



Anaesthesiology

A COMPARATIVE PROSPECTIVE RANDOMIZED CLINICAL STUDY BETWEEN SUPRACLAVICULAR PERIVASCULAR TECHNIQUE AND INFRACLAVICULAR BRACHIAL PLEXUS BLOCKADE FOR BELOW ELBOW SURGERIES

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ABSTRACT

OBJECTIVE: To compare the efficacy of supraclavicular perivascular technique and vertical infraclavicular brachial plexus block, using nerve locator for below elbow surgeries.

MATERIALS AND METHODS: Eighty patients of ASA grade I or II of either sex undergoing below elbow surgeries (mostly orthopedic surgeries) were randomly allocated into group S and group I. Each group comprises of 40 patients. Surgery was done under Vertical Infraclavicular approach of Brachial plexus Block in Group I
Supraclavicular perivascular approach of Brachial plexus block in Group S.

RESULTS: The supraclavicular perivascular technique and vertical infraclavicular brachial plexus block, using nerve locator for below elbow surgeries to evaluate the Ease of technique, Time taken for the onset of sensory and motor blockade, Total duration of sensory and motor blockade and Occurrence of complications statistically showed no significant differences between the two groups.

CONCLUSION: Nerve locator guided Infraclavicular block of brachial plexus is similar to nerve locator guided supraclavicular block in the form of ease of technique, onset and duration of sensory & motor blockade and on complication rate.

KEYWORDS : Nerve locator guided supraclavicular block, Infraclavicular block.

Introduction

Peripheral nerve blockade offers several advantages when compared to general anesthesia or local anesthesia. The patient can remain awake and on spontaneous respiration, complications of general anesthesia can be successfully avoided.^{1,2}

In peripheral nerve blockade the affected limb's sympathetic nerves are blocked, leading to vasodilation and the anaesthetized limb which remains for several hours after surgery, providing excellent post operative pain relief. Deep and superficial structures of the limb are similarly anesthetized, permitting extensive surgical exploration and correction.^{3,4}

Brachial plexus blockade provides excellent intraoperative as well as postoperative analgesia, eliminating the need for post-operative opioids, resulting in quicker recovery, shortened hospital stay, increased patient satisfaction and ultimately a decrease in perioperative costs when compared to general anaesthesia. Continuous catheterization of the brachial plexus is one of the best methods of providing postoperative analgesia.^{5,6,7}

Kulenkampff first described the classical supraclavicular approach to the brachial plexus. The subclavian perivascular block was first described by Winnie and Collins. This approach became popular as it was associated with less incidence of pneumothorax than the Kulenkampff approach. The infraclavicular approach was first developed by Raj an Indian anesthesiologist practicing in USA.^{8,9,10}

AIM OF THE STUDY:

To compare the efficacy of supraclavicular perivascular technique and vertical infraclavicular brachial plexus block, using nerve locator for below elbow surgeries. To evaluate

- Ease of technique.
- Time taken for the onset of sensory & motor blockade.
- Total duration of sensory and motor blockade.
- Complications.

MATERIALS AND METHODS:

This is a prospective randomized study conducted at Govt. Theni Medical College And Hospital, Theni.

Eighty patients of ASA grade I or II of either sex undergoing below elbow surgeries (mostly orthopedic surgeries) were randomly allocated into group S and group I. Each group comprises of 40 patients.

Vertical Infraclavicular approach in Group I.
Supraclavicular perivascular approach in Group S.

The study was done after Ethical Committee approval and written informed consent obtained from all patients included in the study.

INCLUSION CRITERIA:

- ASA grade I & II patients of either sex
- Age :20 - 60 yrs
- Weight: 50 -70 kg
- Type of surgery: Elective below elbow (orthopaedic sx)

EXCLUSION CRITERIA:

- Patient refusal
- Inability to understand the information provided
- Known/ anticipated difficult intubation, Impaired coagulopathy
- Coexisting lung, heart, liver, or kidney disease
- Pregnancy
- Allergy to local anaesthetics
- Chest deformities
- Previous clavicle fractures, neurological disorders.

