



A CLINICAL STUDY COMPARING TWO APPROCHES TO BLOCK BRACHIAL PLEXUS VIZ CONVENTIONAL SUPRACLAVICULAR AND LATERAL SUPRACLAVICULAR APPROACH

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ABSTRACT **BACKGROUND AND AIMS:** Conventional technique of supraclavicular block is associated with direct injury to the vessels, nerves and pleura, which can be minimized with lateral approach. The aim of this study was to compare success rate and complications of conventional approach with lateral approach of supraclavicular block.

MATERIALS AND METHODS: After getting approval from ethical committee, this study was carried out in department of anaesthesiology, Netaji Subhash Chandra Bose medical college Jabalpur (M.P), 60 patients of either gender between 18 to 60 years, of ASA grade I and II undergoing forearm surgeries were enrolled. After doing randomization by computer method, patients were divided into two groups of 30 each. Group C (n=30) received conventional and Group L (n=30) received lateral approach supraclavicular block using nerve locator and total 30 ml of drug (0.75% ropivacaine 20 ml + 10 ml lignocaine 2% with adrenaline.). Patients were evaluated for successful block, onset of sensory and motor block, duration of sensory and motor block and tourniquet time.

RESULTS: After prospective, randomized comparative study which was carried out in 60 patients, result achieved was higher success rate in lateral approach as compared with conventional approach.

KEYWORDS : Supraclavicular block, forearm orthopaedic surgeries, visual analogue scale, ropivacaine, lignocaine .

INTRODUCTION

For upper limb surgeries the regional nerve blocks has proved to be safe and effective method for surgery along with elimination of pain . Regional anaesthesia also protect the patient from unwanted complications of general anaesthesia like sore throat, aspiration. Brachial plexus block is an accepted technique for upper limb surgery, ambulatory anaesthesia, postoperative pain and chronic cancer pain management. There are various approaches like supraclavicular, interscalene ,transscalene , infraclavicular and axillary but they all are associated with some technical difficulties, inadequate blocks and many complications. Also the rate of conversion or supplementation with general anaesthesia from brachial plexus block is quite high. Out of various approaches supraclavicular block is the block mostly used for upper limb surgeries.

The major advantage of supraclavicular block is that , the nerves are tightly packed in the area giving a very fast and deep block. Hence it is called as " The spinal of the arm ".

Disadvantages of the conventional approach of supraclavicular block, as classically described, include an unacceptably high incidence of vascular puncture, pneumothorax (0.5-6%), phrenic nerve block (40%) and Horner's syndrome.^{1,2} The high incidence of phrenic nerve block dictates that the primary contraindication to supraclavicular block is respiratory insufficiency.³ To avoid these complications, a new approach to the supraclavicular block was described by Volker Hempel in 1981.⁴ Later on, it was modified by Dr.Dilip Kothari and termed it as "lateral approach".⁵ This technique involves needle to pass from lateral to medial side at an angle of 20° to the skin and parallel to clavicle. As the advantages of this approach were appreciating, we decided to undertake this study to compare the effectiveness of lateral approach with conventional approach of supraclavicular block.

MATERIAL AND METHODS

After obtaining institutional Ethics Committee approval this prospective randomized comparative study was carried out in 60 patients of age group 18yrs-60yrs, of ASA grade I&2 under going elective upper limb surgery. Patients with history of clotting disorders, sensitive to local anaesthetic agents, psychiatric disorders, active renal and hepatic disorders, patients not willing for regional block, pregnant and lactating women were excluded from this study.

Statistical analysis was performed by using Students t-test and x2 test. The VAS score in two groups was analysed by using a non-parametric test named Mann-Whitney U test . The critical value for the significance of the results was considered at 0.05 level.

For the purpose of study the patients were randomly allocated by random number table into two groups of 30 patients each. Patients for conventional approach included in group C and for lateral approach in

group L . Local anaesthetic agents used in this study were .75%Ropivacain and 2% lignocaine with adrenaline.

After proper preanesthetic check up and well informed written consent, all patients under went routine investigations like CBC , blood urea , blood sugar, ECG ,X ray and bleeding profile. They were properly explained about the block procedure , related complications and visual analogue scale.

