Experience in Supraclavicular Brachial Plexus Block by Ultrasonography compared with Conventional Method in Upper Limb Surgeries

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Abstract:

Introduction: Ultrasound allows direct visualization of peripheral nerves,the block needle and local anesthetic disribution. The conventional technique of supraclavicular brachial plexus block being a blind technique may be associated with higher failure rates and injury to nerves and vascular structures,intravascular injection of local anesthetic agent, and injury to dome of pleura and pneumothorax. Hence Ultrasound (USG) is the method offering safe block of superior quality by optimal needle positioning.

Method: This study was conducted among 60 patients posted for elective upper limb surgery of ASA I and II. In one group (n=30) ultrasonography(USG) guided technique was used and in second group (n=30) elecitation of paresthesia technique was used. Various parameters including procedure time, onset time for sensory block, duration of sensory block, onset time for motor block, duration of motor block, time to achieve complete block and any complications etc were observed.

Results: Overall success rate was higher in USG guided group as compared to conventional method group, which was statistically significant ($p < 0.05$). Time to perform the block was significantly shorter in USG guided group ($p < 0.05$).
Onset time for sensory block, onset time for motor block & time to achieve a complete block was also shorter in USG guided group (p value < 0.05). Duration of sensory & motor block was significantly prolonged in USG guided group ($p < 0.05$)

Conclusion: Ultrasonography guided supraclavicular brachial plexus block is quick to perform, offers improved safety & accuracy in identifying the position of the nerves to be blocked with higher success rates.

Key Words: Brachial Plexus Block(supraclavicular approach), Ultrasonography, elicitation of paresthesia.

Introduction:

Successful peripheral nerve and plexus blockade can provide an excellent anesthetic outcome long lasting pain relief, a low incidence of nausea & vomiting and expedited hospital discharge are some of the clinical advantages for out patients. Among the various approaches of brachial plexus block, supraclavicular approach is considered easiest and effective and safest. It is carried out at the level of trunks of brachial plexus. The first supraclavicular brachial plexus block was performed in 1912.(1)The conventional

paresthesia technique being a blind technique may be associated with higher failure rate and injury to nerves and surrounding structures.

Ultrasound (USG) visualization of anatomical structure is only method offering safe blocks of superior quality by optimal needle positioning. USG allows direct visualization of peripheral nerves, the block needle, and local anesthetic distribution. The use of ultrasound for regional anaesthesia was first reported by La Grange et al in 1978(2), who performed superaclavicular brachial plexus blocks with a Doppler ultrasound blood flow detector.

Hence, a study is planned for comparison of brachial plexus block by supraclavicular approach using conventional(elicitation of paresthesia) and USG based technique.

Objectives

The main objectives of this study were to compare the effects of supraclavicular brachial plexus block using conventional blind technique and USG technique in terms of:

1. Time taken for the procedure
2. Onset and duration of sensory blockade
3. Onset and duration of motor blockade
4. Success rate
5. Incidence of complication.

MATERIAL AND METHODS

Source of Data
Sixty patients aged between 18 and 60 years and ASA Grade I and II admitted to Sheth L.G. General Hospital between December 2014 to June 2015, undergoing upper limb surgery lasting more than 30 min were included in the study.

Method of Collection of Data
The patients were randomly divided into two groups of 30 patients each:
• Group 1: (USG guided) - To receive USG guided supraclavicular brachial plexus block
• Group 2: (Conventional) - To receive conventional supraclavicular brachial plexus block by elicitation of paresthesia.

Inclusion Criteria

1. Patients of either sex, aged between 18 and 60 years
2. Patients with physical status
American Society of Anesthesiologists (ASA) Grade I and II
3. Elective upper limb surgeries.

Exclusion Criteria
1. Patients <18 years and >60 years of age
2. Patient refusal
3. Patients with significant coagulopathy or peripheral neuropathy
4. ASA Grade III and IV patients
5. Allergy to local anesthetics.
6. Infection at local site.

The various parameters were noted:
• Time taken for the procedure

• Onset and duration of sensory neural blockade
• Onset and duration of motor blockade
• Success rate
• Incidence of complications.

Grading of sensory blockade:
(by pin prick method)

• 0 no pain
• + mild pain
• ++ moderate pain
• +++ severe pain.

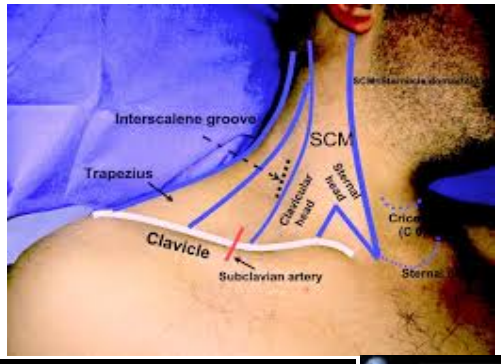
Grading of motor blockade:

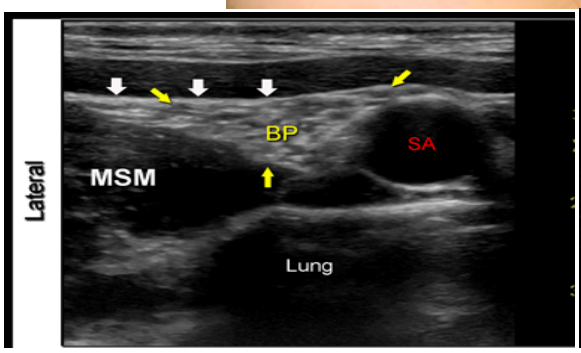
• 0 no contraction
• 1 Flicker of contraction
• 2 Active movement with gravity eliminated
• 3 Active movement with gravity
• 4 Active movement with gravity and resistance
• 5 Normal power

Procedure:

Pre-medication:
Inj. Midazolam 0.05 mg/kg(IV)
Inj. Glycopyrrolate 0.2mg (IV)
Inj. Ondansatron 4mg (IV)

Local anesthetic used:
Inj.Bupivacaine 0.5% 10ml
Inj. Lignocaine with adrenaline 1.5% 20 ml.





