Original Research Article

Indian Journal of Anesthesia and Analgesia
July – August 2020;7(4)
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7420.20

Comparison of Efficacy of Dexamethasone and Clonidine as an Adjuvant in Supraclavicular Brachial Plexus Block Using 0.5% Bupivacaine in Upper Limb Surgeries

Swetha Rajoli[1], Shreyavathi R[2]

[1]Post Graduate, [2]Professor, Department of Anesthesiology, Bangalore Medical College and Research Institute, Bengaluru, Karnataka, 560002, India.

How to cite this article:

Swetha Rajoli, Shreyavathi R. Comparison of Efficacy of Dexamethasone and Clonidine as an Adjuvant in Supraclavicular Brachial Plexus Block Using 0.5% Bupivacaine in Upper Limb Surgeries. Indian J Anesth Analg. 2020;7(4):986–997.

Abstract

Background and Objectives: Dexamethasone, a synthetic corticosteroid has been found to prolong local anesthetic block duration. Clonidine, an Alpha-2-receptor agonist, has been used as an additive to local anesthetics for various regional anesthetic techniques. We compared Dexamethasone and Clonidine as an adjuvant to local anesthetic agent in supraclavicular brachial plexus block with respect to onset of sensory and motor block and duration of post-operative analgesia.

Methodology: A prospective, randomized, controlled, double blind study carried out at Bangalore Medical College and Research Institute, Bengaluru. ASA I and II patients aged 18 to 60 years of either sex were included in the study. We compared the anesthetic and analgesic effects of adding dexamethasone and clonidine to 30 ml 0.5% Bupivacaine and injecting into brachial plexus sheath in 60 patients undergoing upper extremity surgeries. Patients were randomized into 2 groups of 30 each. Group D received Dexamethasone 8 mg and Group C received clonidine 75 mcg as an adjuvant to 0.5% bupivacaine.

Results: There was a significant difference in onset of sensory and motor blockade and postoperative analgesia between two groups. Mean onset of sensory block and motor block was 5.9±0.8 minutes and 8.4±0.9 minutes in dexamethasone group and 8.7±0.9 minutes and 11.7±1.5 minutes in clonidine group. Mean duration of postoperative analgesia was 7.3±0.7 hours in dexamethasone group and 5.9±0.5 hours in clonidine group. There was significant difference in mean HR, SBP and DBP between two groups from 0 min to 12 hours. Mean heart rate, SBP and DBP was higher in dexamethasone group at all intervals compared to clonidine group.

Conclusion: Our study demonstrates that, dexamethasone provides faster onset of sensory block and motor block, longer duration of post-operative analgesia, less number of rescue analgesics in post-operative 12 hours with cost-effectiveness. Hence, dexamethasone can be an alternative to clonidine in brachia plexus block.

Keywords: Supraclavicular brachial plexus block; Dexamethasone; Clonidine; Bupivacaine

Introduction

Peripheral nerve blockade is now a well-accepted concept for comprehensive anesthesia care. From the operative suite, the role of peripheral nerve blockade was expanded for management of postoperative pain and chronic pain.

The recent emergence of pain management and the advantage of regional over general anesthesia in case of emergent surgeries and the increasing importance of outpatient (ambulatory) surgery in anesthesia practice demand a subspecialty peripheral nerve block. Supraclavicular brachial plexus block is the preferred regional anesthesia for

Corresponding Author: **Shreyavathi R,** Professor, Department of Anesthesiology, Bangalore Medical College and Research Institute, Bengaluru, Karnataka, 560002, India.

E-mail: shreyamurthy8993@gmail.com

upper limb surgeries. Here, the brachial plexus is presented most compactly at the proximal division or at the trunk level that provides most reliable anesthesia for upper limb surgeries by anesthetising the middle and lower plexus over 80% of the times (median, radial and ulnar).

After synthesis of Lignocaine 1943 Lofgren's systematic study of a whole range of compounds (Lofgren 1948), so laying the foundation for all subsequent studies of local anesthetic drugs. From these studies have come derivatives of lignocaine such as Local anesthetic administered as regional nerve blocks are utilized in providing postoperative pain relief in many surgical procedures by blocking signal traffic to the dorsal horn. Certain drugs may be used as adjuncts to local anesthetics to lower the dose of each agent and enhance analgesic efficacy while reducing the incidence of adverse reaction. Drugs like neostigmine, opioids, hyaluronidase, midazolam etc.[1-3] have been added to local anesthetics in order to modify the block. Nowadays different drugs have been used as adjuvant with local anesthetics in brachial plexus block to achieve quick, dense and prolonged block. Use of adjuvants to local anestheics is demonstrated to prolong the duration of analgesia in peripheral nerve blocks. Dexamethasone, a synthetic corticosteroid has been found to prolong local anesthetic block duration in animal and human studies. Similarly, several studies have demonstrated analgesic effects of Clonidine, an alpha agonist, in local, spinal and epidural anesthesia when combined with local anesthetic like bupivacaine. This observation that Clonidine has analgesic effects at spinal level has stimulated research to examine analgesic effects in the periphery. It has direct localaction on the nerve itself and facilitation of local anesthetic action. Also, Clonidine seems to provide analgesic benefit without major adverse effects.

The aim of this study is to compare the peripheral action of dexamethasone and clonidine with 0.5% bupivacaine solution to prolong the block with adequate anesthesia in brachial plexus.

Anatomy of Brachial Plexus[4,5,6]

Knowledge of formation of brachial plexus and its ultimate cutaneous and muscular distribution is absolutely essential to the intelligent and effective use of brachial plexus anesthesia for upper limb surgeries. Close familiarity with the vascular, muscular and fascial relationships of the plexus is equally essential to the mastery of various techniques, for it is these perineural structures which serve as the landmark by which needle may accurately locate the plexus percutaneously.

In its course from intervertebral foramina to the upper arm, the fibres are composed consecutively of roots, trunks, divisions, cords and terminal nerves.

Formation of Brachial Plexus

Brachial plexus is formed by the union of ventral rami of lower fourcervical nerves (C5,6,7,8) and first thoracic nerve (Tl) with frequentcontributions from C4 or T2. When contribution from C4 is large and from T2 is lacking, the plexus appears to have a more cephaloid position and is termed "Prefixed".

