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

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ABSTRACT

Introduction: Surgical anaesthesia of upper limb can be obtained by neural 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 neural 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.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

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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 mnemonic of four P’s

2. Push Extend arm with triceps Radial
3. Pull Flex arm with biceps Musculocutaneous
4. Pinch Fifth digit Ulnar
5. 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 significant (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 and 27 ± 38 min in Sc BPB and Ax BPB groups respectively. 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.
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. Winnie5, Ababou A6 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. Our results are comparable with results found in studies of E. Lanzet al7 and Tamilselvan P et al.8

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 ranging 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 P9 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 1:400000 epinephrine.

Lawrence E. Schroeder 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).10

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 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 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 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’s et al. Brand et al22 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 al13 also found a higher success rate with the Ax BPB 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

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