A Comparative Study of Brachial Plexus Block using Infraclavicular (Coracoid) and Axillary Approaches in Forearm Surgery

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ABSTRACT

Introduction: Regional anaesthesia is more preferred over general anaesthesia considering easy techniques and the advantage of an awake patient. The Brachial plexus can be blocked by various approaches namely interscalene, supraclavicular, infraclavicular and axillary. Aim of this study was to compare two approaches of brachial plexus block (Infraclavicular block using coracoid approach and axillary block).

Material and methods: A prospective, randomized comparative study comprising of 60 patients, divided randomly into two group. Group A received Infraclavicular block using lateral coracoid approach. Group B received Axillary block. Duration of surgery, Time taken to perform block, Time taken for the onset of sensory blockade, motor blockade, the degree of motor blockade, Discomfort during blockade, positioning or insertion of the needle, tourniquet tolerance and complications were observed.

Results: Time taken to perform block, successful blockade, tourniquet tolerance was better in coracoid approach group when compared to axillary group. Onsets of both sensory and motor blockade were similar in both the groups. Complication like vascular puncture was found to be more with axillary block than with infraclavicular block.

Conclusion: Brachial plexus blockade with infraclavicular technique by the coracoid approach was found to be better than Axillary approach.

Keywords: Infraclavicular block, Axillary block, Brachial plexus block, vascular puncture and Nerve Stimulator

INTRODUCTION

The merits of regional anaesthesia compared to general anaesthesia are many and have been well documented. The pain relief during the perioperative period can be maintained in the postoperative period, reducing the occurrence of side-effects caused by opioids[1,2] (especially pruritus, nausea, vomiting and sedation). There are various approaches to the brachial plexus block such as Supraclavicular, Interscalene, Infraclavicular and Axillary approaches.[3] The infraclavicular approach of brachial plexus has its own merits like decreased incidence of discomfort during patient positioning and also reduction in the chances of pneumothorax.[4] The various modalities widely in practice to identify a nerve to facilitate the block are elicitation of paresthesia (blind techniques), stimulation of peripheral nerves (nerve locator) and ultrasound guided technique which is gaining importance in the recent years. The chances of successful nerve blockade seem to be high with the use of nerve locator than with blind techniques.[5] Aim of this study was to compare two different approaches of brachial plexus block using the Infraclavicular technique by the coracoid approach and Axillary approach using the nerve stimulator in Forearm surgeries.

MATERIAL AND METHODS

A prospective, randomized comparative study was done in Department of Anesthesiology, Government Kilpauk Medical College Hospital and Government Royapettah Hospital. Institutional Ethics committee approval and written Informed consent were obtained. Patients of ASA 1 and 2 of both genders, age 18 to 45 years, weighing between 45 to 70 kg posted for forearm surgeries were selected for the study. Patients with hypersensitivity to the drug, chest wall deformities, any distortion of local anatomy, neck contractures, local infection, coagulopathy, pneumothorax, patient's refusal and pregnant patients were excluded. Patients were all evaluated preoperatively and clinically examined. Investigations including biochemical, electrocardiogram, CXR were done prior to the assessment. Procedures were explained in detail and written consent was obtained. Patients were divided randomly into two groups.

GROUP A: 30 patients receiving infraclavicular block of brachial plexus using lateral coracoid approach. GROUP B: 30 patients receiving brachial plexus block using axillary approach. All the patients selected for the study were kept in nil per oral state of about 8 hours before taking up for the procedure. Local anaesthetic test dose was carried out using 0.1 ml of Injection. Lignocaine 2%. Intravenous access was obtained with 18G IV cannula. Antacid prophylaxis with Injection Ranitidine 50 mg and Injection Ondansetron 0.1 mg/kg were given intravenously. Injection Midazolam (0.02 – 0.05 mg/kg) was given as premedication intravenously 10 minutes before the procedure.