On the day of surgery patients were kept nil orally for at least 6 hours prior to surgery. After taking patient on table, base line pulse rate , blood pressure, respiratory rate and Spo2 were recorded. Intravenous line established on contralateral upper limb.

Every block was performed according to standard procedure using a short bevelled 22G, 50mm sheathed needle, using with a nerve stimulator guided technique (Bbraun, stimuplex, germany).

Electrical current was initially set at 1mA with a frequency of 2 Hz and pulse duration of 0.1msec. The intensity of current was slowly decreased until contraction of forearm muscles or biceps was obtained at 0.4 or less than 0.4mA. Once the plexus was located, an assistant will administer a mixture of 10ml of 2% lignocaine and 20ml of 0.75% ropivacaine slowly after negative aspiration for blood and air.

In both the groups patients were laid supine with head turned to opposite side, arm laid by side of chest, small folded sheet was placed below the shoulder to make the field more prominent.

GROUP C - The block was instituted at a point 1cm above the midpoint of clavicle, where subclavian artery pulsations were felt. Pushing the subclavian artery medially with the help of thumb, the needle was advanced in caudal, medial and downward direction till the plexus is encountered.

GROUP L - The insertion point is 1cm above the clavicle, at the junction of inner two third and outer one third of the clavicle, which is approximately 1cm medial to the border of trapezius.

The needle was inserted at the entry point at an angle of 20° to the skin, parallel to the clavicle directing medially, avoiding the external jugular vein. Once the plexus is located, with the help of nerve stimulator, the drug mixture was administered slowly after negative aspiration. Gentle pressure at the area of drug deposition was given for uniform spread of local anaesthetic in both the groups.

After performing the block, assessments was made for the following parameters – time taken for the procedure, onset and duration of sensory blockade, need for supplementation of anesthesia intraoperatively, adverse effects and success rate.

ASSESSMENT OF SENSORY AND MOTOR BLOCKAD

Sensory block assessed in C4 to T2 dermatomes by using following grades.

- 0=No loss of sensation to pinprick
- 1=Analgesia (patient feel touch but no pain on pinprick)
- 2=Anaesthesia (patient even not feel touch sensation on pin prick)

Onset of sensory block was time taken from the end of drug injection to complete ablation of sensation (sensory score 2).

Duration of sensory blockade was time taken from onset of block to VAS>4

Onset of motor blockade was assessed by using modified BROMEZ 3 point scale.

Motor block evaluation:

- Musculocutaneous nerve - Elbow flexion
- Median nerve - Thumb and index finger opposition
- Radial nerve - Wrist extension
- Ulnar nerve - Little finger flexion

Scale:

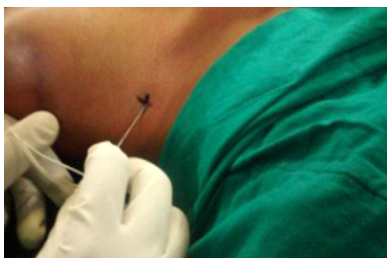
- Normal motor function - 0
- Decreased motor strength - 1
- Complete block - 2

Time to achieve complete motor block was defined as the time interval between administration of the drug and complete loss of muscle function.

PARAMETERS OBSERVED

1. Mean time to perform block (from the time of skin disinfection to the end of injection).
2. Number of attempts.
3. Tourniquet tolerance & duration
4. Successful block – Defined as analgesia in the all nerves. (musculocutaneous, median, ulnar, radial and medial cutaneous nerve of the forearm).
5. Partaial Block – If patients was supplemented with 0.5 mg/kg iv ketamine
6. Onset of Sensory block – Onset of Sensory block was taken as abolition of touch sensation over the distribution of ulnar and median and was assessed every minute after the performance of the block.
7. Onset of motor block – Onset of motor blockade was assessed every 2 minute after the block using modified Bromez 3 point scale. Time to achieve complete motor block was defined as the time interval between administration of the drug and complete loss of muscle function.
8. Duration of sensory blockade – The pain was assessed using visual Analogue scale having 10cm length numbered from 0 to 10. Patient was explained about the visual Analogue scale as 0 – No pain and 10 the worst possible pain and was asked the score in visual analogue scale. The patient was observed every 30 minutes after the surgery is over till the motor block reverses and thereafter hourly for 6hrs; two hourly for next 6hrs and then at 24 hours.
9. Duration of Motor Block: is assessed by complete loss of function to return normal muscle power.
10. Vital parameters observed intraoperatively -PR, BP, RR, Spo2
11. Complications
Pneumothrax, Accidental vessel puncture.

