



## A Comparative study of adding dexamethasone to bupivacaine versus bupivacaine alone in supraclavicular brachial plexus block in upper limb surgery by using peripheral nerve stimulator

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Submitted: 15-03-2022

Accepted: 25-03-2022

### ABSTRACT

**Title:** A Comparative study of adding dexamethasone to bupivacaine versus bupivacaine alone in supraclavicular brachial plexus block in upper limb surgery by using peripheral nerve stimulator. **Aim:** The aim of the current study is to 1) Evaluate the effects of adding dexamethasone to bupivacaine in supraclavicular brachial plexus block for upper limb surgeries on onset time of sensory and motor block and duration of motor and sensory block. 2) To evaluate the effect of adding Dexamethasone to Bupivacaine in supraclavicular brachial plexus block for upper limb surgeries on haemodynamics intraoperatively

**Introduction:-** Supraclavicular block is most commonly used method of anaesthesia and analgesia in upper limb surgeries . Bupivacaine 0.5% is commonly used drug in all kinds of nerve block. Its onset of action is 3 to 8 minutes. This onset and duration can be enhanced by addition of glucocorticoid Dexamethasone.

**Materials and methods:** A randomised double blinded study was undertaken in patients posted for upper limb surgeries under supraclavicular block. 40 patients with ASA class I and II were randomly grouped into two groups. Group B received 28ml bupivacaine 0.5%+ 2ml of Normal Saline and Group D received combination of 28ml Bupivacaine 0.5% and 2ml dexamethasone 8mg. 30ml solution is used for a single shot blockade of supraclavicular brachial plexus. **Results:** Group D patients had faster onset of action and prolonged duration of action. **Discussion:** Addition of dexamethasone 8mg to bupivacaine 0.5% speeds the onset of sensory and motor blockade also prolongs the duration thus provides better analgesia and reduces the requirements of rescue analgesics. **Conclusion:** Combination of Bupivacaine 0.5% and dexamethasone 8mg has significantly faster onset and prolonged duration of action. **Key words:** Brachial plexus, Bupivacaine, Dexamethasone.

### I. INTRODUCTION

With the evolution of peripheral nerve block, brachial plexus block is the most frequently and commonly used block now a days, in clinical practice, for upper limb surgeries. It has been proved beyond doubt that Brachial plexus block alone is sufficient to provide good intra operative and post operative analgesia. There are various approaches used for brachial plexus block like interscalene brachial plexus block, superior trunk block, supraclavicular brachial plexus block, infra clavicular brachial plexus block and axillary brachial plexus block. One of the commonly used approach is supraclavicular approach. Many studies had shown and proved the usefulness of Dexamethasone as an additive to local anesthetic but the studies are insufficient in respect of analgesic efficacy. Hence this study was taken up to assess the efficacy of Dexamethasone as an analgesic mainly for upper limb surgeries.

### OBJECTIVES

**Primary objectives of study** 1) To evaluate effect on onset time of sensory and motor block and 2) To evaluate effect on duration of motor and sensory block

**Secondary objective of study** 1) To evaluate effect on hemodynamic variables

### II. MATERIALS AND METHOD

A randomized double blinded study was undertaken among 40 patients, 20 patients in each group having age between 18 to 65 years, undergoing upper limb surgeries. Clearance was obtained from Institutional Ethical review committee. An informed, and written consent was obtained from all the patients. The inclusion and exclusion criteria were, **Inclusion Criteria:** Patient posted for upper limb surgeries, Patient willing to participate in study, Patient between age 18-65 years, Patient having ASA grade I and II fitness



**Exclusion Criteria :**Not Posted for upper limb surgeries, Not willing to participate in study ,Under the age of 18 years, Having local site infection, ASA grade III and IV, Renal and liver diseases, On long term steroid therapy, pregnant women, hemodynamic instability, BMI >35, Neuropathy involving the arm undergoing surgery, coagulopathy, **Enrollment Details-**Patient ready to participate in study and who have given informant consent were enrolled as per inclusion and exclusion criteria. **Randomization Schedule:** Systematic randomization technique using Allocation concealment is done with opaque sealed envelopes. Patients randomized using computer-generated random number table.. The patient and the assessor blinded to the group allocation. **Group B:** Patients induced with 28 ml of 0.5% Bupivacaine + Normal saline 2 ml. **Group D:** Patients induced with 28 ml of 0.5% Bupivacaine + 8 mg Dexamethasone (2ml). **Procedure of the study:** The study protocol approved by the Hospital Institutional Ethics Committee and registered. The patients evaluated a day prior to surgery and emergency patient before surgery, and all routine and required investigations done. Written informed valid consent checked. NBM status confirmed. On arrival of patient in Operating room, IV line accessed. Standard anesthesia monitoring including noninvasive blood pressure, heart rate, oxygen saturation and electrocardiographic monitoring started and recorded every 5 min. Under strict asepsis, the supra clavicular area of the side to be operated cleaned and draped. The PNS needle 5cm ,22 G insulated needle pierced in supra clavicular fossa to locate brachial plexus. Nerve located by stimulation with Peripheral Nerve Stimulator before the injection of local anesthetic with. Electrical nerve stimulation done with current intensity (up to 5 mA) and short-duration (0.05-1 ms) of electrical stimulus (at 1-2 Hz repetition rate) to elicit a desired twitch response of twitches of hand or flexion or extension of fingers at lowest current but not less than or equal to 0.2mA to avoid nerve injury. A single operator anesthesiologist experienced in PNS location perform all the SCBs.