When contribution from T2 is large and from C4 is lacking, the plexus appears to have a caudal position and is termed "postfixed". Usually prefixed or postfixed positions are associated with the presence either of a cervical rib or of an anamolous 1st rib.

Roots

Represent the anterior primary divisions of lower four cervical and first thoracic nerves. They emerge from the intervertebral foramina and fuse above the first rib to form the trunks.

Trunk

The roots combine above the first rib to form the three trunks of the plexus. C5 and C6 unite at the lateral border of the scalenus medius and form the "Upper trunk", C8 and Tl unite behind the scalenus anterior to form "lower trunk" and C7 continues as a sole contributor to the "middle trunk".

Divisions

As the trunks pass over the first rib and under the clavicle, each one of them divides into anterior and posterior divisions.

Cords

The fibres, as they emerge from under the clavicle, recombine to form three cords. The "lateral cord" is formed by anterior divisions of upper and middle trunks, lateral to the axillary artery. The anterior division of lower trunk descend medial to the axillary artery forming the "medial cord". The posterior divisions of all three trunks unite to form the "posterior cord", at first above and then behind the axillary artery.

The medial and lateral cords give rise to nerves that supply the flexor surface of upper extremity, while nerves arising from the posterior cord supply extensor surface.

Major Terminal Nerves

Each of these cords gives off a branch that contributes to or become one of the major nerves to the upper extremity and then terminates as a major nerve. The lateral and median cords give off lateral and medial heads of the medial nerve and continue as major terminal nerves, the lateral cord terminating as musculocutaneous nerve and medial cord as ulnar nerve. Posterior cord gives off, axillary nerve as its major branch and then continues as the radial nerve.

In summary, conveniently it can be considered that brachial plexus begins with five nerves (C5-T1) and terminates in five nerves (Musculocutaneous, radial, axillary, median and ulnar nerves) with its intermediate portions displaying in sets of three, that is, three main trunks which divide into 2 sets of three, which reunite and give rise to three cords. These three cords give off three lateral branches before becoming the major terminal branches of brachial plexus.

Pharmacology of Bupivacaine[7–10]

Local AnestheticDrugs

Local anesthetics are drugs that produce reversible conduction blockade of impulse along central and peripheral nerve pathways after regional anesthesia. With progressive increases in concentrations of local anesthetics the transmission of autonomic, somatic sensory and somatic motor impulses are interrupted producing autonomic nervous system blockade, sensory anesthesia, and skeletal muscle paralysis in the area innervated by the affected nerve. Removal of the local anesthetic is followed by spontaneous and complete return of nerve conductions, with no evidence of structural damage to nerve fibres.

Local anesthetics have similar configuration. They have one aromatic lipophilic part (Benzene ring) and one hydrophilic part (quaternary ring) connected by an intermediate ring either ester (-COO-) or an amide (-NHCO-).

Bupivacaine

Source: Bupivacaine, a synthetic drug, was prepared by A.F. Ekenstam in 1957.

Chemistry: The molecular weight of the chloride salt is 325 and that of the base form is 288. It has a melting point of 258°C. Solutions containing epinephrine have a pH of about 3.5.

The chemical name is l-n-butyl-DL-piperidine-2 carboxylic acid-2,6 dimethylamilide hydrochloride.

The molecular formula is C18N2OH28HCl.

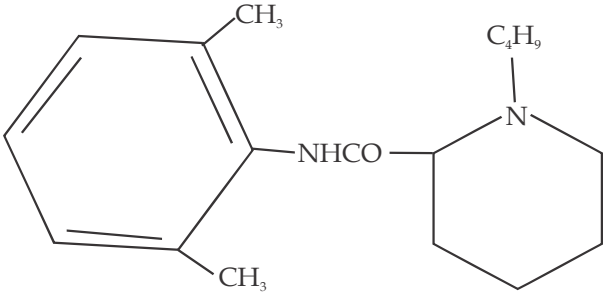

Fig. 1: Chemical Structure of Bupivacaine

Physiochemical properties

Solubility: The base is sparingly soluble, but the hydrochloride is readily soluble in water.

Stability and sterilization: Bupivacaine is highly stable and can withstand repeated autoclaving.

pH of saturated solution: 5.2

Specific gravity: 1.021 at 37°C

Melting point: 247-258°C

Anesthetic properties

Potency

Bupivacaine is approximately three to four times more potent than Lidocaine. The duration of action for local anesthesia is two to three times longer than Lidocaine.

Anesthetic index

Bupivacaine's anesthetic index is 3.0 to 4.0.

Mechanism of action

It is similar to that of any other local anesthetics. The primary action of local anesthetics is on the cell membrane of the axon, on which it produces electrical stabilization. The large transient increase in permeability to sodium ions necessary for propagation of the impulse is prevented. Thus the resting membrane potential is maintained and depolarization in response to stimulation is inhibited.

The mechanism by which local anesthetics block sodium conductance is as follows:

a) Local anesthetics in the cationic form act on the receptors within the sodium channels, on the cell membrane and block it. The local anesthetic can reach the sodium channel either via the lipophilic pathway directly across the lipid membrane, or via the axoplasmic opening. This mechanism

accounts for 90% of the nerve blocking effects of amide local anesthetics.

b) The second mechanism of action is by membrane expansion. This is a nonspecific action in contrast to the more specific drug receptor interaction.

***Dexamethasone*[11–14]**

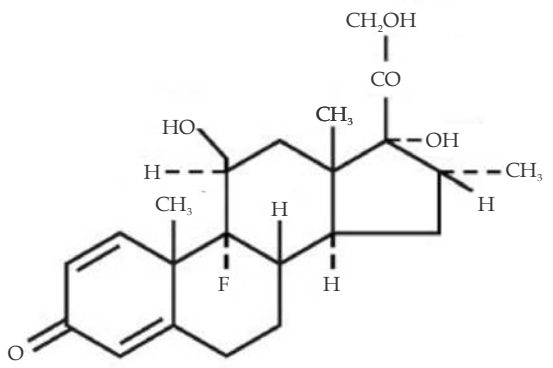

Fig. 2: Chemical Structure of Dexamethasone.

Dexamethasone is a water soluble ester, in the form of dexamethasone sodium phosphate. It has an oral, intramuscular or intravenous preparation. It acts rapidly and attain high concentration in tissue fluids. Dexamethasone is mainly metabolized in the liver by hepatic microsomal enzymes. The t 1/2 of dexamethasone in greater than 36 hrs, its action starts within 30 minute of injection and action persists even after the drug disappears from the circulation.

