A Study to Compare Efficacy of The Supraclavicular (Sc BPB) and Axillary (Ax BPB) Brachial Plexus Block

Vaijayanti S. Gandhi[1], Basavaraj V. Modi[2]

ABSTRACT

Introduction: Surgical anaesthesia of upper limb can be obtained by nueral blockade of brachial plexus. We can approach the brachial plexus at any point, right from the level of the nerve roots to that of isolated peripheral nerves.Supraclavicular approach is the most widely used method. When there is inability to use this approach due to local pathology or posture etc, the Axillary approach is another alternative, which is safe and easy to perform. Objective of the study was to compare the Supraclavicular and Axillary approaches using peripheral nerve stimulator.

Material and Method: In this study, 60 patients of ASA physical status grade I and II, scheduled to undergo operative procedures of upper extremity below distal end humerus were randomly divided into two groups, Sc BPB group and Ax BPB group, 30 patients in each group.

Results: Sc BPB group showed a longer duration of analgesia. Muscle relaxation was adequate in 90% of cases in both the groups. In Sc BPB group 6 % while in Ax BPB group 10 % cases had nerve sparing. Difference between both the groups was statistically insignificant. Accidental vessel puncture was seen in 10 % (3) cases in Sc BPB group while in Ax BPB group no complications were seen. No incidence of haematoma formation or pneumothorax was seen. No other complications were seen in either group.

Conclusion: Onset of action in Supraclavicular approach is faster than Axillary approach though both the techniques for brachial plexus block are safe and simple to perform due to easy surface landmarks. In both the groups motor action starts earlier than sensory

Key words: operative procedures, upper extremity, humerus

INTRODUCTION

Surgical anaesthesia of upper limb can be obtained by nueral blockade of brachial plexus. We can approach the brachial plexus at any point, right from the level of the nerve roots to that of isolated peripheral nerves.[1]

Supraclavicular approach is the most widely used method. When there is inability to use this approach due to local pathology or posture etc, the Axillary approach is another alternative, which is safe and easy to perform.[2]

Earlier when these methods were performed with the parathesia technique the failure rates may be high. Now with the advent of peripheral nerve stimulator, localization of nerves has become easier and failure rates have dropped down.[3]

Though it is like old wine in new bottle, present study is designed to compare the Supraclavicular and Axillary approaches using peripheral nerve stimulator. The comparison is in terms of safety, nerve sparing, onset and duration of anaesthesia, and acceptability of the procedure by the patient and surgeon.

MATERIAL AND METHOD

In this study, 60 patients of ASA physical status grade I and II, scheduled to undergo operative procedures of upper extremity below distal end humerus were randomly divided into two groups, Sc BPB group and Ax BPB group, 30 patients in each group.

Inclusion Criteria

- Age limit 15-75 years
- Indoor cases
- Both emergency and planned operations
- The patients who were able to follow the instructions and were likely to cooperate for the operation were selected.

Exclusion Criteria

- Patients with hypersensitivity to local anaesthetic agents.
- Patients with neurological disturbances / personality disorders / mental illness.
- Patients with bleeding disorders
- Patients with skin infection.
- Patient's refusal for regional anaesthesia.
- Patients with full stomach

Technique

Supraclavicular approach for Brachial Plexus block

Method: Supraclavicular block was performed by single

[1]Assistant Professor, [2]Professor, Department of Anesthesiology, Malla Reddy Medical College for Women, Hyderabad, India

Corresponding author: Dr. Vaijayanti S. Gandhi, Assistant Professor, Department of Anesthesiology, Malla Reddy Medical College for Women, Hyderabad, India

How to cite this article: Vaijayanti S. Gandhi, Basavaraj V. Modi. A study to compare efficacy of the supraclavicular (Sc BPB) and axillary (Ax BPB) brachial plexus block. International Journal of Contemporary Medical Research 2016;3 (1):233-236.

injection technique of Kulenkampff with peripheral nerve stimulator.

Axillary approach for Brachial Plexus block

Method: Axillary block was performed by Winnie's technique, by single injection with peripheral nerve stimulator.

Operative conditions: The operative conditions like diagnosis, operative procedure, whether traumatic / non-traumatic, planned / emergency were recorded. The site of operation, bony / soft tissue involvement, use of traction / tourniquet, duration of operation were recorded.