The patients received SCB under PNS at the same time avoiding inadvertent vessel and pleural injury as per group allocation to either of the two groups <sup>(20)</sup>. Group D receive inj Bupivacaine 28 ml + inj Dexamethasone 8 mg and group B receive 28 ml of inj Bupivacaine + 2ml Normal saline.

Sensory block is checked and graded as 2 = Normal, 1 = Reduced and 0 = Absent to pinprick sensation compared to the contra lateral arm every 5 min for up to the time the grade = 0 or absent pin

prick sensation observed in all the nerve territories or up to a maximum of 60 min had elapsed. Median nerve = checked on Thenar eminence, Musculocutaneous nerve = checked on Lateral side of forearm, radial nerve checked on = Dorsum of the hand over the second metacarpophalangeal joint, ulnar nerve = checked on Hypothenar eminence, medial cutaneous nerve of arm = checked on Medial side of the arm and medial cutaneous nerve of forearm = Medial side of the forearm. Motor block: scored as 2 = Normal, 1 = Reduced, 0 = Unable to overcome gravity compared to the opposite arm that recorded every 5 min for up to the time the grade = 0 observed in all the territories or up to a maximum of 60 min. Radial nerve = checked on Push the arm by extending the forearm at the elbow against the resistance, musculocutaneous nerve = checked on Resisting the pull of the forearm at the elbow, median nerve = Thumb and second digit pinch, ulnar nerve = Thumb and fifth digit pinch. Surgical anesthesia success considered as the performance of surgery without the need of general anesthesia (GA) supplementation. All Participant assessed during pre operatively & intra operative period for Pulse rate , Systolic Blood Pressure, Diastolic Blood Pressure ,Mean Arterial Pressure , Respiratory Rate , Oxygen saturation at every 5 min till 30 min from block injection then at every 15 min till completion of procedure. Then participant followed post operatively at 6<sup>th</sup> hour 12<sup>th</sup>hour and 24<sup>th</sup> hour for pain and analgesic requirement and side effects or untoward finding, Mean and Standard deviation calculated. T test and Chi square S

The motor block was checked by using Bromage three point score 0=normal motor function with full flexion and extension of elbow, wrist and fingers, 1=decreased motor power with ability to move fingers and/or wrist only, 2= complete motor blockade with inability to move fingers. The time of motor blockade was noted.

The time of onset of sensory block was defined as the time elapsed between the injection of drug and complete loss of cold perception of the hand, while onset of the motor blockade was defined as the time elapsed from injection of drug to complete the motor block.

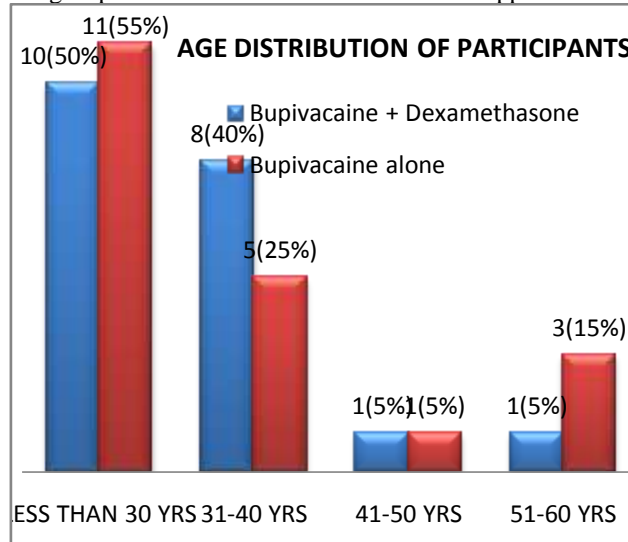
Heart rate, noninvasive blood pressure and oxygen saturation were monitored during the surgery. Duration of sensory block which is the time elapsed between the injection of drug and appearance of pain requiring analgesia and duration of motor block was also recorded.

## RESULTS



About 40 patients, posted for upper limb and having ASA grade I and II were enrolled in this study as study subjects. They were randomly divided into two equal groups where first group B received 28

ml of 0.5% Bupivacaine + 2ml normal saline and second group D received 28 ml of mixture of Bupivacaine with Dexamethasone (8 mg) by supra clavicular approach.