***Clonidine*[15–19]**

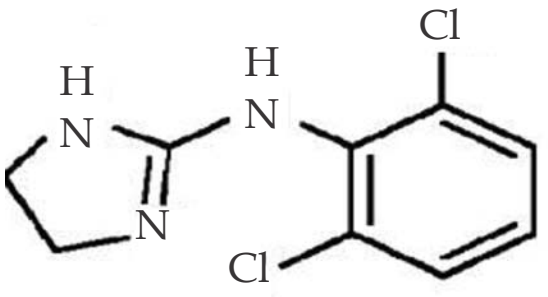

Fig. 3: Chemical Structure of Clonidine.

Clonidine hydrochloride, an imidazoline derivative was originally developed as a nasal decongestant and vasoconstrictor. Its hypotensive and bradycardia effects were first appreciated in 1962. It is a centrally acting adrenergic agonist that lowers blood pressure by decreasing basal sympathetic nervous system activity. It was introduced first in Europe in 1966 and subsequently in the U.S. for use as an antihypertensive agent.

Clonidine hydrochloride is an imidazoline derivative and exists as a mesomeric compound. The chemical name is 2-(2,6-dichlorophenylamino)-2-imidazoline hydrochloride. The following is the structural formula: C9H9C12N3HCl.

The molecular weight of Clonidine is 266.56. Clonidine hydrochloride is an odourless, bitter, white, crystalline substance soluble in water and alcohol.

Objectives of the Study

The objectives of this study are to compare the effects of dexamethasone and clonidine as an adjuvant to 30 ml of 0.5% bupivacaine used for Supraclavicular approach to brachial plexus block with respect to

- Onset time of sensory block
- Onset time of motor block
- Duration of postoperative analgesia
- Monitoring of hemodynamic parameters.

Methodology

Preoperative Preparation

The study protocol was approved by the hospital ethical committee. All patients were visited and evaluated thoroughly on the day prior to surgery along with laboratory investigations. The anesthetic procedure to be undertaken including development of paraesthesia was explained to the patients and an attempt was made to alleviate the anxiety of the patient. A written informed consent was obtained. Pre-anesthetic preparation of patient included a period of overnight fasting. All patients received oral diazepam 10 mg night before surgery. A meticulous airway assessment was also carried out. Routine laboratory examinations were conducted including complete haemogram, urine analysis and whenever appropriate blood sugar, ECG and chest X-ray.

Materials and Methodology

Seventy five patients aged between 18 and 60 years of physical status ASA 1 and 2 undergoing upper limb surgeries lasting more than 30 minutes were included in the study. The study was carried out at Victoria Hospital and Bowring and Lady Curzon Hospitals attached to Bangalore Medical College and Research Institute. The patients mainly included those undergoing orthopedic, plastic and reconstructive surgeries.

Inclusion Criteria

Patients between age group 18 and 60 years, under the physical status ASA 1 and ASA 2 scheduled for upper limb surgeries were included after obtaining ethical clearance from the institution and informed written consent from the patients.

Exclusion Criteria

Patients with history of hypersensitivity reactions to local anesthetics, bleeding disorders, pregnant and lactating women, peripheral neuropathies and patients who refused to participate in the study.

Method of Collection of Data

After obtaining informed written consent from patients, patients will be randomly divided into 2 groups, dexamethasone group (Group D, n=30) and Clonidine group (Group C, n=30) in a double blind fashion.In the pre-operative room, an intra-venous line is secured with 18G cannula on the normal arm. Baseline: E.C.G [Electrocardiogram], NIBP [Noninvasive blood pressure] and SpO_2 [Oxygen saturation] recorded. The patients were premedicated with Inj. Ranitidine 50 mg i.v. stat and Inj.

Ondansetron 4 mg i.v. stat, 30 minutes before Surgery. The Anesthetist performing the procedure was blinded to the study group and patients were selected by random chit selection method. Supra-clavicular Brachial Plexus block was performed after eliciting paresthesia and 32 ml of anesthetic solution was given after bloodless aspiration. The onset of sensory block was assessed with pin prick method. Assessment of motor block done by Modified Bromage Scale.

All necessary equipments and drugs needed for administration of general anesthesia and for emergency resuscitation were kept ready in order to manage failure of block or toxic reactions occurring during procedure.

Procedure

Intravenous access was obtained in the limb opposite to that undergoing surgery with 18G cannula. Standard monitors like ECG monitoring, Pulse oximeter, Non-invasive blood pressure were connected and monitored in all the patients. The patient was placed in a supine position with the head turned away from the side to be blocked. The arm to be anesthetized should be adducted, and the hand should be extended along the side towards the ipsilateral knee as far as possible. Using classic technique approach, the midpoint of the clavicle was identified and marked. The posterior border of the sternocleidomastoid was palpated easily when the patient raised the head slightly. Palpating the belly of the anterior scalene muscle moving towards interscalene groove with the fingers, a mark was made at approximately 1.5 to 2.0 cm posterior to the midpoint of the clavicle. By palpating the subclavian artery at this site, landmark was confirmed.

