

COMPARATIVE EVALUATION OF EFFICACY OF DEXAMETHASONE AND DEXMEDETOMIDINE IN DURATION OF MOTOR AND SENSORY BLOCK IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

Alankrita Agarwal¹, Sanchi Jain¹, Gaurav Misra², Dheeraj Saxena², Geeta Karki³

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Corresponding Author:

Dr. Dheeraj Saxena,
Email: drsdheeraj@gmail.com

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¹Assistant Professor, Department of Anaesthesia, SRMSIMS, Bareilly, Uttar Pradesh, India.

²Associate Professor, Department of Anaesthesia, SRMSIMS, Bareilly, Uttar Pradesh, India.

³Professor and Head, Department of Anaesthesia, SRMSIMS, Bareilly, Uttar Pradesh, India.

Abstract

Background: Peripheral nerve block techniques are new advent in regional anaesthesia and have allowed even ASA grade 3 and 4 patients to undergo surgical procedures with less complications and early mobilization of the patient with stable hemodynamics. Brachial plexus block is one of the most common nerve block technique used for upper limb surgeries in routine practice. Peripheral nerve blocks should provide quick onset along with adequate duration and depth of analgesia not only in the intraoperative but also the post operative period of the surgery. To achieve this various adjuvants are being used to prolong the action of the nerve block. Therefore, we planned this study to compare dexamethasone and dexmedetomidine and study their effect in duration of the sensory and the motor blockade in supraclavicular brachial plexus block with 0.5% bupivacaine in upper limb surgeries. **Materials and Methods:** 80 patients willing to be a part of the study, belonging to ASA grade I and II, between 18- 65 years and weight 50-75 kg were randomly divided into two groups A and B receiving 2 ml of dexamethasone and 25 µg dexmedetomidine mixed with 0.5% bupivacaine. All patients were assessed pre-operatively before giving supraclavicular brachial plexus block. The duration of the motor and sensory block was assessed postoperatively at prefixed intervals and compared. **Result:** The duration of the sensory and the motor blockade was comparable in both groups at approximately 7-8 hours with dexmedetomidine having longer duration of action. **Conclusion:** Addition of Dexamethasone and Dexmedetomidine to local anaesthetic drugs in brachial plexus block significantly prolongs the duration of analgesia and motor block in patients undergoing surgeries in upper extremities and is remarkably safe and cost effective method of providing post-operative analgesia. Both are good adjuvants for bupivacaine but our present study of comparison between the two agents, suggests that Dexmedetomidine is a better choice for enhancing the quality and duration of Supraclavicular brachial plexus block without any significant adverse side effect. Our study concludes that using Dexmedetomidine as adjuvant prolongs the duration of block and postoperative analgesia compared to Dexamethasone with minimal or negligible adverse events.

INTRODUCTION

Regional anaesthesia is a well-accepted component of comprehensive anaesthetic care. With appropriate selection and sedation, these techniques can be used in all age groups. It has become increasingly popular for ambulatory anaesthesia and has contributed to increase the percentage of day care surgery. Peripheral nerve block has taken patient care in anaesthesia to a whole new level.

Generally surgeries on upper limb are performed under general anaesthesia but due to increasing cost of anaesthetic agents, associated sequelae and the problems of operation theatre pollution, focus has been shifted towards regional anaesthesia. Moreover postoperative pain relief is an added advantage of regional techniques.

The supraclavicular approach to brachial plexus block provides anesthesia of the entire upper extremity in the most consistent and time efficient

manner. It has a high success rate and rapid onset of action. It provides more complete anesthesia of the plexus, particularly the axillary and musculocutaneous nerves, and does not require abduction of the arm to be performed.^[1] Peripheral nerve blocks have an increasingly important role in ambulatory anesthesia.^[2]

Dexamethasone, steroid adjuvant stimulates the synthesis of enzymes needed to decrease the inflammatory response. The mechanisms by which steroids potentiate the analgesic effects seem to be different from its intrinsic anti-inflammatory mechanism.^[3] There is also evidence to show that the local action on nerve fibres and systemic effects, both potentiate dexamethasone's analgesic properties.^[4]

Dexmedetomidine is a relatively selective alpha 2-adrenergic agonist with sedative properties. Several studies have found Dexmedetomidine to be safe and effective in various neuraxial and regional anaesthesia in humans including intrathecal and IV regional anaesthesia with lesser side effects.^[5,6]

Therefore, the study aims at determining the efficacy of dexamethasone and dexmedetomidine as adjuvants to 0.5% Bupivacaine in supraclavicular Brachial Plexus Block by assessing the duration of the motor and sensory block.