The procedure was performed in the theatre. Boyle machine, suctioning equipment, emergency intubation cart, Manual resuscitation bag with mask and reservoir were kept ready. Routine monitoring with ECG, Pulse Oximetry, NIBP was done. In patients belonging to group A, infraclavicular block of brachial plexus was carried out using lateral coracoid approach. Under strict aseptic precautions, identification of the coracoid process was done and a point about 2 cm inferior and 2 cm medial to coracoid process was infiltrated with 1-2 ml of 1% lignocaine. Insulated stimulating needle was then inserted at right angles to

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the skin. The infraclavicular block was given with the guidance of a nerve stimulator which was attached to the proximal point of 50mm, 22 G insulated stimulator needle until the distal motor response (contraction of the middle and ring finger) was elicited with 0.5 mA current. Then Injection of 25ml – 30 ml of 0.5% bupivacaine was done with intermittent aspiration. In patients belonging to group B, Axillary block was performed using multiple Injection technique. All four main branches of brachial plexus (ulnar, radial, median and musculocutaneous nerves) were located based on the specific twitches elicited by stimulation. Arm flexion for Musculocutaneous nerve; Arm and finger extension, supination for Radial nerve; Wrist, second and third finger flexion, pronation for Median nerve; Fourth and fifth finger flexion, thumb adduction for Ulnar nerve. 5ml of 0.5% bupivacaine was injected for each nerve. Duration of surgery (in minutes), time taken to perform block (in minutes), time taken for the onset of sensory blockade (in minutes), time taken for the onset of motor blockade (in minutes), degree of motor blockade, discomfort during blockade, discomfort during positioning or insertion of the needle, tourniquet tolerance and complications were observed. Success rate – sufficiency of the block to perform surgery was observed. Block was termed as successful when it does not need any supplementation. Patients in whom the block was insufficient, were supplemented with either Injection Fentanyl (2 μ/kg) or local infiltration at the surgical site. Those converted to general anaesthesia were excluded from the study.

STATISTICAL ANALYSIS

Data obtained were subjected to statistical analysis. Continuous variables were analysed using Independent sample t test and chi- square test was used to analyse categorical variables. P value less than 0.05 was taken as statistically significant.

RESULTS

60 patients were included in the study, distribution of demographic profile like age, sex, weight seems to be equal and comparable among the two study groups.

Time taken to perform block ranges from 3 to8 minutes in group A with mean of 5.13 and standard deviation of 1.279 whereas in group B, it ranges from 6 to 11 minutes with mean 8.53 and standard deviation 1.137. The 'p' value was found to be <0.0001 (p value<0.05). Hence, the difference observed among the two study groups was found to be statistically significant (Table-1).

No discomfort was observed in 11 (36.7%) patients belonging to group A compared to 4 (13.3%) patients in group B. Mild discomfort was observed in 13 (43.3%) patients belonging to group A compared to 10 (33.3%) patients in group B. Moderate discomfort was observed in 4 (13.3%) patients belonging to group A compared to 11 (36.7%) patients in group B. Severe discomfort was observed in 2 (6.7%) patients belonging to group A compared to 5 (16.7%) patients in group B. The 'p' value was observed to be 0.042 (p value <0.05). Hence, the difference observed among the two study groups was found to be statistically significant (Table-2).

Block was sufficient to perform surgery in 27 (90%) patients and insufficient in 3 (10%) patients in group A. In group B, block was sufficient to perform surgery in 21 (70%) patients and insufficient in 9 (30%) patients. The 'p' value was observed to be 0.053 and the difference among the two groups was to identified to be statistically significant (Table-3).

There was no tourniquet sensation in 27 (90%) patients in group A compared to 22 (73%) of patients in group B. Tourniquet sensation was felt but no pain in 2 (6.7%) patients in group A compared to 5 (16.7%) patients in group B. Tourniquet pain was felt in 1 (3.3%) patient belonging to group A compared to 3(10%) patients belonging to group B. The 'p' value was 0.0247 and the difference among the two study groups was observed to be statistically significant (Table-4).

Complications like vascular puncture occurred in 1 (3.3%) patient in Group A, compared to 3 (10%) patients in group B. complications didn't occur in 29 (96%) patients in group A, compared to 27 (90%) in group B. The 'p' value was 0.030 and the difference between the two study groups was found to be statistically significant (table-5).

DISCUSSION

Time taken to perform block was shorter in coracoid approach group when compared to Axillary approach group. Onsets of both sensory and motor blockade were similar in both the groups. Successful block was achieved more with coracoid approach group than with the axillary approach group. Tourniquet tolerance was found to be better with coracoid approach

Parameter	Time taken to perform block (in minutes)	
	Coracoid approach Group A	Axillary approach Group B
Mean	5.13	8.53
S.D.	1.279	1.137
P value	<0.0001	

Table-1: Time taken to perform block in both groups

Discomfort during blockade	Coracoid approach group A		Axillary approach group B	
	Patients	%	Patients	%
Nil	11	36.7	4	13.3
Mild	13	43.3	10	33.3
Moderate	4	13.3	11	36.7
Severe	2	6.7	5	16.7
P value	0.042			