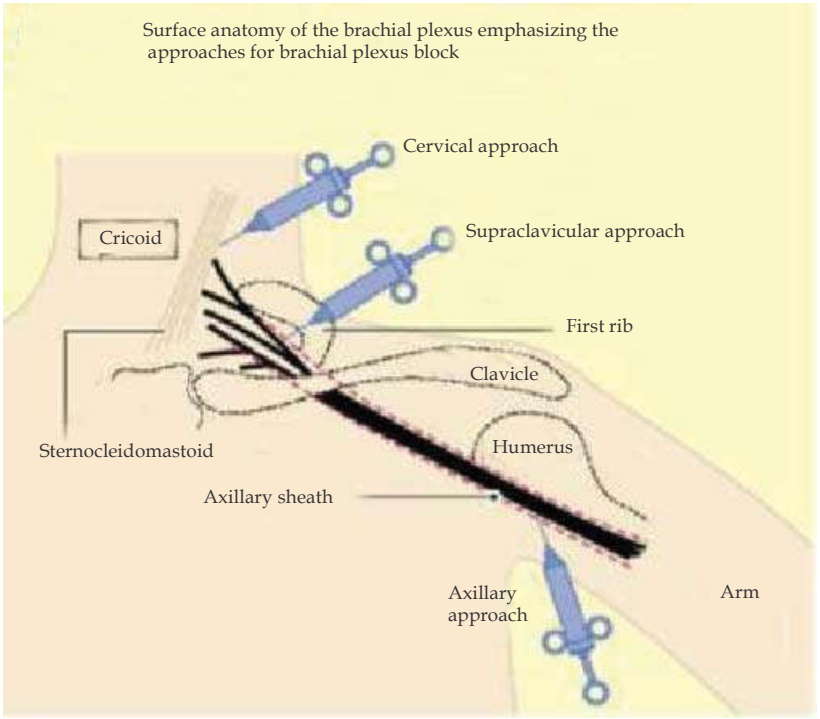

Fig. 4: Surface Anatomy of Brachial Plexus

After appropriate preparation and injection of a skin wheal, 22-gauge needle was inserted at the point of entry above the midpoint of clavicle in the backward-inward-downward direction (BID). Although the direction of needle was towards the first rib, it was not always necessary to touch the rib. Paresthesia in the forearm or hand was elicited. After negative aspiration for air or blood, appropriate drugs were injected. Group D received 30 ml of 0.5% Bupivacaine and 2 ml of 8 mg dexamethasone. Group C received 30 ml of 0.5% Bupivacaine and Clonidine 75 µg. The effects of the anesthetic agents on the following parameters were observed:

1. The onset time of sensory blockade, defined as time between injection and total abolition of temperature sensation, was evaluated in 4 nerve areas (median, ulnar, radial and musculocutaneous) at every 5 minutes until 30 minutes after the injection. The block was judged to have failed if anesthesia was not present in 2 or more peripheral nerve distributions and such patients were excluded from the study.
2. The onset time of motor blockade was determined according to modified Bromage scale 6 ranging from Grade 0 (normal motor function) to Grade 2 (complete motor block with inability to move the fingers). Following tests were done to see different nerve function: Thumb abduction for the radial nerve, thumb adduction for the ulnar nerve, thumb opposition for the median nerve and flexion of elbow for the musculocutaneous nerve.
3. The duration of analgesia, defined as the time between onset of action and onset of pain, was the time when patients received the first dose of analgesic.
4. During surgery, pulse, arterial blood pressure and peripheral oxygen saturation were monitored. Symptoms such as nausea, vomiting, drowsiness and other adverse effects/complications were also monitored.

Ramsay Sedation Scale[20]

1	Anxious and agitated, restless
2	Co-operative, oriented, tranquil
3	Responsive to verbal commands, drowsy
4	Asleep, responsive to light stimulation (loud noise, tapping)
5	Asleep, slow response to stimulation no response to stimulation

Statistical analysis

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test was used as test of significance for qualitative data.

Continuous data was represented as mean and standard deviation. Independent t-test or man whitney U test was used as test of significance to identify the mean difference between two quantitative variables. Graphical representation of data: MS Excel and MS word was used to obtain various types of graphs such as bar diagram and Line diagram. p value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Statistical software: MS Excel**,** SPSS version 22 **(**IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

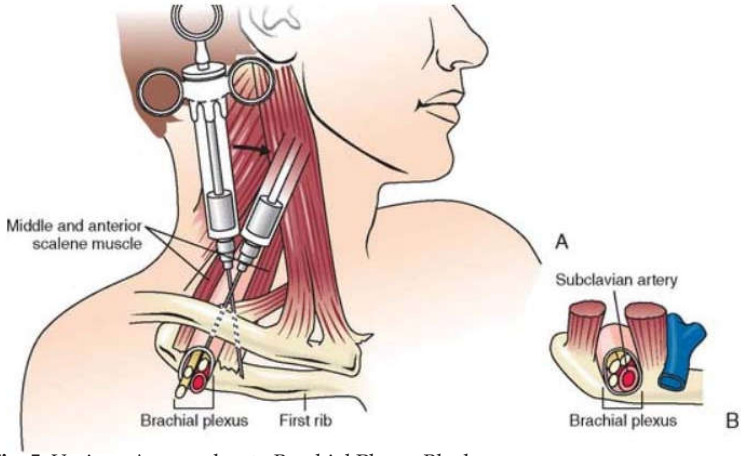

Fig. 5: Various Approaches to Brachial Plexus Block
A. Supraclavicular Block
B. The Three Trunks are Compactly Arranged at the Level of the First Rib.

Results

Table 2: Age distribution comparison between two groups

		Group			
		Group D		Group C	
		Count	%	Count	%
Age	<30 years	5	16.7%	3	10.0%
	31 to 40 years	9	30.0%	12	40.0%
	41 to 50 years	10	33.3%	9	30.0%
	>50 years	6	20.0%	6	20.0%

χ^2 =0.981, df =3, p = 0.806

In Group D, majority were in the age group 41 to 50 years (33.3%). In Group C, majority were in the age group 31 to 40 years (40%). There was no significant difference in age distribution between two groups.

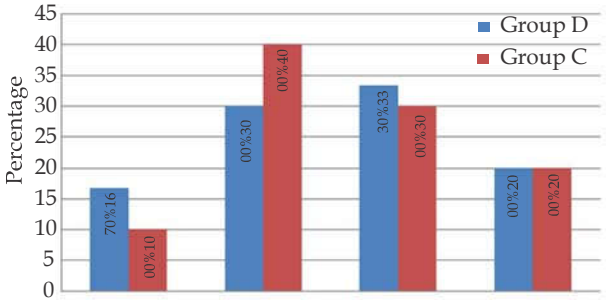

Fig. 6: Diagram showing Age distribution comparison between two groups

Table 3: ASA Grade comparison between two groups

		Group			
		Group D		Group C	
		Count	%	Count	%
ASA Grade	1	21	70.0%	20	66.7%
	2	9	30.0%	10	33.3%

χ^2 =0.077, df =1, p = 0.781

In Group D, 70% had ASA grade 1 and 30% had ASA grade 2. In Group C, 66.7% had ASA grade 1 and 33.3% had ASA grade 2. There was no significant difference in ASA grade between two groups.