MATERIALS AND METHODS

After attaining ethical committee approval and informed consent from the patients, the study was conducted in the department of anaesthesiology, Shri Ram Murti Smarak Institute Of Medical Sciences, Bareilly.

Inclusion Criteria

1. ASA Grade 1 and 2 posted for elective surgery on forearm and hand.
2. Age Group 18-60 years.
3. Weight 50-70 kg
4. No known hypersensitivity to local anaesthetics of the amide type of the group.
5. No history of coagulation disorder or intake of any antiplatelet drugs.
6. No history of pulmonary/cardiac/renal or endocrine diseases.
7. No known hypersensitivity to study drugs.
8. Pt. willing to give consent for study.

Exclusion Criteria

1. ASA Grade III, IV, V.
2. Age below 18 or above 60.
3. Any local infection at the site of block.
4. Patients not giving consent for study.
5. Patchy, inadequate and failed block.

Preoperative checkup was done on the day before and on the morning of surgery. Routine and specific investigations were advised and reviewed accordingly. Local examination of block site was done to exclude any sign of sepsis/previous injury or deformity. Prior to induction, patient were kept NPO 6-8 hrs.

Patients were randomly allocated into 2 groups each having 40 patients.

GROUP A (23 ml 0.5% bupivacaine+ 2 ml dexamethasone).

GROUP B (23 ml 0.5% bupivacaine + 25 µg dexmedetomidine + 1.5 ml distilled water).

After connecting all the monitors patient was placed in a supine position with head turned away from the side to be blocked. The arm to be anaesthetized was abducted, and hand was extended along the side. The mid-point of the clavicle was identified and marked. The posterior border of the sternocleidomastoid can be easily palpated when the patient rises the head slightly. Palpation of subclavian artery was done. A 22 gauge, 4 cm needle is directed in a caudal, slightly medial and posterior direction until parasthesia or motor response was elicited to the first rib was encountered. When first rib was encountered without elicitation of parasthesia, the needle was systemically walked anteriorly and posteriorly along the rib until the plexus or the subclavian artery was encountered. The needle can be withdrawn and reinserted in a more posterolateral direction that usually results in a parasthesia and a motor response. After localization of the brachial plexus, aspiration for blood was performed before incremental injections of total volume of 25ml of local anaesthetic agent. Adequate block anaesthesia was achieved and surgery was allowed to start.

Duration of Sensory Blockade

Defined as the time interval of sensory block of (score 1) to complete resolution of the block on all nerves (score 0) and return of pain and VAS>3, was assessed every 30 min postoperatively in atleast 3 major nerve distributions. The duration of motor block.

Is defined as the time interval of block on all the actions of the nerve to the complete return of pain and VAS>3 and was assessed at same duration as sensory.

RESULTS

The data was compiled on MS Excel sheet and analysed using SPSS software version 20 using unpaired t-test and other appropriate tests of statistical significance. The power of study was 90% with P<0.05 being considered as statistically significant.

Sex specific distribution of patients are marked for the study, under two different groups using either dexamethasone 2 ml with 0.5% bupivacaine 23 ml (GROUP A) or dexmedetomidine 25µg with 0.5% bupivacaine 23 ml(GROUP B) and The below table shows the demographic details of the studied patient in both the groups, the mean age was found to be 36.50 ± 11.41 years and 38.53 ± 11.65 years in group A and B respectively whereas the mean BMI of Group A was 23.47 ± 2.42 and B was 23.43 ± 2.03; the majority of patients in group A were males

whereas in group B 50.0% were males and 50.0% females, the mean duration of surgery was almost

similar in all the groups and the association was found to be statistically in significant ($p>0.05$).

Table 1: Demographic details of studied patients.

Variable	Group-A (N=40)	Group-B (N=40)	P Value (A-B)
Age(years)	36.50 ± 11.41	38.53 ± 11.65	0.435
Weight(kg)	56.40 ± 5.67	57.98 ± 7.67	0.300
Height(cm)	155.13 ± 5.77	156.05 ± 6.22	0.493
BMI (kg/m ²)	23.47 ± 2.42	23.43 ± 2.03	0.933
Sex (M:F)	27:13	20:20	0.111
Duration of Surgery (Minutes)	90.40 ± 4.20	89.75 ± 4.20	0.491

The [Table 2] depicts the blockade characteristics in the studied patients for Duration of sensory block was 461.25±33.18 in Group A and 503.25± 35.29 in Group B Duration Of Motor Block was 460.43±37.15 in Group A and 504.28± 34.82 in Group B, Duration Of Analgesia was 568.98±33.21 in Group A and 648.53±32.91 in Group B shows highly statistically significant (<0.001) association among the groups.