**Age Distribution of study Groups**

The mean age of patients who received 28ml of 0.5 % Bupivacaine + 2ml normal saline was 32.46 years and those who received Bupivacaine – Dexamethasone was 29.65 years. Difference between the mean ages of two groups was not

statistically significant. About 55% of the patients in group B and 50.0% of the patients in group D belonged to <30 years age group. Since the age groups were similar the groups were comparable in age.

**Sex Distribution in Study Groups**

Sex Distribution of Study Groups				SEX DISTRIBUTION IN STUDY GROUPS The mean Sex distribution of the study group of patients who received 28 ml of 0.5% Bupivacaine + 2ml normal saline (group B) was male 65 % and female .35% and those who received Bupivacaine – Dexamethasone (group D) was male 55 % and female 45%...
GROUP	Bupivacaine + Dexamethasone (n)	Bupivacaine	P Value	
MALE	11(55%)	13(65%)	Not significant	
FEMALE	9(45%)	7(35%)		



\* Student's unpaired t test NS = Not Significant

**ASA Status of the study groups**

ASA GRADE	Bupivacaine + Dexamethasone (n)	Bupivacaine	P Value	<b>ASA Status of study groups</b>  The mean ASA Grade distribution of the study (Group B) of patients who received 28 ml of 0.5% Bupivacaine + 2ml normal saline was male 60 % and female . 40 % and those who received Bupivacaine – Dexamethasone (Group D) was male 65 % and female . 35%
I	12(60%)	13(65%)	Not significant	
II	8(40%)	7(35%)		

\* Student's unpaired t test NS = Not Significant

**Duration of Surgery in Study Groups**

GROUP	Bupivacaine + Dexamethasone	Standard Deviation	Bupivacaine	Standard Deviation	t value	P-value	<b>Mean Duration Of Surgery in Study Groups</b>  The mean duration of surgery of patients who received (Group B) 28 ml of 0.5% Bupivacaine + 2ml normal saline was 1.86 hours and those who received Bupivacaine – Dexamethasone (Group D) was 1.68 hours. There was no statistically significant difference between the
Duration of surgery in Study groups	1.86	± 0.4	1.68	± 0.3	1.48	0.14	



mean duration of surgery of two groups.

**Onset of sensory block between the study groups**

GROUP	Bupivacaine + Dexamethasone	Standard Deviation	Bupivacaine	Standard Deviation	t value	P-value	Onset of Sensory Block between Study Groups
ONSET OF SENSORY BLOCK	10.95	± 1.4	16.7	± 1.5	-12.04	<0.0001	The mean time of onset of sensory block in 28 ml of 0.5% Bupivacaine + 2ml normal saline (Group B) was <b>16.7</b> minutes and <b>10.95</b> minutes in Bupivacaine + Dexamethasone (Group D). This difference in onset of sensory block was statistically significant between the two groups

**ONSET OF SENSORY BLOCK**

TIME IN MINUTE

Group	Mean Onset Time (min)
Bupivacaine + Dexamethasone	10.95
Bupivacaine alone	16.7

\* Student's unpaired t test      Sig =Significant

**Onset of motor block between the study groups**

GROUP	Bupivacaine + Dexamethasone	Bupivacaine	t value	P-value	Mean Time Of Onset of Motor Block in Study Groups
ONSET OF MOTOR BLOCK	5.65± 0.74	8.25± 1.01	-9.2	<0.0001	The mean time of onset of motor block in this study 28 ml of 0.5% Bupivacaine + 2ml normal saline (Group B) was 8.25(± 1.01) minutes and the mean onset of motor block in Bupivacaine + Dexamethasone (Group D) was 5.6(±0.7)

**ONSET OF MOTOR BLOCK**

Group	Mean Onset Time (min)
Bupivacaine + Dexamethasone	5.65
Bupivacaine alone	8.25



	minutes. There is significant difference between the onset of motor block in minutes and 28 ml of 0.5% Bupivacaine + normal saline and Bupivacaine + Dexamethasone groups.
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\* Student's unpaired t test Sig = Significant

**Duration of sensory block between the study groups**

GROUP	Bupivacaine + Dexamethasone	Bupivacaine	t value	P-value	Mean duration of sensory block in the treatment groups The mean duration of sensory block in 28 ml of 0.5% Bupivacaine + 2ml normal saline (Group B) was 3.02(±0.75) hours and in Bupivacaine +Dexamethasone (Group D) was 5.89(±0.53) hours. This difference was not statistically significant between the Bupivacaine and Bupivacaine-Dexamethasone groups.
DURATION OF SENSORY BLOCK	5.89±0.53	3.02±0.75	13.18	<0.0001	