METHODS:

80 patients under ASA I and II scheduled to undergo elective Below elbow surgeries were included in this study. Patients underwent thorough preoperative evaluation

Premedication with Tab. midazolam 7.5mg orally one hour prior to surgery with sips of water. Standard monitoring with BP/pulse/ SpO₂/ ECG, IV access secured. Inj. fentanyl 2 microgram/kg iv given to the patient on the table 5mins prior to giving the block.

- Group I - 15ml of 2% lignocaine with adrenaline 1 in 2,00,000 (5mic/ml) + 15ml of 0.5% bupivacaine.
Group S - 15ml of 2% lignocaine with adrenaline 1 in 2,00,000 (5mic/ml) + 15ml of 0.5% bupivacaine.

Nerve plexus will be identified using the nerve stimulator. Surgery will be allowed to start 20 mins after giving the drug.^{11,12}

PARAMETERS OBSERVED:

1. **Time to perform block-** from the time of skin disinfection to the end of injection.
2. **Quality of the block-** defined as a blockade in the four nerves

Below elbow (musculocutaneous, median, ulnar and radial).

- Satisfactory block - Surgery without patient discomfort or need for Supplementation.
- Unsatisfactory block - a sensory region involved in the surgery was not completely anesthetized and the block was supplemented by a rescue block.

- Complete failure - if the patient still experienced pain Despite supplementation, GA was administered.
- 3. Onset of sensory block** - Onset of sensory block was taken as abolition of temperature sensation using alcohol-soaked gauze over the distribution of four.

0= no difference from an unblocked extremity
 1= less cold than unblocked extremity.
 2= no sensation of cold

- 4. Onset of motor blockade** - Onset of motor blockade was assessed every 2 minute after the block using the following score.
 - 0- Normal power.
 - 1- Reduced power compared with contralateral side.
 - 2- Incapacity to overcome gravity.

Attaining a score of 1 was considered as onset of motor Block.

- 5. Duration of motor Blockade** - When score (2) changes to score (1)the motor blockade is said to be reversed. duration of motor block is noted from time from score (2) - (1).
- 6. Post operative analgesia** - The time interval between the onset of sensory blockade to the first requirement of post operative analgesia was recorded in every patient. The patient was observed every 30 minutes after the surgery is over till the motor block reverses thereafter hourly for 6 hrs; second hourly for next 6 hrs and then at 24 hours.
- 7. Vital parameters:**
 - Pulse rate
 - Blood pressure
 - Respiratory rate monitored periodically
 - Oxygen saturation
 - ECG
- 8. Complications:**
 - Pneumothorax
 - Vascular puncture
 - Horner's syndrome
 - Dyspnea.

DATAANALYSIS:

Data analysis was done with the help of computer using SPSS software.

Data was expressed as mean +/- of SD.

Quantitative Analysis was compared with Student's 't' test and the Fisher's exact test for 2 x 2 contingency tables were used.

A 'p' value < 0.05 was considered significant.

OBSERVATIONS AND RESULTS:

1. AGE DISTRIBUTION: Supraclavicular group - from 20 years to maximum of 55 years ,with a mean value of 33.52 years, and standard deviation of 10.09. Infraclavicular group - from 20 years to maximum of 50 years, with the mean value of 32.88 years, and standard deviation of 8.45.

Table-1 Age Distribution

Age group	Group S		Group I	
	No.	%	No.	%
20 - 30 years	20	50	19	47.5
31 - 40 years	12	30	13	32.5
41 - 50 years	5	12.5	8	20
>51 years	3	7.5		
Total	40	100	40	100
Range	20 - 55 years		20 -50 years	
Mean	33.52 years		32.88 years	
S.D.	10.09 years		8.45 years	
'p'	Chi sq = 3.76; p = 0.28; Not significant			

2. SEX DISTRIBUTION:

Infraclavicular group-males were 26, and the rest were females. Supraclavicular group - males were 27, and the rest were females.

Table-2 Sex distribution

Sex	Group S		Group I	
	No.	%	No.	%
Males	27	67.5	26	65
Females	13	32.5	14	35
Chi square value	0.06			
'p'	0.8 not significant			

3.WEIGHT DISTRIBUTION:

Group-S - from 50kg to 70 kg, with a mean of 58.1, and the standard deviation of 5.47,
 Group-I - from 50-68kg, with a mean of 58.62, and the standard deviation of 5.27. P value insignificant.