The nerves were tested by the pnemonic of four P's[2,3]

4 P's	Patient action	Nerve checked
Push	Extend arm with triceps	Radial
Pull	Flex arm with biceps	Musculocutaneous
Pinch	Fifth digit	Ulnar
Pinch	Index finger	Median

RESULTS

Table 1 shows the distribution of cases as per the requirement and duration of tourniquet / traction. Tourniquet was required in 31.66% (19 of 60) and traction in 41.66 % (25 of 60) cases. The tourniquet time (Mean ± SD) was 81 ± 31 min in Sc BPB group and 64 ± 18 min in Ax BPB group. The traction time (Mean ± SD) was 108 ± 98.48 min and 27 ± 38 min in Sc BPB and Ax BPB groups respectively.

Table 2 show the mean values of various parameters of the block action in the study cases. The onset of sensory action was 7.1 ± 4.11 and 9.23 ± 4.30 (Mean ± SD) min in Sc BPB and Ax BPB groups respectively. The difference observed was statistically insignificant (p >0.05). Onset of motor block (Mean ± SD) was 7 ± 4 min in Sc BPB group and 8.83 ± 4.06 min in Ax BPB group. The difference observed was statistically insignificant (p >0.05). In our study the onset of motor action was earlier than sensory action in both the groups. The difference observed was statistically insignificant (p >0.05).

The onset of complete sensory blockade (Mean ± SD) in Sc BPB group was 12.62 ± 5.24 and 17.74 ± 4.69 min in Sc BPB and Ax BPB groups respectively (z value = 3.98 and p value < 0.01). The mean onset of complete motor blockade in Sc BPB group was 13 ± 5.58 and 17.74 ± 4.69 min in Sc BPB and Ax BPB groups respectively (z value = 3.56 and p value < 0.01). The onset of complete sensory and motor blockade was early (on an average 5.12 min) in Sc BPB group as compared with Ax BPB group that was statistically significant.

Duration of analgesia was 849 ± 249.49 and 756 ± 187 min in Sc BPB and Ax BPB groups respectively. The difference between the two groups was statistically insignificant (p >0.05).

Tables 3 – 4 C show the anaesthesia details of the two groups. Muscle relaxation was adequate in 90 % (27 of 30) and nerves were spared in 10 % (3 of 30) of patients in both the groups. Radial nerve sparing was observed in 6.66 % (2 of 30) and 10 % (3 of 30) in Sc BPB and Ax BPB group respectively. Ulnar nerve sparing was seen in 3.33 % (1 of 30) in Sc BPB group. Difference between both the groups was statistically insignificant.

Sedation was required in 10% (3 of 30) and 20 % (6 of 30) of patients in Sc BPB and Ax BPB group respectively. General anaesthesia was required in 10 % (3 of 30) in either group.

Table 5 shows the complications encountered in this study series. In Sc BPB group 10 % (3) cases had accidental vessel puncture while in Ax BPB group no complications were seen.

Table 6 shows that the procedure was acceptable both by the patients and surgeons in 100 % of cases in either group.

Discussion:

In the present study tourniquet was required in 31.66% (19 of 60) and traction in 41.66 % (25 of 60) cases. The tourniquet time (Mean ± SD) was 81 ± 31 min in Sc BPB group and 64 ± 18 min in Ax BPB group. The traction time (Mean ± SD) was 108 ± 98.48 min in Sc BPB and 27 ± 38 min in

Parameter	Sc BPB (N=30) (%)	Ax BPB (N=30) (%)	Total
Torniquet	15 (50%)	04 (13.33%)	19 (31.66%)
Torniquet time (min) (mean±SD)	81±15.5	64±18	
Traction	04 (13.33)	21 (70)	25 (41.66)
Traction time (min) (mean±SD)	108±49.24	27±38	
None	11 (36.66)	05 (16.66)	16 (26.66)
Total	30	30	60

Table-1: Distribution of cases as per use and duration of tourniquet / traction

Parameters	Sc BPB (N=30) (Mean±SD)(min)	Ax BPB (N=30) (Mean±SD)(min)	Z value	P value
Onset of sensory of action	7.1±4.11	9.23±4.3	1.96	NS
Onset of motor action	7±4	8.83±4.06	1.75	NS
Complete sensory blockade	12.62±5.24	17.74±4.69	3.98	< 0.01
Complete motor blockade	13±5.58	17.74±4.69	3.56	< 0.01
Duration of analgesia	849±249.49	756±187	1.63	NS
(z> 1.96, p<0.01 significant; NS: Non significant)				

Table-2: Comparison of block action

Muscle relaxation	Sc BPB (n=30) (%)	Ax BPB (n=30) (%)
Adequate	27 (90%)	27 (90%)
Inadequate	03 (10%)	03 (10%)
Total	30	30