SURFACE LAND MARK FOR LATERAL APPROACH



SURFACE LAND MARK FOR CONVENTIONAL APPROACH



OBSERVATION & RESULT

This study comprised of two groups. Group–C:30patients were received Lateral approach of supraclavicular brachial plexus block. Group–L:30patients were received conventional approach.

TABLE 1: DEMOGRAPHIC PROFILE

	Group L	Group C	P - value
Age (Yrs)	35.96	36.61	0.840
Sex (M/F)	20/10	21/9	0.542
Weight	58.46	57.36	0.628
ASA status I/II	25/5	26/4	0.843

Both the groups were comparable with regards to age ,sex, weight and ASA grading. It is not significant .

TABLE 2: TECHNICAL DIFFICULTIES

		Group L		Group C		P - value
		No	%	No.	%	
No. of attempts	1	23	76%	5	17%	0.0001
	>1	7	24%	25	83%	
Time to perform block		6.132.17		4.860.86		0.0001

In lateral group 24% patients and in conventional group 83% patients required >1 attempts. Time required to perform block was less in group C 4.840.86 while it was 6.132.17 in group L. The difference was statistically significant.

TABLE 3: Characteristics of Sensory block

Parameters	Group L	Group C	P - value
Onset of sensory block (in min)	7.11.66	7.41.5	0.479
Duration of sensory block (in hours)	7.531.52	7.331.59	0.622

The time for onset of sensory block in group L was 7.11.66 minutes while in group C it was 7.41.5 minutes (P>0.05). The duration of sensory block in group L was 7.531.52 hours and in group C it was 7.331.59 hours (P>0.05). There was no significant difference.

TABLE 4: Characteristics of motor block

Parameters	Group L	Group C	P - value
Onset of motor block (in min)	7.11.61	11.861.65	1
Duration of motor block (in hours)	2.310.56	2.340.53	1

The time for onset of motor block in group L was 7.11.61 minutes while in group C it was 11.861.65 minutes (P>0.05). The time for duration of motor block in group L was 2.310.56 hours and in group C it was 2.340.53 hours (P>0.05). There was no significant difference.

TOURNIQUET TOLERANCE in lateral approach was good in 28 patients with 93.33% success rate where as in conventional approach it was good in 21 patients with 70% success rate. It was fair in 7% in group L and 30% in group C. The difference was statistically significant (p=0.020).

TABLE 5: SUCCESS OF PROCEDURE

Success of Procedure	Lateral Approach Group		Conventional Approach	
	No	%	No	%
Complete	28	93.33	21	70
Partial	2	6.67	9	30
'p'	0.0453 Significant			

The procedure was more successful in the Lateral approach 93.3% compared with 70% of the Conventional approach group. The

difference was statistically significant ($p=0.0453$).

TABLE 6: COMPLICATIONS

Complications Vessel injury	Lateral Approach Group		Conventional Approach	
	No	%	No	%
Present	2	6.60%	9	30.00%
Absent	28	93.40%	21	70.00%
'p'	0.020 Significant			

2/30 case in lateral approach had vascular injury. In Conventional approach 9/30 (30%) cases of vessel injury. This difference was statistically significant ($p=0.020$).

DISCUSSION

The present study was conducted to evaluate the success rate and complication of conventional approach with lateral approach of supraclavicular block. We found the procedure was completely successful in 93.3% of the lateral approach group and 73.4% of the Conventional approach group. The difference was statistically significant ($p=0.01$).

Our study reaffirms the outcome of study conducted by Dr. Kothari in lateral approach, placing needle parallel to the course of brachial plexus and near the most compact plexus of nerves, results in higher success rate. Dr. Kothari⁶ achieved a success rate of 98%, and DK Sahu⁷ achieved a success rate of 92%.