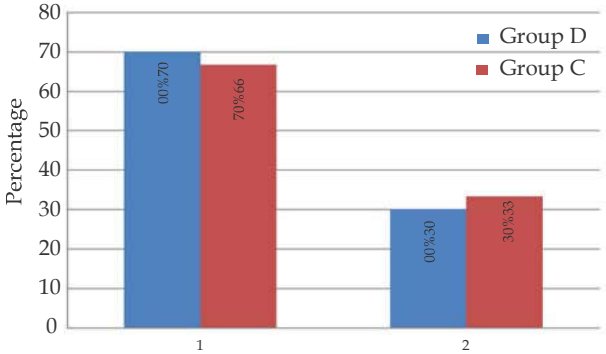

Fig. 7: Bar diagram showing ASA Grade comparison between two groups

Table 4: Duration of surgery comparison between two groups

	Group				P value
	Group D		Group C		
	Mean	SD	Mean	SD	
Duration of Surgery	85.2	20.4	101.7	28.0	0.022*

Mean duration of surgery in Group D was 85.2 ±20.4 min and in Group C was 101.7±28.0 min. There was significant difference in mean duration of surgery between two groups.

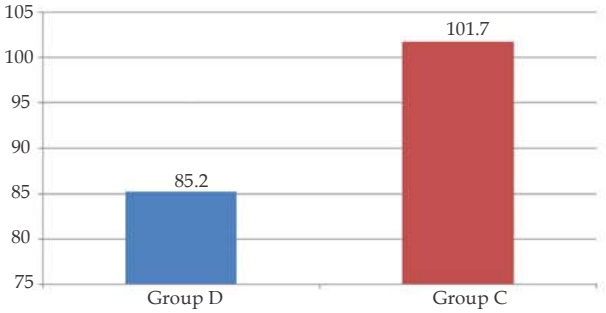

Fig. 8: Bar diagram showing Duration of surgery comparison between two groups

Table 5: Onset of Sensory Block comparison between two groups

	Group				P value
	Group D		Group C		
	Mean	SD	Mean	SD	
Onset of Sensory Block	5.9	0.8	8.7	0.9	<0.001*

Mean Onset of Sensory Block in Group D was 5.9 ±0.8 min and in Group C was 8.7±0.9 min. There was significant difference in mean Onset of Sensory Block between two groups.

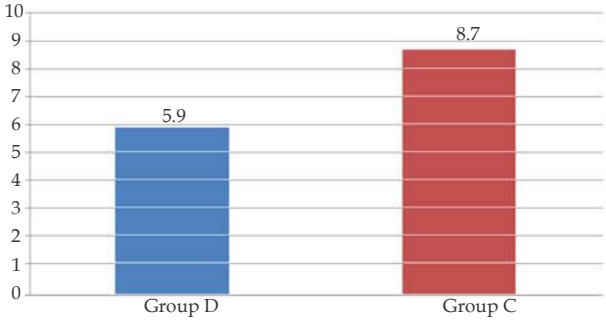

Fig. 9: Bar diagram showing On set of Sensory Block comparison between two groups

Table 6: Onset of Motor Block comparison between two groups

	Group				P value
	Group D		Group C		
	Mean	SD	Mean	SD	
Onset of Motor Block	8.4	0.9	11.7	1.5	<0.001*

Mean Onset of Motor Block in Group D was 8.4 ±0.9 min and in Group C was 11.7±1.5 min. There was significant difference in mean Onset of Motor Block between two groups.

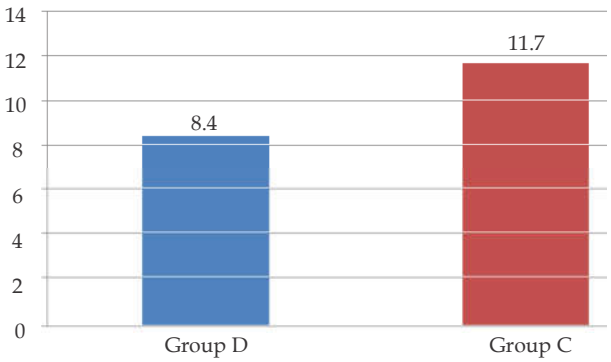

Fig. 10: Bar diagram showing On set of Motor Block comparison between two groups

Table 7: Duration of Postoperative Analgesia comparison between two groups

	Group				P value
	Group D		Group C		
	Mean	SD	Mean	SD	
Duration of Postoperative Analgesia	7.3	0.7	5.9	0.5	<0.001*

Mean Duration of Postoperative Analgesia in Group D was 7.3±0.7 min and in Group C was 5.9±0.5 min. There was significant difference in mean Duration of Postoperative Analgesia between two groups.

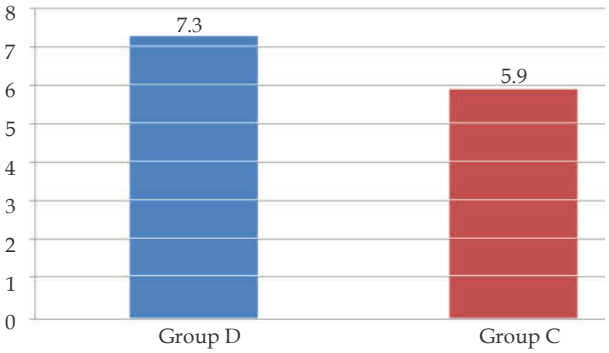

Fig. 11: Bar diagram showing Duration of Postoperative Analgesia comparison between two groups

Table 8: No of Rescue Analgesia comparison between two groups

		Group			
		Group D		Group C	
		Count	%	Count	%
No of Rescue Analgesia	0	24	80.0%	0	0.0%
	1	6	20.0%	25	83.3%
	2	0	0.0%	5	16.7%

χ^2 =40.64, df =2, p < 0.001*

In Group D, 80% required 0 doses of Rescue Analgesia and 20% required 1 dose of Rescue Analgesia. In Group C, 83.3% required 1 dose of Rescue Analgesia and 16.7% required 2 doses of Rescue Analgesia. There was significant difference in no of Rescue Analgesia needed between two groups.