Table 2: Observed Blockade Characteristics in studied patients using unpaired t test.

Variables	Group-A (N=40)	Group-B (N=40)	P Value (A-B)
Duration Of Sensory Block (Minutes)	461.25±33.18	503.25± 35.29	<0.001
Duration Of Motor Block (Minutes)	460.43±37.15	504.28± 34.82	<0.001
Duration Of Analgesia (Minutes)	568.98±33.21	648.53±32.91	<0.001

DISCUSSION

Regional anesthesia techniques can be utilized for analgesia not only during the operative period, but during the postoperative period as well and avoids complications of general anesthesia. With the use of adjuvants in brachial plexus block (BPB), one can extend patient care in the form of extended postoperative analgesia with stable hemodynamic variables. Nowadays brachial plexus block is an easy, safe and the most commonly performed peripheral nerve blocks in routine anesthesia practice. Supraclavicular approach of brachial plexus block was preferred as the narrowest part of plexus is located there and anesthesia is rapid, dense and predictable for the entire upper limb.

Dexmedetomidine is a highly selective α -2 adrenergic agonist with an affinity of 8 times greater than clonidine.^[7] Presynaptic activation of α -2 adrenoceptor in CNS inhibits the release of norepinephrine, terminating the propagation of pain signals and their postsynaptic activation inhibits sympathetic activity, thereby decreasing the heart rate and blood pressure in higher doses.^[8]

Addition of steroid to local anaesthetic effectively and significantly prolongs the duration of analgesia as well as producing earlier onset of action. Therefore Dexamethasone a synthetic glucocorticoid was preferred for its safety and high potency.

In present study, we demonstrated that in patients undergoing Supraclavicular brachial plexus block, addition of Dexmedetomidine or Dexamethasone to Bupivacaine, extends the duration of block time in both sensory and motor aspects.

As there was random allocation of the patients in the groups so the groups were statistically alike. Thus bias in patient selection was excluded. The comparable demography of groups assures authentic and precise analysis of administered drugs.

The mean duration of surgery was almost similar in all the groups and the association was found to be statistically non-significant ($p>0.05$). ASA grade categorization resulted in group A and B had 26 (55%), 14 (35%) and 24 (60%), 16 (40%) under grade I and II respectively. No significant correlation among the groups was seen. We encountered many studies which were consistent with our findings.

Baloda R et al,^[9] in their prospective randomized, controlled, double blinded study on Supraclavicular brachial plexus block stated that no significant difference in the groups was observed regarding demographic profile. Mean age was 39.20±12.508 years and 38.60±13.206 years in two groups respectively. The sex distribution (M: F) was 21:9 and 20:10 in groups.

Assessment of duration of block was carried out by the principal investigator who was blinded to the drugs administered in the block. Duration of sensory block, duration Of Motor Block, duration Of Analgesia was maximum in group B followed by A. Supraclavicular brachial plexus block significantly leads to increased duration of analgesia in group B. In conclusion, adjuvants produced positive results in early onset of block and prolonged analgesia. This establishes Dexmedetomidine as a better adjuvant with bupivacaine in achieving supraclavicular brachial plexus block.

A comparative study between Dexamethasone and Dexmedetomidine in supraclavicular block by Kaur M et al found that the duration of sensory block, the block lasted much longer for Dexmedetomidine group as compared to Dexamethasone group. Similar results were obtained for duration of motor block where mean time for D group (858.2 minutes) was much greater than X group (684.6 minutes). The results published by the authors was quite consistent with results in our study.

On the contrary Arish B T et al in their study on Dexamethasone as an adjuvant to bupivacaine found that addition of Dexamethasone did not have any impact on the time taken for onset of sensory and motor blockade. But their results in terms of duration of analgesia and prolongation of the duration of sensory and motor blockade concur with our study.

CONCLUSION

Addition of Dexamethasone and Dexmedetomidine to local anaesthetic drugs in brachial plexus block significantly prolongs the duration of analgesia and motor block in patients undergoing surgeries in upper extremities and is remarkably safe and cost effective method of providing post-operative analgesia.

Both are good adjuvants for bupivacaine but our present study of comparison between the two agents, suggests that Dexmedetomidine is a better choice for enhancing the quality and duration of Supraclavicular brachial plexus block without any significant adverse side effect.

Our study concludes that using Dexmedetomidine as adjuvant prolongs the duration of block and postoperative analgesia compared to Dexamethasone with minimal or negligible adverse events.

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