Table-3 Weight distribution

Weight(in kgs)	Group S	Group I
Range	50 – 70	50 – 68
Mean	58.1	58.62
S.D.	5.47	5.27
'p'	T = 0.44; P = 0.66; Not significant	

4.DURATION OF SURGERY:

Group-S - 60 min to 180 min with mean of 127.75,and the standard deviation of 33.24.
 Group-I - 80-180 mins,with a mean of 124.25, and the standard deviation of 30.03. P value insignificant.

Table-4 Duration of surgery

Duration of Surgery	Group S	Group I
Range	60 – 180	80 - 180
Mean	127.75	124.25
S.D.	33.24	30.03
'p'	T = 0.49; P = 0.6; Not significant	

5. TIME TO PERFORM BLOCK:

Group-S - from 3 min to 7 min, with the mean of 4.35,and the standard deviation of 0.89.
 Group-I- from 3min to 6 min, with the mean of 4.15min,and the standard deviation of 0.8.

The 'p' value was not significant.

Table-5 Time to Perform block

Time to perform block (in minutes)	Group S	Group I
Range	3 – 7	3 – 6
Mean	4.35	4.15
S.D.	0.89	0.8
'p'	T = 1.05; P=0.29; Not significant	

6.TIME FOR ONSET OF MOTOR BLOCK:

Group S - from 3 min to 6 min, with the mean of 4.21min standard deviation of 0.86.
 Group-I- from 3min to 6 min, with the mean of 4.05minutes, standard deviation of 0.749 min.

P value insignificant.

Table-6 Time of onset of motor block

Time for onset of motor block in minutes)	Group S	Group I
Range	3 – 6	3 - 6
Mean	4.21	4.05
S.D.	0.86	0.749
'p'	T = 0.85; P = 0.39; Not significant	

7.TIME FOR ONSET OF SENSORY BLOCK:

Group-S - 6min to 12 min, with the mean value of 8.24 min, and the standard deviation of 1.45.

Group_I- 6min to 12 min, with the mean of 8.45min and the standard deviation of 1.52.

P value insignificant.

Table-7 Time of onset of sensory block

Time for onset of sensory block (in minutes)	Group S	Group I
Range	6 – 12	6 - 12
Mean	8.74	8.45
S.D.	1.45	1.52
'p'	T = 0.88; P = 0.38; Not significant	

8.MOTOR BLOCK TIME:

Group-S- from 390min to 540 mins, with the mean of 464.1min, standard deviation of 38.44.

Group-I- from 390 min to 540 min, with the mean of 452.5mins, standard deviation of 40.11.

P value insignificant.

Table-8 Motor block time

Duration of motor block (in minutes)	Group S	Group I
Range	390 – 540	390 – 540
Mean	464.1	452.5
S.D.	38.44	40.11
'p'	T = 1.31; P = 0.193; Not significant	

9.POST OPERATIVE ANALGESIA TIME:

Group-S- from 360 min to 480 min, with mean of 429.49, standard deviation of 35.02.

Group-I,- from of 360 min to 480 min with the mean of 414 mins, standard deviation of 36.71.

P value insignificant.

Table-9 Postoperative analgesia time

Duration of Post op Analgesia	Group S	Group I
Range	360 – 480	360 – 480
Mean	429.49	414
S.D.	35.02	36.71
'p'	T = 1.92; P = 0.06; Not significant	

10.QUALITY OF BLOCK:

Quality of block, that is involvement of four terminal nerves.

Group-S- 3 out of four nerves were blocked in 2 pt (5 %), all four nerves were blocked in 37 pts (92.5 %)and complete failure in 1(2.5%)patient.

Group I - 3 out of four nerves were blocked in 2 pts (5 %) all four nerves were blocked in 38 pts (95 %).

The 'p' value of 0.6 was statistically insignificant.