**DURATION OF SENSORY BLOCK**

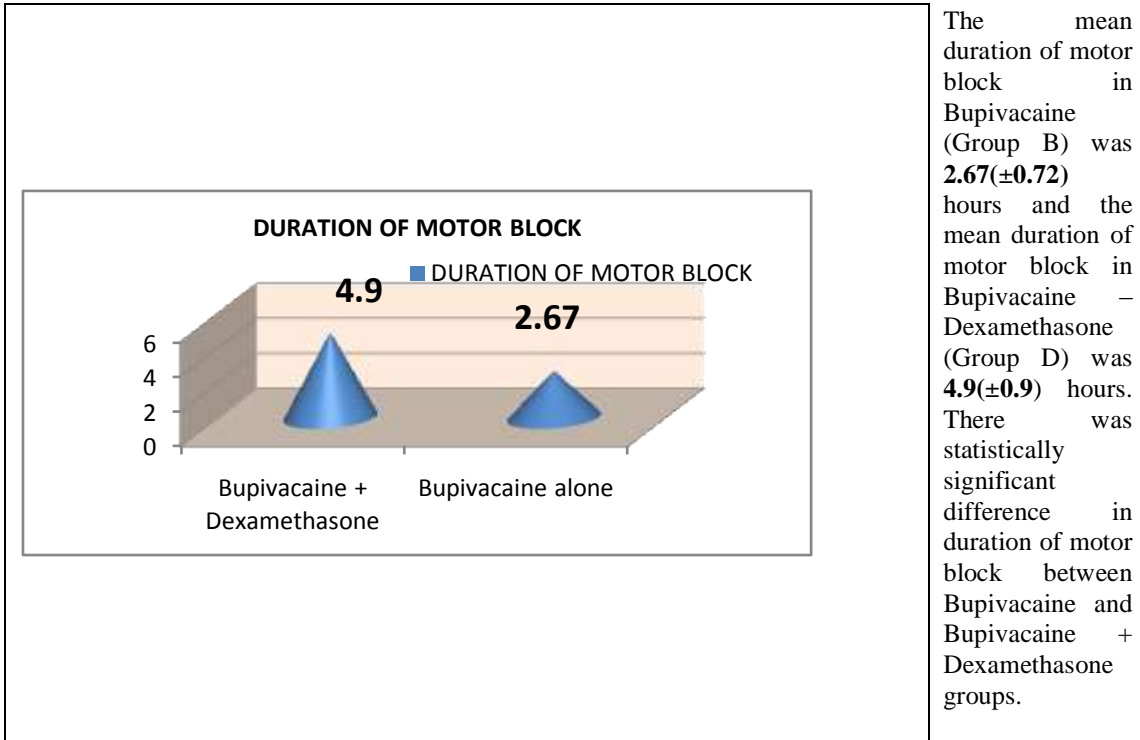
Legend: ■ DURATION OF SENSORY BLOCK

Group	Mean Duration (hours)
Bupivacaine + Dexamethasone	5.89
Bupivacaine alone	3.02

\* Student's unpaired t test Sig= Significant

**Duration of motor block between the study groups**

GROUP	Bupivacaine + Dexamethasone	Bupivacaine	t value	P-value	Mean duration of motor block in the study group
DURATION OF MOTOR BLOCK	4.9±0.9	2.67±0.7	9.09	<0.0001	

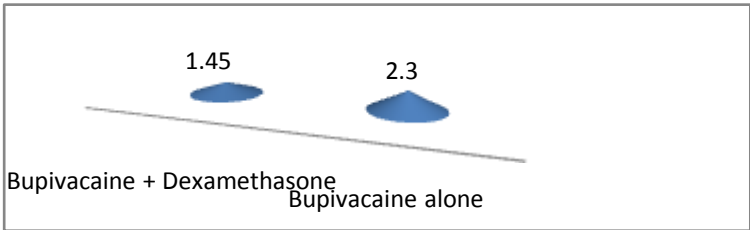


The mean duration of motor block in Bupivacaine (Group B) was **2.67(±0.72)** hours and the mean duration of motor block in Bupivacaine – Dexamethasone (Group D) was **4.9(±0.9)** hours. There was statistically significant difference in duration of motor block between Bupivacaine and Bupivacaine + Dexamethasone groups.

\* Student's unpaired t test Sig =Significant

**No. of Rescue Analgesia in 24 hours between the study groups**

GROUP	Bupivacaine + Dexamethasone	Bupivacaine	t value	P-value	No. of Rescue Analgesia in 24 hours between the study group
Rescue Analgesia IN 24 HRS	1.45±0.6	2.3±0.57	-4.5	<0.0001	Table and Chart shows the distribution of the study groups about the number of rescue analgesic doses in 24 hours. The patients of Bupivacaine (Group B) had received <b>2.3(±0.57)</b> doses and the patients of Bupivacaine – Dexamethasone (Group D) received <b>1.45(±0.6)</b> mean doses of rescue analgesic. The difference in receiving the mean doses of rescue analgesic was statistically significant between the Bupivacaine and Bupivacaine – Dexamethasone groups.