Table-2: Discomfort during blockade in both groups

Success of procedure	Coracoid approach group A		Axillary approach group B	
	Patients	%	Patients	%
Sufficient	27	90	21	70
Insufficient	3	10	9	30
P value	0.053			

Table-3: Success rate of the procedure in both groups

Tourniquet tolerance	Coracoid approach Group A		Axillary approach Group B	
	No	%	No	%
0-no sensation	27	90	22	73
1-Sensation No pain	2	6.7	5	16.7
2-pain	1	3.3	3	10
P value	0.0247			

Table-4: Tolerance to tourniquet in both groups

Complications	Coracoid approach Group A		Axillary approach Group B	
	No	%	No	%
vascular puncture present	1	3.3	3	10
Absent	29	96.7	27	90
P value	0.030			

Table-5: Incidence of complications during the procedure in both groups

group than with the axillary approach group. Complication like vascular puncture was more in axillary approach than with coracoid approach. K.Whiffler et al[6] conducted a prospective randomized controlled trial of infraclavicular block using coracoid approach. They found that compared with supraclavicular approach pulmonary complications do not occur and also a higher level of analgesia can be obtained when compared to axillary approach. J.Desroches et al[7] conducted a study to describe the sensory distribution, motor blockade and clinical efficacy of infraclavicular approach of brachial plexus block by coracoid approach. They concluded that this approach of infraclavicular block has very good tolerance to tourniquet and produces extensive sensory blockade and consistent anesthesia for surgeries of the upper limb. K J Chin et al[8] conducted a study to compare other approaches of the brachial plexus with infraclavicular approach in terms of safety and efficacy. They concluded that for lower arm surgeries infraclavicular block provides efficient anaesthesia like other techniques and is also simple to learn and perform. Also tourniquet pain and discomfort during block is very less. M Neuburger et al[9] conducted a clinical trial on efficiency of vertical approach of infraclavicular block for providing brachial plexus anaesthesia with use of peripheral nerve stimulator and found that complications like nerve lesions or pneumothorax does not occur. The vertical approach using nerve stimulator is an easy and simple technique for providing brachial plexus anaesthesia and very easy to master. HG Kilka[10], P Geiger et al found that infraclavicular brachial plexus block using vertical approach is a successful technique when compared to other techniques. It also provides excellent tourniquet tolerance of the upper arm for longer period of time. Onset of complete nerve block is achieved faster and this technique also provides longer period of analgesia postoperatively. Lower risks and high patient acceptance makes this technique a better one. Z Ertung[11] et al conducted a clinical trial on comparison of axillary approach and infraclavicular approaches of brachial plexus blockade for surgeries involving forearm and arm and concluded that both the approaches are similar in terms of safety and efficacy. But infraclavicular approach is preferred to the axillary approach in terms of mobility. Deleuze[12] and Arnaud compared single stimulation lateral infraclavicular block with triple stimulation axillary block. The complete block in median, radial, ulnar, musculocutaneous, and medial antebrachial cutaneous nerves was taken for clinical success rate and they concluded that single shot ICB is equally effective as a triple nerve stimulation axillary block. Heid F M et al[13] conducted a study to compare modified approach of axillary block and vertical approach of infraclavicular block and found that both techniques provided sufficient surgical anesthesia, vertical infraclavicular plexus block was found to be superior over high axillary block in terms of higher success rate and a faster onset. Lahori VU et al[14] conducted study to compare axillary block and infraclavicular block on their efficacy using a nerve stimulator for surgeries of the upper limb. They found that VIB was better in terms of easily identifiable landmarks, patient comfort during the procedure and the ability to block more nerves than axillary approach. Koscielniak – Nielsen ZJ et al[15] compared infraclavicular and axillary blocks in terms of discomfort during performance of block. They also assessed pain during passage of needle, while Injecting local anesthetic drugs and using nerve stimulator, complications and analgesia. They found that efficacy of block, time of onset and patient acceptance were equal in both the blocks but in terms of discomfort infraclavicular block using single Injection seems to be better than axillary approach with multiple Injections.

CONCLUSION

From this study, Brachial plexus blockade with infraclavicular technique by the coracoid approach was found to be better than Axillary approach in various aspects taking into consideration the ease of performing the block, negligent vascular punctures, Multiple Injection sites (as in axillary), tourniquet tolerance.

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