Moore *et al.*⁸, and Dupreet *al.*⁹, had failure rates of 8 and 11%, respectively. Brand and Papper¹⁰ had a success rate of 84.4%. The success rate was 85.2% with transscapular approach. Hempel¹¹

Pham Dang *et al.*¹² observed satisfactory anaesthesia in 93% of the cases. Nishiyama N, Naqanuma K *et al.*, reported that the success rate of their study was 95%. They did this lateral approach under fluoroscopic guidance.¹³ The success rate in the study done by Pothula Krishna Prasad *et al.*¹⁴ with the help of nerve stimulator was 88% in lateral approach versus 68% in conventional approach.

Time to perform block in Lateral approach range from minimum 4 minutes to maximum 11 minutes with mean of 6.13 and standard deviation of 2.17. In Conventional approach range from 3 minutes to maximum 7 minutes with the mean of 4.6 and standard deviation of 0.86. The difference was statistically significant ($p = 0.0001$). Lateral approach relatively easy to perform block. This correlates with the study done by Dr. Dilip Kothari *et al.*⁶

The mean time taken for the procedure was 5.45 minutes in Group-C compared to 8.62 minutes in Group-L ($p<0.001$) in the study performed by Pothula Krishna Prasad *et al.*¹⁴

Number of attempts in Lateral approach range from 1 to 3 attempts mean value of 1.267 and standard deviation of 0.52. In Conventional approach range from 1 to 4 attempts mean value of 2.1 and standard deviation of 0.75. The difference was statistically significant ($p = 0.0001$).

There was no significant difference with the onset of sensory block and motor block ($P=0.479$, $P=1$) respectively, this correlates with the study done by Pothula Krishna Prasad *et al.*¹⁴. This might be attributed to the pharmacological properties of the drug rather than the type of approach used.

There was no significant difference with the duration of sensory and motor block ($P=0.62$, $P=1$) respectively, this correlates with the study done by Pothula Krishna Prasad *et al.*¹⁴. This might be attributed to the pharmacological properties of the drug rather than the type of approach used.

Tourniquet tolerance in Lateral approach was good in 28 patients with 93.3% success rate where as Conventional Tourniquet tolerance was good in 21 patients with 70% success rate and fair in 9 patients % of 30. The difference was statically significant ($p=0.020$).

2 case had vessel injury 6.6% in the lateral approach, whereas 9 cases

had vessel injury, 9/30 cases (30%) in Conventional approach. This difference was statistically significant ($p=0.020$). The incidence of vessels puncture was 15% in the first half and 5% in the later half of the study conducted by DK Sahu *et al.*⁷. Dr. Kothari⁶ has described 8% incidence of vessels puncture.

In lateral approach, needle is directed parallel to clavicle and not inward and downward toward inlet, and the incidence of pneumothorax is nil. Nguyen HC¹⁵. In our study, none developed pneumothorax. Brand and Pepper¹⁰ injected local anaesthetic agent by Murphy's supraclavicular route, but had 6.1% incidence of pneumothorax. Moore⁸ described 1.5% incidence of pneumothorax.

No patient developed Horner's syndrome or recurrent laryngeal nerve blockade, while Pham Dang *et al.*¹² observed asymptomatic phrenic nerve paralysis (60%), Horner's syndrome (10%) and transient recurrent nerve paralysis (1.5%). Dupreet *al.*⁹ and Hemepelet *al.*¹¹ also reported Horner's Syndrome in 9 and 47% cases in their studies, respectively. Kumar *et al.*¹⁶ and Ross¹⁷ reported epidural and subdural blockade due to widespread distribution of anaesthetic agent with interscalene route.

A Kumar *et al.*¹⁶, reported that lateral approach is a better alternative to conventional approach with high success rate and less complication rate. The observations of this study correlated with our study, the difference being, they did not use peripheral nerve stimulator to perform the block.

CONCLUSION

It can be concluded that Supraclavicular blockade of the brachial plexus by Lateral approach provides an adequate sensory and motor blockade. good tourniquet tolerance, high success rate and less complications as compared to Conventional approach.

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