Data were collected every 3 min for first 15 min. And every 30 min after surgery at least for 8 h post-operatively.

All patients were observed intraoperatively as well as postoperatively for the complications like vascular puncture, pneumothorax, nerve injury & LA systemic toxicity. Intraoperatively pulse rate, SpO2 and NIBP was recorded at every 15 min interval till the end of surgery. All patients were followed up in PACU until complete recovery of sensory and motor function of the operated limb. Chest X-Ray was done post operatively in all the patients.

Suitable statistical tests were applied to compare data and p-Value < 0.05 was considered statistically significant.

OBSERVATION AND RESULTS

A prospective, randomized, comparative study was conducted in the Department of Anesthesiology, Sheth L. G. General Hospital,Ahmedabad on 60 patients aged between 18 and 60 years posted for upper limb surgeries. There were no clinical or statistically significant differences in the demographic profile of patients in either group.

Age and Weight:

The average age was 35 ± 10years in Group 1 (USG), and 34 ± 9 years in Group 2. Youngest patient in our study group was 18 years, and oldest was 60 years. The average weights of the patients were 60.50 ± 8.9 kg in Group 1 and 63 ± 9 kg in Group 2.

		Group 1	Group 2	P value
Age (years)	Mean±SD	35±10	34±9	0.242
Weight (Kg)	Mean±SD	60.50±8.9	63±9	0.276

Time Taken for the Procedure

The mean time taken for the procedure to administer a block by eliciting paresthesia (Group 2) was 10 min, whereas using an USG (Group 1) the time required for the same was 5.3 min. This was clinically and statistically significant.

		Group 1	Group 2	P Value
Time taken for Procedure(min.)	Mean	5.3	10	<0.0001
	SD	1	1.3	

Onset of Sensory Blockade

The mean time of onset of sensory blockade in Group 1(USG) was 5 ± 2 min and 6 ± 3 min in Group 2.

Onset of sensory Blockade(min)		Group 1	Group 2	P value
	Mean	5	6	0.321
	SD	2	3	

Onset of Motor Blockade

The onset of motor block was within 7 ± 3 min in Group 1 (US) and 10 ± 5 min in group 2. This difference is statistically significant.

Onset of motor Blockade(min)		Group 1	Group 2	P value
	Mean	7	10	0.03
	SD	3	5	

Duration of Sensory Blockade

In Group 1 (USG) the mean duration of sensory blockade was 270±30 min and in Group 2 240±30 min which was longer in group 1.

Duration of Sensory blockade(min)		Group 1	Group 2	P value
	Mean	270	240	0.03
Duration of Sensory blockade(min)		Group 1	Group 2	P value
	Mean	270	240	0.03
	SD	30	30	

Duration of Motor Blockade

The mean duration of motor blockade in group 1 was 250 ± 30 min and in Group 2 the duration of motor blockade was 225±30 min which was shorter in Group 2 when compared to Group 1.

Duration of Motor blockade(min)		Group 1	Group 2	P Value
	Mean	250	225	0.04
	SD	30	30	

Hemodynamic Parameters

There was no clinically and statistically significant difference in pulse rate, systolic and diastolic blood pressures between the two groups during all period of the study.

Overall Effectiveness of the Block

The block was successful in 100% in Group 1 and 96.70% of patients in Group 2. Only one patient of Group 2 required additional sedation and analgesia.

Complications

Incidence of vessel puncture/hematoma was 10% in Group 2 compared to 0% in group 1. There was no incidence of nerve injury and pneumothorax in both groups.

Discussion

Supraclavicular approach for Brachial plexus block is an easy and relatively safe procedure for upper limb surgeries. It can be given either after eliciting paresthesia or using nerve stimulator or using ultrasonography.

This study is intended to compare USG guided supraclavicular brachial plexus block with the conventional method by eliciting paresthesia in terms of time taken for the procedure, onset and duration of sensory blockade, onset and duration of motor blockade, success rate and the incidence of complications.

In our study the mean time taken for the procedure to administer block in Group 2 was 10 min, whereas using an USG (Group 1) was 5.3 min.
The study done by Morros *et al*.7 suggest that the use of US in regional anesthesia requires the acquisition of new knowledge and skills by anesthesiologists.The mean time of onset of sensory blockade in Group 1(USG) was 5 ± 2 min and 6 ± 3 min in Group 2 and of motor block was 7 ± 3 min in Group 1 and 10 ± 5 min in group 2. This is similar to the study done by Danelli *et al*.(7) (2012).
The mean duration of sensory blockade was 270±30 min in Group 1 and in Group 2 240±30 min which was longer in group 1and for motor blockade in group 1 was 250 ± 30 min and in Group 2 was 225±30 min which was shorter in Group 2 when compared to Group 1.
There was no clinically and statistically significant difference in pulse rate, systolic and diastolic blood pressures between the two groups during all periods of the study.
Incidence of vessel puncture/hematoma was 10% in Group 2 compared to 0% in group 1.
There was no incidence of nerve injury and pneumothorax in both groups.

CONCLUSION

From our study, it was concluded that:
• Success rate of the block was more with USG group than conventional
• Time taken for the block performed by USG was shorter than the conventional technique
• Onset of sensory and motor blockade was little earlier in USG group than in conventional group
• Duration of sensory and motor blockade was longer in USG group
• Complications like vessel puncture was seen with conventional method.

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