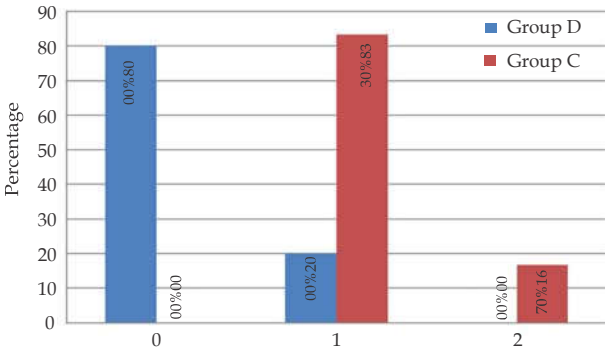

Fig. 12: Bar diagram showing No of Rescue Analgesia comparison between two groups

Table 9: Ramsay Sedation Score comparison between two groups

	Group						P value
	Group D			Group C			
	Mean	SD	Median	Mean	SD	Median	
0 min	0.07	.25	0	1.00	0.00	1	<0.001*
5 min	0.13	0.35	0	1.00	0.00	1	<0.001*
15 min	0.10	0.31	0	1.13	0.35	1	<0.001*
30 min	0.13	0.35	0	1.17	0.38	1	<0.001*
60 min	0.00	0.00	0	1.67	0.71	2	<0.001*
2 hr	0.00	0.00	0	1.47	0.57	1	<0.001*
6 hr	0.00	0.00	0	1.13	0.35	1	<0.001*
12 hr	0.00	0.00	0	0.73	0.45	1	<0.001*

In the study there was significant difference in Mean Ramsay sedation scores between two groups from 0 min to 12 hrs.

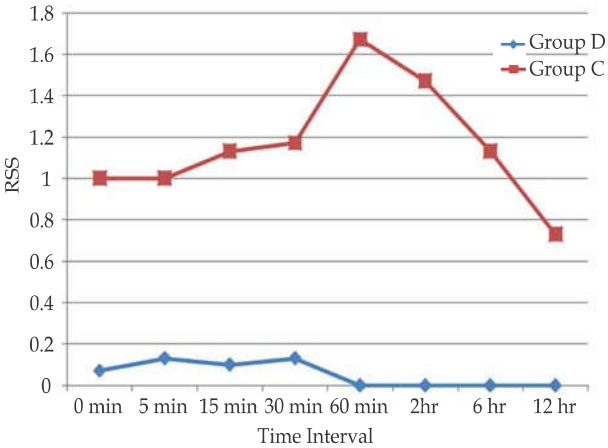

Fig. 13: Line diagram showing Ramsay Sedation Score comparison between two groups

Table 10: Heart rate comparison between two groups at different intervals of follow up

HR	Group				P value
	Group D		Group C		
	Mean	SD	Mean	SD	
0 min	97.4	10.5	80.9	9.1	<0.001*
5 min	95.2	10.3	80.8	8.5	<0.001*
15 min	91.6	18.8	77.2	13.2	<0.001*
30 min	93.8	10.4	76.9	6.7	<0.001*
60 min	91.9	8.6	76.1	7.3	<0.001*
2 hr	91.4	9.1	75.7	7.3	<0.001*
6 hr	93.0	9.3	78.4	6.2	<0.001*
12 hr	93.1	9.2	81.4	6.7	<0.001*

In the study there was significant difference in mean HR between two groups from 0 Min to 12 hrs. Mean HR at all the intervals was higher in Group D than in Group C.

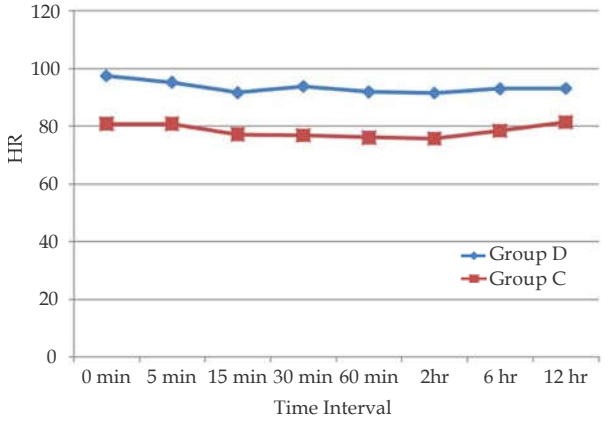

Fig. 14: Line diagram showing Heart rate comparison between two groups at different intervals of follow up

Table 11: SBP comparison between two groups at different intervals of follow up

SBP	Group				P value
	Group D		Group C		
	Mean	SD	Mean	SD	
0 min	135.2	12.7	126.0	9.9	0.003*
5 min	130.7	11.7	122.4	9.4	0.003*
15 min	129.4	10.4	120.9	9.1	0.001*
30 min	129.2	9.7	119.8	8.0	<0.001*
60 min	128.4	10.4	119.8	6.9	<0.001*
2 hr	128.2	9.8	117.7	7.5	<0.001*
6 hr	127.3	9.1	117.7	7.4	<0.001*
12 hr	126.1	10.2	117.7	8.8	0.001*

In the study there was significant difference in mean SBP between two groups from 0 Min to 12 hr. Mean SBP at all the intervals was higher in Group D than in Group C.

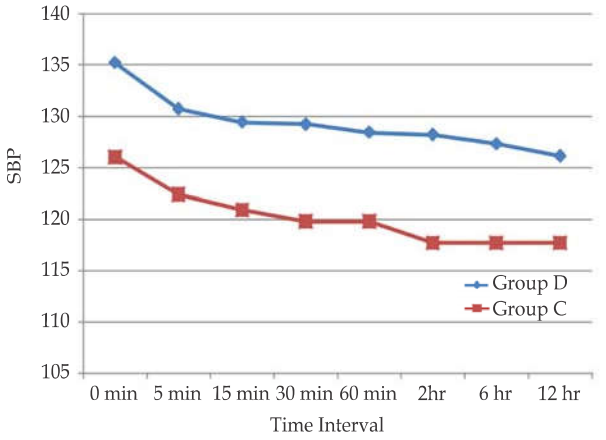

Fig. 15: Line diagram showing SBP comparison between two groups at different intervals of followup

Table 12: DBP comparison between two groups at different intervals of followup

DBP	Group				P value
	Group D		Group C		
	Mean	SD	Mean	SD	
0 min	73.17	7.50	62.37	6.14	<0.001*
5 min	70.63	7.90	59.87	4.45	<0.001*
15 min	71.93	7.19	57.80	3.58	<0.001*
30 min	70.57	7.38	58.13	3.88	<0.001*
60 min	70.00	6.93	58.17	2.90	<0.001*
2 hr	69.73	5.90	57.40	2.92	<0.001*
6 hr	69.00	6.53	57.83	2.44	<0.001*
12 hr	69.37	6.41	61.60	2.65	<0.001*

In the study there was significant difference in mean DBP between two groups from 0 min to 12 hr. Mean DBP at all the intervals was higher in Group D than in Group C.