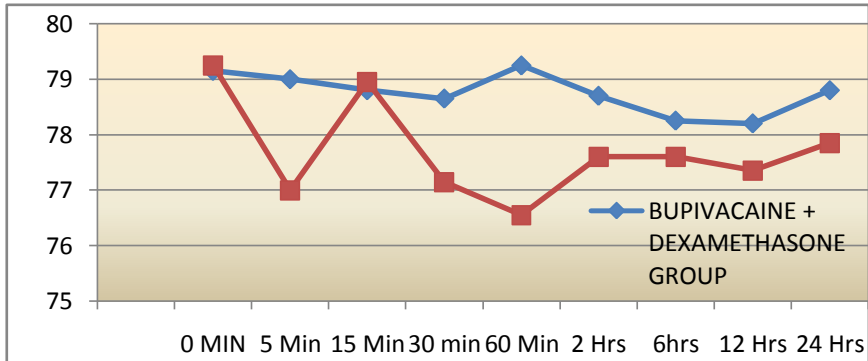
\* Student's unpaired t test Sig =Significant



**Pulse rate at different time intervals between the study groups**

PULSE RATE	MEAN ± SD		*t VALUE	P VALUE	SIGNIFICANCE	Pulse rate at different intervals of time after anesthesia
	BUPIVACAINE + DEXAMETHASONE GROUP	BUPIVACAINE GROUP				
0 MIN	79.15±6.04	79.25±5.9	-0.05	0.9	NS	The mean heart rate in Bupivacaine (Group B) was around 76 to 79 beats per minute. The mean heart rate in Bupivacaine – Dexamethasone (Group D) was around 78 to 79 beats per minute. There was no statistically significant difference between Bupivacaine and Bupivacaine – Dexamethasone groups in Heart rate at different time intervals
5 Min	79.0±6.2	77.5±5.2	0.82	0.41	NS	
15 Min	78.8±5.4	78.95±5.52	0.086	0.93	NS	
30 min	78.65±5.65	77.15±6.1	0.8	0.42	NS	
60 Min	79.25±5.17	76.55±5.9	1.5	0.13	NS	
2 Hrs	78.7±6.11	77.6±5.67	0.59	0.55	NS	
6hrs	78.25±6.48	77.6±5.97	0.3	0.76	NS	
12 Hrs	78.2±6.74	77.35±5.99	0.42	0.67	NS	
24 Hrs	78.8±6.60	77.85±6.5	0.46	0.64	NS	