Table-3: Distribution of cases as per muscle relaxation

Nerve	Sc BPB (n=30) (%)	Ax BPB (n=30) (%)	Total (n=60) (%)
Musculocutaneous Nerve	0	0	0
Radial nerve	2 (6.66%)	3 (10%)	5 (8.33%)
Median nerve	0	0	0
Ulnar nerve	1 (3.33%)	0	1 (1.66%)
Total	3 (10%)	3 (10%)	6 (10%)

Table-4: Distribution of cases showing nerves spared

Complications	Sc BPB (n=30) (%)	Ax BPB (n=30) (%)	Total (n=60) (%)
Vessel puncture	3 (10%)	0	3 (5%)
Pneumothorax	0	0	0
Others	0	0	0
None	27 (90%)	30 (100%)	57 (95%)
Total	30	30	60

Table-5: Distribution of cases showing complications

Satisfaction (yes)	Sc BPB (n=30) (%)	Ax BPB (n=30) (%)	Total (n=60) (%)
Surgeon	30 (100%)	30 (100%)	60 (100%)
Patient	30 (100%)	30 (100%)	60 (100%)

Table-6: Distribution of cases showing satisfaction of surgeon and patient

Ax BPB group.

In our study in case of Supraclavicular block gentle massage of the area was done to make uniform spread. In Axillary block, distal pressure was maintained and arm adducted after the drug injection. This may be the reason for no musculocutaneous nerve sparing. All the patients with effective block in both groups tolerated tourniquet / traction well.

Our results are comparable with studies of Bennet Abraham[4], Alon P. Winnie[5], Ababou A[6] who had used similar technique for axillary block in their study and had found that digital pressure and adduction of arm after giving drug improved the success rate.

In the present study the onset of sensory block was 7.1 ± 4.11 (Mean ± SD) min in Sc BPB and 9.23 ± 4.30 min in Ax BPB group. The onset of sensory block was earlier in Sc BPB as compared to Ax BPB though the difference observed is statistically insignificant. The results of our study are comparable with the study of R. Pande[7] et al, where the onset of sensory block was reported to be 8.2 ± 2.8 min in Sc BPB with nerve stimulator technique, while it was 8.3 ± 2.3 min in parathesia group. In our study the onset of motor action was earlier than sensory action in both the groups. The difference observed is statistically insignificant. Our results are comparable with results found in studies of E. Lanzet al[8] and Tamilselvan P et al.[9]

In the present study the onset of complete sensory and motor blockade was early (on an average 5.12 min) in Sc BPB group as compared with Ax BPB group that is statistically significant. I have not found any references in relation to the comparison of onset of complete motor and sensory blockade.

In our study Sc BPB group showed a longer duration of analgesia. As the duration of operation was variable raging from 10 minutes to 4 hours, the total duration of analgesia was measured from the time of block till the patient complained of pain postoperatively.

Tamilselvan P[9] et al, in their study found postoperative pain relief (measured from the end of surgery until patient started complaining of pain) for 175-250 minutes (2.91- 4.16 h). They have used a combination of 1 % lignocaine with 0.125 % bupivacaine and 1:400,000 epinephrine.

Lawrence E. Schroeder[10] et al, found no difference in duration of analgesia between Axillary (10 ± 7 h), Supraclavicular (8 ± 6 h), and Interscalene (9 ± 6 h) approaches. They reported prolonged analgesia with bupivacaine (13 ± 2 6 h) than with mepivacaine (8 ± 7 h).The probable reason for the prolonged duration of analgesia in our study may be due to the concentration of drug used. We used 0.5 % bupivacaine, 2 mg /kg body weight which has a longer duration of action (1.5 to 8 hours).[11]

In the present study muscle relaxation was adequate in 90 % (27 of 30) of cases in both Sc BPB and Ax BPB groups. These cases were considered as successful block. In all these patients the anaesthesia was complete and satisfactory allowing optimal surgical conditions. In present study both groups had similar success rates.

In the Sc BPB group 1 patient (3.33 %) had ulnar nerve sparing and 2 patients (6.66 %) had radial nerve sparing. In the Ax BPB group 3 patients (6.66 %) had radial nerve sparing. Difference between both the groups is statistically insignificant. In our study none of the patients had musculocutaneous nerve sparing.

Bennet Abraham[4] et al, in their study report sparing of musculocutaneous and radial nerves during axillary brachial plexus block.In the present study supplementation in the form of General Anaesthesia was required in 3 patients (10 %) in either group. These cases were considered as failure. Both the groups are comparable and the difference is statistically insignificant.