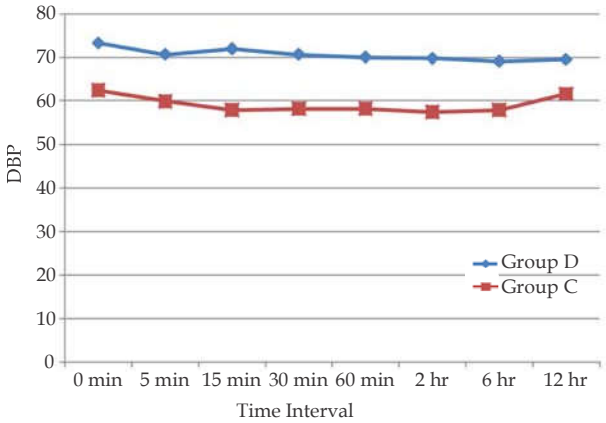

Fig. 16: Line diagram showing DBP comparison between two groups at different intervals of followup

Table 13: SpO_2 comparison between two groups at different intervals of follow up

SpO_2	Group				P value
	Group D		Group C		
	Mean	SD	Mean	SD	
0 min	99.2	0.4	98.4	0.8	<0.001*
5 min	98.8	0.4	98.0	0.5	<0.001*
15 min	98.9	0.7	98.6	0.6	0.069
30 min	99.2	0.9	98.8	0.5	0.034*
60 min	99.8	0.4	98.7	0.6	<0.001*
2 hr	98.9	0.6	98.3	0.5	<0.001*
6 hr	99.1	0.8	98.9	0.4	0.247
12 hr	98.7	0.5	98.2	0.6	0.001*

In the study there was significant difference in mean SpO_2 between two groups from 0 min to 12 hr except at 15 min and 6 hr. Mean SpO_2 at all the intervals was higher in Group D than in Group C.

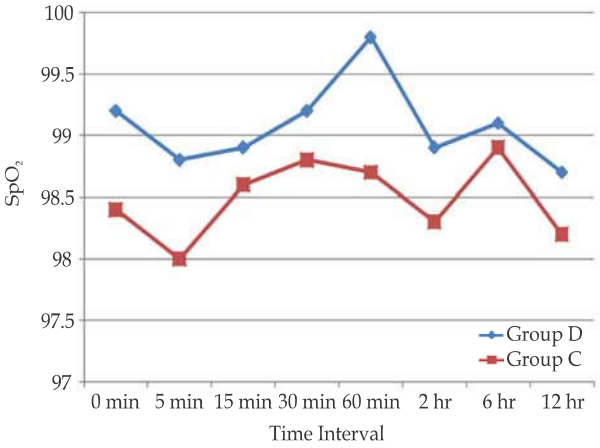

Fig. 17: Line diagram showing SpO_2 comparison between two groups at different intervals of followup

Table 14: RR Comparison between two groups at different intervals of follow up

RR	Group				P value
	Group D		Group C		
	Mean	SD	Mean	SD	
0 min	15.9	1.8	14.2	1.2	<0.001*
5 min	15.4	1.1	13.4	1.7	<0.001*
15 min	15.0	2.4	13.1	1.1	<0.001*
30 min	16.3	1.6	13.1	1.1	<0.001*
60 min	15.2	1.0	13.2	1.0	<0.001*
2 hr	16.2	1.6	14.6	1.2	<0.001*
6 hr	16.1	1.7	14.5	.9	<0.001*
12 hr	15.0	1.7	15.0	1.3	1.000

In the study there was significant difference in mean RR between two groups from 0 Min to 12 hr except at 12 hr. Mean RR at all the intervals was higher in Group D than in Group C.

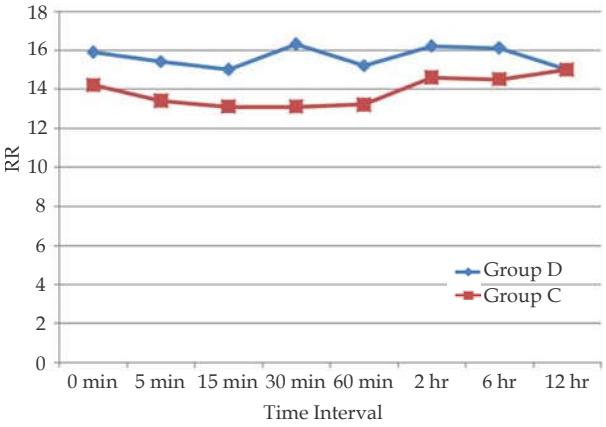

Fig. 18: Line diagram showing RR comparison between two groups at different intervals of follow up

Discussion

A variety of receptors mediate anti-nociception on peripheral sensory axons. The peripheral administration of appropriate drugs (adjuncts) may have good anesthetic condition, analgesic benefit and reduce systemic adverse effects. In an attempt to improve peri-operative analgesia, a variety of adjuncts such as opiods, verapamil, neostigmine, tramadol and alpha-2 agonist like clonidine have been administered concomitantly with local anesthetics into the brachial plexus sheath. The aim of this study was to compare the additional anesthetic and analgesic effects of dexamethasone and clonidine (alpha-2 adrenoreceptor), after administration into brachial plexus sheath along with bupivacaine. The study was a prospective, randomized study carried out at Bangalore Medical College and Research Institute, Bangalore. Sixty ASA-1 and ASA-2 patients undergoing elective upper limb surgery were divided into 2 groups of 30 each[group D and group C]. Group D received brachial plexus block with 30 ml 0.5% bupivacaine and dexamethasone 8 mg, group C received brachial plexus block with 30 ml 0.5% bupivacaine and clonidine 75 mcg.

Parameters observed include onset of sensory blockade, onset of motor blockade, duration of analgesia, hemodynamic monitoring, Ramsay sedation scale, side effects and requirement of rescue analgesia in 12 hr post-operatively. In our study both the groups were comparable with respect to age and gender.