**Systolic Blood Pressure In Study Groups**

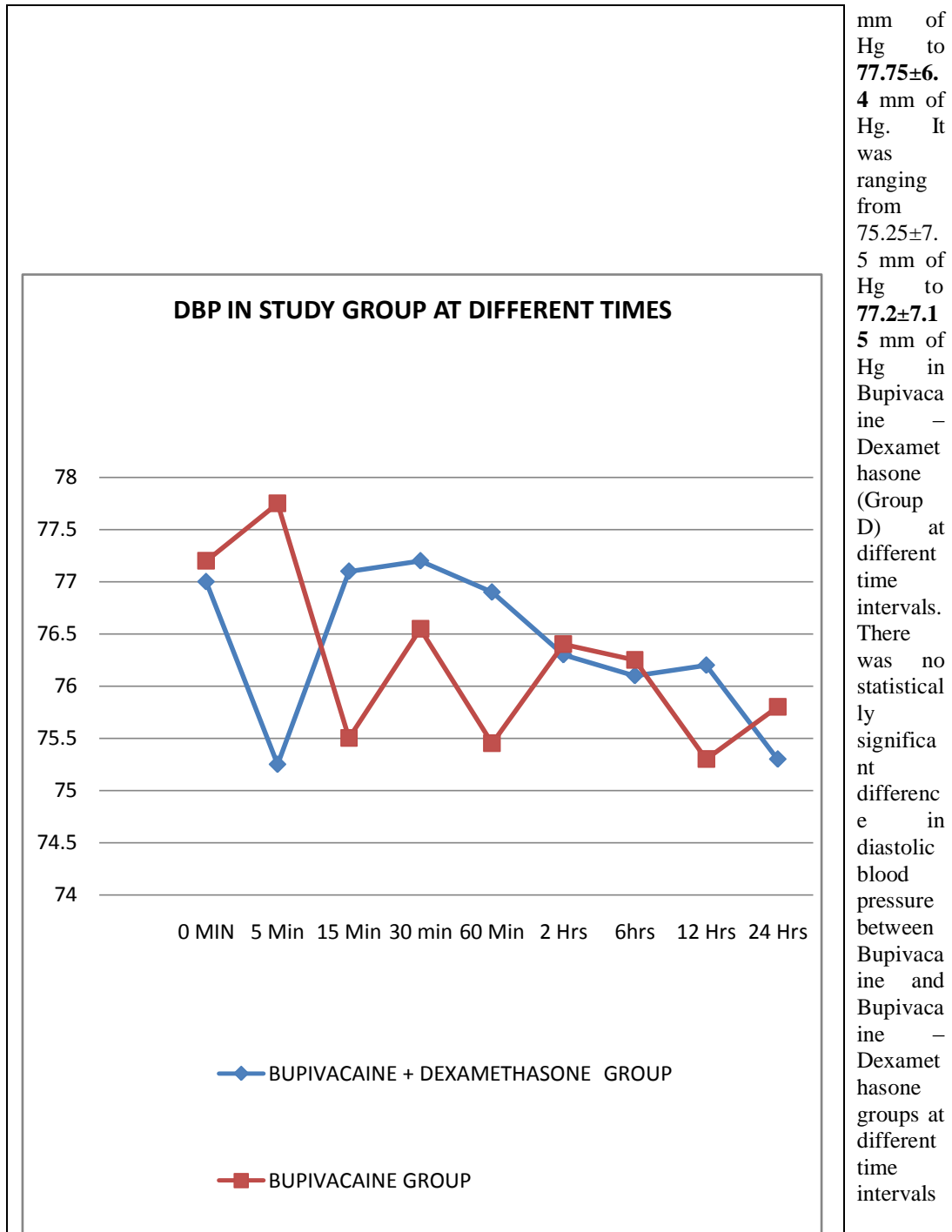
SBP	MEAN ± SD		*t VAL UE	P VAL UE	SIGNIFICAN CE	<b>Mean-systolic blood pressure at different intervals of time after anesthesia</b> The mean systolic blood pressure in <u>Bupivacaine</u> (Group B) ranged from 113.7±8.4 mm of Hg to 114.8±8.1 mm of Hg. The mean systolic blood pressure in <u>Bupivacaine-Dexamethasone</u> (Group D) was ranging from 118.38±12.13 mm of Hg to 120.2±13.39 mm of Hg at different time intervals. The difference in systolic blood pressures at different time intervals between <u>Bupivacaine</u> and <u>Bupivacaine - Dexamethasone</u> groups were not statistically significant.
	BUPIVACAINE + DEXAMETHASONE GROUP	BUPIVACAINE GROUP				
0 MIN	118.5±12.36	114.2±8.12	1.3	0.2	NS	
5 Min	118.43±12.34	114.3±7.8	1.25	0.2	NS	
15 Min	118.38±12.13	114.8±8.1	1.94	0.3	NS	
30 min	118.7±13.06	114.15±8.4	1.3	0.19	NS	
60 Min	119.0±12.97	114.7±7.76	1.3	0.2	NS	
2 Hrs	118.8±12.56	113.7±8.4	1.5	0.13	NS	
6hrs	118.99±13.37	113.9±8.3	1.4	0.16	NS	