Table-10 Quality of block

	Grp I	Grp S	chi sq	p value
Satisfactory	38(95%)	37(92.5%)	1.01	0.6
Unsatisfactory	2 (5%)	2 (5%)		
complete failure		1 (2.5%)		

11.COMPLICATIONS:

Group S - vascular puncture was 3(6.7%) , no vessel punctures in Group I (0%).

2 cases of horner s syndrome in group S and No such complication in group I.

No other complications were noted in either group. p' value was 0.06 which is statistically insignificant.

Table-11 Complications

Complications	Group S		Group I	
	No.	%	No.	%
V.P & HS	5	12.5	0	0
No of.complications	35	87.5	40	100
Chi square value	5.33			
'p' value	0.06			

DISCUSSION:

In this study, the supraclavicular and infraclavicular approach to the brachial plexus block using neurostimulation was compared; it was found that the two approaches did not show any significant differences.

By statistical analysis of two Groups the age and sex distribution in both the Groups was statistically not significant with a p value of 0.28(p>0.05) and 0.8 respectively.

On comparing the weight of the patients in two groups it was statistically not significant with a p value of 0.66 (p>0.05).

Both the groups were comparable in relation to Age, sex and Weight.

Duration of Surgery:

The mean duration of surgery in Group S was 127.75 and the mean duration of surgery in Group I was 124.25 with a P value of 0.6 (p> 0.05), which is also statistically not significant.

Time to perform block:

Time to perform block in Group-S ranges from 3 min to 7 min, with the mean of 4.35, standard deviation of 0.89.

In Group-I, the time to perform the block ranges from 3min to 6min, with the mean of 4.15min, and standard deviation of 0.8, with a p value of 0.29, which is not significant. (p> 0.05)- Comparable with the study of Genevieve Arcand, Stephen Williams, et al.^{13,14}

Onset of sensory Blockade:

Mean onset of sensory block in Group S was 8.74 min mean and in Group I it was 8.45min. The difference between the two groups was statistically not significant with a p value of 0.38 (p>0.05), again comparable with the study of Genevieve Arcand, Stephen Williams, et al.^{15,16}

Onset of motor blockade:

Mean onset of motor blockade in Group S was 4.21 min and in Group I it was 4.05min. The difference between the two groups was statistically not significant with a p value of 0.39 (p>0.05).

Quality of block:

Satisfactory block, that is involvement of four terminal nerves. In Group-S, 3 out of four nerves were blocked in 2 pt (5 %), all four nerves were blocked in 37 pts (92.5 %)and complete failure in 1(2.5%) pt . In Group I, 3 out of four nerves was blocked in 2 patients (5 %) and all four nerves were blocked in 38 patients (95 %).

One patient in Group S underwent general anaesthesia.^{17,18}

Applying Chi square tests, it was found to be statistically insignificant.(p'vaule 0.6)-similar to study of Chun Woo Yang et al in which in Group S complete failure is 2%,unsatisfactory block is 12% and satisfactory block is 86%.

In Group I unsatisfactory block is 12% and satisfactory block is 88%.^{19,20}

Duration of Motor Block:

Mean duration of motor block from score 2-1 in Group S was 464.1 minutes and in Group I 452.5 minutes. The difference between the two groups was statistically not significant with a p value of 0.193 (p>0.05).

Duration of post operative analgesia:

The mean duration of post operative analgesia till the requirement of first dose of post op analgesia in Group S was 429.49 mins and in Group I it was 414 minutes. The difference between the two groups was not statistically significant with a p value of 0.06 (p>0.05). Thus the quality of blockade was not statistically significant between the two groups which is comparable with the study of Yang, et al.^{21,22}

Complications:

The number of vessel punctures in Group S was 3(6.7%) and there were no vessel punctures in Group I (0%). There were 2 cases of horner's syndrome in Group S and no such complication in Group I. Applying Chi square tests, the 'p' value was 0.06 which is statistically insignificant.

No other complications were noted in either group.

Although the incidence of pneumothorax is often feared in infraclavicular block, it is an extremely rare complication.^{23,24}

CONCLUSION:

From this study it is inferred that nerve locator guided Infraclavicular block of brachial plexus is similar to nerve locator guided supraclavicular block in the form of ease of technique, onset and duration of sensory & motor blockade and on complication rate.

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