In our study, we observed that onset of sensory block was earlier in Group D [dexamethasone group] having a mean value of 5.9±0.8 min in comparison with group C [clonidine group] having a mean value of 8.7±0.9 min, which is statistically significant (p <0.001) and onset of motor block was

earlier in Group D [dexamethasone group] having a mean value [8.4±0.9 min] in comparison with Group C having mean value of [11.7±1.5 min], which is statistically significant (p <0.001). Sensory blockade was assessed using pin prick method and motor blockade was assessed using modified bromage scale.

The mean time from onset of block to request of analgesia is taken as total duration of analgesia. Postoperative analgesia was 7.3±0.7 hr in group D and 5.9±0.5 hr in group C, which is statistically significant with p <0.001. In our study, the mean numbers of rescue analgesia dosed were lesser in dexamethasone group i.e. 80%(24) required zero doses of rescue analgesia and 20%(6) required 1 dose of rescue analgesia. In Clonidine group it was 83.3%(25) required 1 dose of rescue analgesia and 16.7%(5) required 2 doses of rescue analgesia which was statistically significant p <0.001**.**

In our study, intra-operatively no patient had bradycardia, there was significant difference in mean heart rate between two groups from 0 to 12 hr. Mean heart rate at all intervals was higher in group D than in group C with p <0.001. There was significant difference in mean systolic blood pressure and mean diastolic pressure between two groups from 0 min to 12 hr, at all intervals mean systolic blood pressure and mean diastolic blood pressure was higher in group D than in group C. In our study, there was significant difference in respiratory rate between two groups from 0 min to 12 hr except at 12 hr in which there was significant depression in respiratory rate in clonidine group (p<0.001) when compared to dexamethasone group. No patient of any group complained of respiratory difficulty. We did not find any appropriate study to compare change in respiratory rate.

Ramsay sedation scale was compared between 2 groups. In Group D, all patients were awake and alert and had sedation score of 1. In Group C, sedation corresponding to score 2 was observed in some patients. Statistical analysis of sedation score by independent t test showed that the difference in sedation score was significant (P <0.001). The sedation in Group C and Group D patients were desirable, without any need for airway assistance. We did not find any appropriate study to compare change in Ramsay sedation scale.

Conclusion

To conclude, our study demonstrates that, dexamethasone can be an alternative to clonidine when administered with 0.5% bupivacaine as an adjuvant for supraclavicular brachial plexus block in upper limb surgeries. Dexamethasone provides:

- Faster onset of sensory block.
- Faster onset of motor block.
- Longer duration of post-operative analgesia.
- Less number of rescue analgesics in postoperative 12hr.
- Cost-effectivness.

Limitations

- Did not perform ultrasound-guided blocks because of unavailability at the time of our study which would have helped us to lower the volume of local anesthetic.
- An ideal scale for assessment of quality of block achieved.
- Small sample size in each group might have limited the true clinical significance of our comparison.

References

1. Bazin JE, Massoni C, Bruelle P, et al. The addition of local anesthetics in brachial plexus block : The comparative effects of morphine, buprenorphine and sufentanil. Anesthesia 1997;52:858–62.
2. Bone HG, Van Aken H, Brooke M, et al. Enhancement of axillary brachial plexus block anesthesia by coadministration of Neostigmine. RegAnesth Pain Med 1999;24:405–10.
3. Keeler JF, Simpson KH, Ellis FR, et al. Effect of addition of hyaluronidase to bupivacaine during axillary brachial plexus block. Br J Anesthesia 1992;68:68–71.
4. Winnie AP. Plexus anesthesia vol. 1, 1st ed. 1984;83.
5. David Johnson, Harold Ellis. Pectoral girdle and upper limb.In : Gray's - The anatomical basis of clinical practice. 38th Edn.Churchill Livingstone; 1999. 23. Collins Vincent J. Editor. Principles of Anaesthesiology. 3rd ed. Philadelphia :Lea &Febiger ;1993.
6. Brunton LL, Lazo JS, Parker KL. Local anaesthetics In: Goodman and Gilman's.The pharmacological basis of therapeutics.11th edn.2006; p.369- 387.Prashant Biradar, Padmanabha Kaimar, and Kannappady

Gopala krishna. Effect of dexamethasone added to lidocaine in supraclavicular brachial plexus block: A prospective, randomized, double–blind study.Indian J Anesth. 2013 Mar–Apr;57(2):180–84.

7. Pramila Bajaj. Drugs in Clinical Anesthesia. Paras, 1st ed. 2005.
8. Ranise J, Wedel, Terese TH. Nerve blocks. In: Miller Ronald D. Editor. Anesthesia 6th Ed. Philadelphia: Churchill Livingstone; 2005.
9. Gristwood. R.W. Drug Safety–Levobupivacaine. Vol 25, No.3.
10. Goodmann and Gilmann, The pharmacological basis of therapeutics. 10th ed. 233–34.
11. Kopacz DJ, Lacouture PG, Wu D, et al. The dose response and effects of dexamethasone on bupivacaine microcapsules for intercostals blockade (T9 to T11) in healthy volunteers. AnesthAnalg 2003;96:576–82.
12. Liu K, Hsu CC, Chia YY. Effects of dexamethasone on postoperative pain and emesis. Br J Anesth 1998;80:85–86.
13. Marks R, Barlow JW, Funder JW. Steroid–induced vasoconstriction: glucocorticoid antagonist studies. JClin Endo Meta 1982;54; 1075–7.
14. Miralles FS, Carceles MD, Micol JA, et al. Postoperative analgesia and dexamethasone Rev Esp Anestesiol Reanim. 1989 Nov–Dec;36(6):315–21.
15. Sujatha Basker, Georgene Singh, Rebecca Jacob. Clonidine In Paediatrics: A Review. Indian Journal of Anesthesia 2009;53(3):270–80.
16. PN Vishvanathan. Clonidine: A Review article. Karnataka Journal of Anesth 9(1).
17. Aho M, Erkola O, Kortilla K. Alpha–2 Adrenergic agonists in anesthesia. Current Opinion Anesthiology 1992.
18. Miller RD, ed. Anesthesia, 7th ed. Newyork: Churchill Livingstone 2010;720–28.
19. Noel WL, Joel OJ. Autonomic nervous system: Physiology and pharmacology clinical Anesthesia. 2006;5th ed:275–333.
20. Michael AE. Ramsay, Acute postoperative pain management Baylor University Medical Center 2000 July;13(3):244–247