\*Student's unpaired t test

NS = Not Significant Sig=Significant

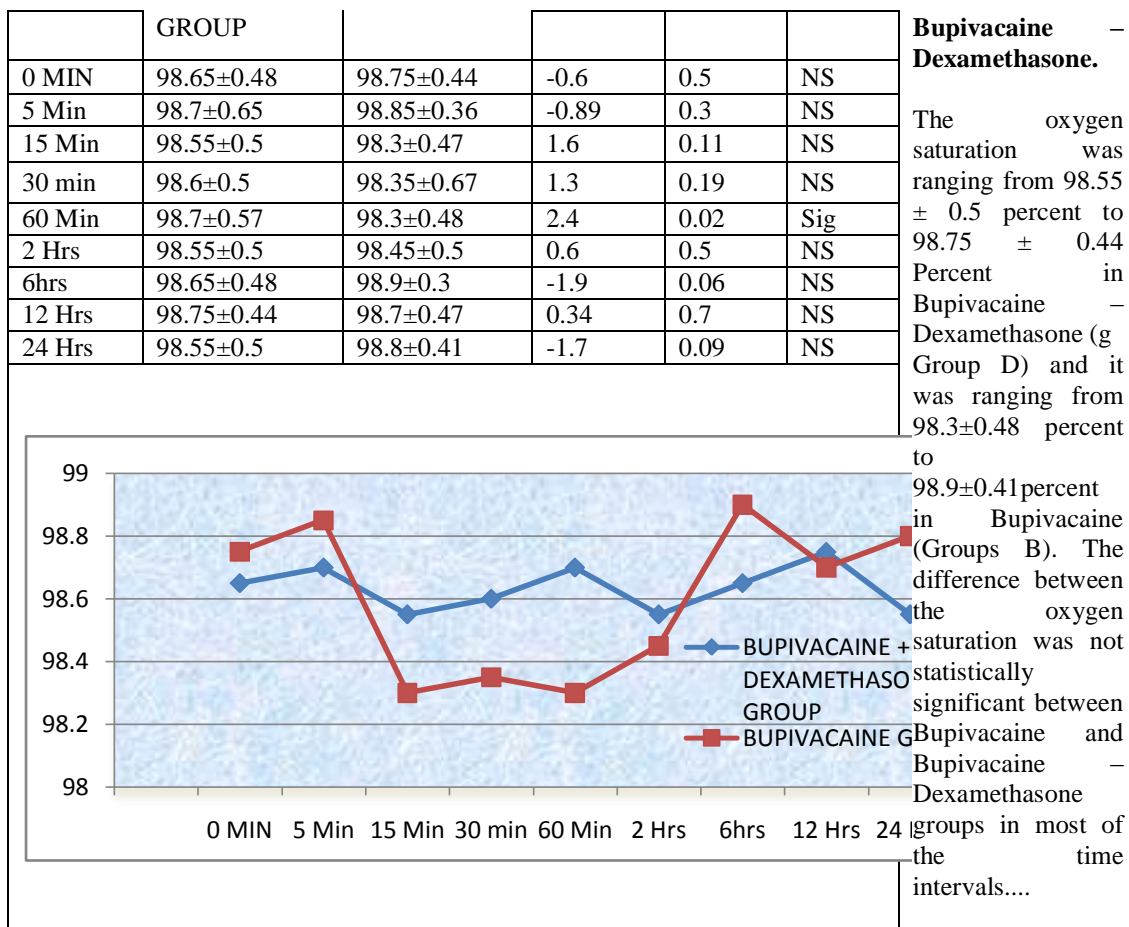
**Diastolic blood pressure at different time intervals between the study Groups**

DBP	MEAN ± SD		*t VALUE	P VALUE	SI GN I FI CA NC E	<b>Diastolic blood pressure of the study group at different time intervals</b> The mean diastolic pressure in <u>Bupivacaine</u> (Group B) was ranging from 75.3±5.9
	BUPIVACAINE + DEXAMETHASON E GROUP	BUPIVACAINE GROUP				
0 MIN	77±7.1	77.2±7.05	-0.09	0.9	NS	
5 Min	75.25±7.5	77.75±6.4	0.6	0.5	NS	
15 Min	77.1±6.8	75.5±6.3	0.76	0.4	NS	
30 min	77.2±7.15	76.55±6.3	0.3	0.76	NS	
60 Min	76.9±7.24	75.45±6.2	0.67	0.5	NS	
2 Hrs	76.3±7.8	76.4±5.7	0.04	0.98	NS	
6hrs	76.1±7.74	76.25±6.33	0.06	0.94	NS	
12 Hrs	76.2±7.0	75.3±5.9	0.43	0.66	NS	
24 Hrs	75.3±5.6	75.8±6.1	0.24	0.8	NS	



**Oxygen saturation at different time intervals in the study group**

SPO2	MEAN ± SD		*t VALUE	P VALUE	SIGNIFICANCE	The oxygen saturation at different time intervals in Bupivacaine and
	BUPIVACAINE + DEXAMETHASONE	BUPIVACAINE GROUP				



### III. DISCUSSION

Brachial plexus block has become as a popular technique among the anesthetists for upper limb surgeries because this avoids the untoward effects of general anesthesia like complications related to upper airway instrumentation. Its good approach and effective in terms of economy, performance, margin of safety and also provides good postoperative analgesia.

The mean age of patients posted was 32.46 years in Bupivacaine and 29.6 in Bupivacaine – Dexamethasone groups. There is no statistically significant difference in age between the two groups. Hence the two groups were comparable in the aspect of age. Majority of the patients in this study belonged to <30 years in both the groups. In a study by Hesham A et al, the mean age was 33.80 ± 9.92 years in local anesthetic group and 34.75 ± 7.52 in Dexamethasone groups

The mean time of onset of sensory block was greater in Bupivacaine group compared to Bupivacaine – Dexamethasone group. The mean time of onset of motor block was also lesser in Dexamethasone group than local anesthetic group in this study. This difference was also statistically

significant between the two groups. In a study by Hesham A . et al the mean onset of action was 12.85 ± 2.50 minutes while it was 10.30 ± 2.27., Yadav et al compared three different drugs by supra clavicular brachial plexus block. However, the onset of anesthesia in Dexamethasone group was faster than other two groups of drugs. In a study by Islam et al, the onset of sensory block also lesser in Dexamethasone group than the plain local anesthetic group.