Brand[1,12] et al, used inhaled N20 and barbiturates in a non-blinded fashion during surgery and success was considered to be tolerance of initial skin incision only. Lawrence E. Schroeder[10] et al, used Midazolam, fentanyl for preoperative sedation. Intraoperatively, the additional sedatives were further supplementation by Midazolam, fentanyl, and propofol. In our present study we did not encounter any other major complications like haematoma formation or pneumothorax in both the groups. Our study results are comparable with

study of R. Pande[7] et al. Brand[12] et al, had a higher rate of pneumothorax (6.1 %) in Sc BPB group. Haematoma formation was seen in 3 % of patients in Sc BPB group and in 2 % of cases in the Ax BPB group in their study.

In the present study the procedure was accepted both by the surgeons and all the patients. They were happy with the analgesia extending to the postoperative period.In the 10 % of cases (considered as failure) even though GA was supplemented, the patients were comfortable because they had postoperative analgesia. They did not have any complaints against the regional technique as such. All the patients were willing to accept regional blockade for similar surgical condition in future.

In the recovery room the patients were also asked about the block acceptability for any similar procedure in future. All the patients were ready.In the present study after the analysis and discussion of all the observation data, a success rate of 90% is seen in both the groups.

In the study of Brandet al,[12] success rate was 84.4 % in the Sc BPB group and 91.5 % in the Ax BPB group. Schroeder et al[13] also found a higher success rate with the Ax BPP group (89%) as compared with Sc BPB group (78%) and Interscalene BPB group (75%). Thompson et al,[1] found no significant difference in block success between SCB (83%) and AXB (85%). Our study also showed no difference between the success rates in both the groups. The high success rate (90%) and lower incidence of complications may be attributed to the use of peripheral nerve stimulator in our study.

CONCLUSION

Onset of action in Supraclavicular approach is faster than Axillary approach though both the techniques for brachial plexus block are safe and simple to perform due to easy surface landmarks. In both the groups motor action starts earlier than sensory

REFERENCES

1. American Society of Regional Anesthesia and Pain medicine, Brachial Plexus Blockade: A Comprehensive Review, www.asra.com.
2. Peripheral Nerve Blocks – A Colour Atlas, 2nd edition, Jacques E. Chelly, 2004.
3. 52nd Annual Refresher Course Lectures, Clinical Updates And Basic Science Reviews David L Brown, Brachial plexus blocks: an update, Iowa City, Iowa; 124:1-6,www.asahq.org.
4. Bennet Abraham, Mamie Zachariah and MeenaCherian, Axillary brachial plexus Block: A comparison of three techniques. J AnesthClinPharmacol, 1995;11:285-288.
5. Winnie, A. P., Radonjic R., Akkineni S. R., and Durraniz, Factors influencing distribution of local anesthetic injected into the brachial plexus sheath. AnaesthAnalg 1979; 58: 225-234.
6. Ababou A et al, The effect of arm position on onset and duration of Axillary Brachial plexus block. AnesthAnalg 2007;104:980-1.
7. R. Pande. Supraclavicular brachial plexus block as a sole anesthetic technique in children: an analysis of 200 cases; Anaesthesia, 2000;55:798 – 810.
8. EgonLanz, The Extent of Blockade Following Various Techniques of Brachial plexus block. AnesthAnalg 1983;62:55-8.
9. Joseph M. Neal, James R. Hebl, J. C. Gerancher, and Quinn H. Hogan, Brachial plexus anesthesia: essentials of our current understanding. Regional Anesthesia and Pain Medicine. 2002; 27:402–428.
10. Lawrence E. Schroeder,The Efficacy of Axillary Block for Surgical Procedures About the Elbow. AnesthAnalg 1996;83:747-51.
11. Clinical Anaesthesiology, 4th edition, G. Edward Morgan, Jr., 2006.
12. Leonard Brand and E. M. Papper, A comparison of supraclavicular and axillary techniques for brachial plexus blocks. Anesthesiology 1961;22:226-229.
13. Dipal Mahendra Shah, Mahesh Arora, AnjanTrikha, Ganga Prasad, Rani Sunder, Prakash Kotwal,[1] and-PreetMohinder Singh. Comparison of dexamethasone and clonidine as an adjuvant to 1.5% lignocaine with adrenaline in infraclavicular brachial plexus block for upper limb surgeries. J AnaesthesiolClinPharmacol. 2015; 31: 354–359.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 05-12-2015; **Published online**: 20-12-2015