The mean duration of sensory block in Bupivacaine group was 3.02(±0.75) hours and 5.89(±0.53) hours in Bupivacaine– Dexamethasone group. The mean duration of motor block in Bupivacaine group was 2.67(±0.7) hours and in Bupivacaine – Dexamethasone group was 4.9(±0.9) hours. There was statistically significant difference in duration of action between Bupivacaine and Bupivacaine – Dexamethasone groups. A similar study in Nepal<sup>5</sup> found that the duration of action of the local anesthetic as 3.16 hours in local anesthetic group and 12.75 hours in steroid group.

The mean numbers of rescue analgesic doses were lesser in Dexamethasone group than Bupivacaine group significantly. In a study by



Yadav et al, the mean number of rescue analgesic doses was also lesser in Dexamethasone group than other groups.

The mean heart rate slightly higher in Dexamethasone group than the local anesthetic group. There was no statistically significant difference between the heart rates of the Dexamethasone group than local anesthetic group. But it was within normal limits. The mean systolic and diastolic pressure was also almost similar in both the groups within normal limits. The mean oxygen saturation also not varied much in both the groups. In summary, the hemodynamic responses are crucial in maintenance of patient during anesthesia. However, the Bupivacaine has already proved its safety especially when used as local anesthetic in supra clavicular block. Since the hemodynamic responses were similar, the study concludes that the Bupivacaine – Dexamethasone combination also safer to use in supraclavicular block.

This study has shown that addition of 4 – 8 mg of Dexamethasone effectively and significantly prolongs the duration of analgesia also by producing early onset of action. This study has also shown that the early onset of action in steroid group can be attributed to synergistic action with local anesthetic on blockage of nerve fibers. The prolongation of duration of block is the local effect of steroid than the systemic action. The effects are mainly mediated by glucocorticoid receptors. The blockade is not produced by the action of steroid alone. Hence it should be used in addition to a local anesthetic.

#### IV. CONCLUSIONS

Supraclavicular approach of brachial plexus block has been popular technique in delivery of anesthesia in patients undergoing upper limb surgeries. The simplicity in the technique helps in safe delivery of anesthesia and also assures prolonged analgesia by preventing the side effects of general anesthesia. Steroids are commonly used now a day along with the local anesthetics due to their anti inflammatory and analgesic effects. Dexamethasone being a potent corticosteroid is becoming popular for the regional blocks. This study has made an effort to compare the Bupivacaine with Bupivacaine – Dexamethasone. The study is methodologically simple and clear since it is randomized controlled study. However, one cannot rule out bias since it is double blind study. This study has shown the beneficial effect of addition of steroid to a local anesthetic in terms of onset and duration of anesthesia. The further research with calculation of sample size is needed

to study the beneficial or adverse effects of addition of steroids along with local anesthetics for producing the blockade.

#### V. SUMMARY

Brachial plexus block is a accepted approach for upper limb surgeries and rising as alternative to general anesthesia due to low complications. Supraclavicular approach brachial plexus block is valuable in terms of cost and performance, margin of safety, along with good postoperative analgesia. The local anesthetics are commonly used for regional anesthesia but many studies have proved that addition of other drugs produces synergistic effects. Dexamethasone being a potent corticosteroid has been tried as an additive for local anesthetic due to its anti-inflammatory and analgesic effects. The studies are less in this part of the country about the analgesic efficacy of the Dexamethasone when used along with a local anesthetic.. A randomized double blinded study was taken up in two groups of twenty patients each. The mean age of patients was 32.46 years and 29.6 years in Bupivacaine and Bupivacaine – Dexamethasone groups respectively. The two groups were comparable with respect to age. The mean time of onset of sensory block in Bupivacaine group was 16.7 minutes and 10.9 minutes in Bupivacaine – Dexamethasone group which was statistically significant. The mean time of onset of motor block in this study in Bupivacaine group was 8.25 ( $\pm$  1.01) minutes and the mean onset of motor block in Bupivacaine – Dexamethasone group was 5.65 ( $\pm$  0.7) minutes. The difference was statistically significant. The mean duration of sensory block in Bupivacaine group was 3.02 ( $\pm$  0.75) hours and in Bupivacaine – Dexamethasone group was 5.89( $\pm$  0.53) hours. This difference was statically significant. The mean duration of motor block in Bupivacaine group was 2.67 ( $\pm$  0.7) hours and in Bupivacaine – Dexamethasone group was 4.9 ( $\pm$  0.9) hours. There was statistically significant difference between Bupivacaine and Bupivacaine – Dexamethasone groups. The mean rescue analgesic doses were lower in Bupivacaine – Dexamethasone group compared to Bupivacaine group. There were no significant changes in hemodynamic response between Bupivacaine and Bupivacaine – Dexamethasone groups except after 1 hours of oxygen saturation. But the oxygen saturation was within normal limits.



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