ORIGINAL RESEARCH PAPER
Volume-8 | Issue-9 | September - 2019 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK WITH OR WITHOUT ADDING DEXAMETHASONE AS AN ADJUVANT TO A MIXTURE OF 2% LIGNOCAINE AND 0.25% BUPIVACAINE IN UPPER LIMB ORTHOPAEDIC SURGERIES TO PROLONG ANALGESIA-A COMPARATIVE STUDY.

Anaesthesiology

Dr. Sasikumar Palanivel M.D, Consultant anesthesiologist, Kavery speciality Hospitals, Trichy

Dr Sajna A Khadir* M.D, Department of Anaesthesiology, Kavery speciality Hospitals, Trichy
*Corresponding Author

KEYWORDS

AIM OF STUDY

To assess the effectiveness of addition of dexamethasone to a mixture of lignocaine with adrenaline and bupivacaine in prolonging the duration of analgesia and motor block in supraclavicular brachial plexus block for upper limb surgeries.Following things were observed during the study and it was compared with another group without adding dexamethasone to the same mixture of local anaesthetics.

a. Onset of analgesia
b. Onset of motor block
c. Duration of analgesia
d. Duration of motor block
e. Side effects

MATERIALS AND METHODS

1. Study Design

A prospective comparative study of two groups of patients of 30 each,comparing the onset of analgesia,onset of motorblock, duration of analgesia,duration of motor block and the side effects in two groups.

2. Study Period

3 months.

3. Setting of The Study

Department of Anaesthesiology,Kavery Hospitals, Trichy

4. Population/Participants

60 patients of age group 20-65 years who would meet the inclusion criteria were divided into two groups of 30 each as per the order they come for surgery.

5. Inclusion Criteria

1. Adult patients in the age group 20-65 years(weighing 50-80 kg)of either sex
2. ASA1 or ASA 11 of physical status.
3. Orthopaedic surgical procedures of the upper limb lasting atleast for one hour.

6.Exclusion Criteria

1. Patients who are allergic to local anaesthetics .
2. Those with anatomical abnormalities of shoulder and neck region
3. Alchoholic, psychiatric, unco-operative patients.
4. Those with any bleeding disorders.
5. Patients with comorbidities like Diabetes Mellites & severe infections,Peptic ulcer disease.
6. Patients with hepatic or renal failure
7. Patients already on medications like benzodia zepines, opioids, analgesics.

7.Sample Size

Sample size calculated with the help of Epi-6 utilizing the mean increase in analgesia of approximately 8 hours.

8.Method

Pre-operative evaluation:
Detailed history
Age and weight
Basal heart rate and Blood Pressure

Investigations: Hemoglobin, Total and Differential count
Blood Urea
Routine Urine exam
Chest X-ray

Type of surgery: ORIF/External fixation/ debridement/tendon repair
Airway assessment

Patient preparation:
After getting consent from the ethical committee,patients were divided into 2 groups after satisfying all inclusion criteria as per the order they came for surgery..Pre anaesthetic examination were carried out and relevant investigations done.The procedure to be performed was explained in detail to the patient.An informed consent was taken.

Technique:
Each of the group received either a mixture of lignocaine 2% with 1:200,000 adrenaline and bupivacaine 0.25% with 2 ml normal saline (a total volume of 40ml), or a mixture of 2% lignocaine with 1:200,000 adrenaline and bupivacaine 0.25% with 8mg dexamethasone(2ml) (a total volume of 40ml) . Total dose of the mixture did not exceed the recommended dose as per body weight.

Supraclavicular brachial plexus block was performed in the supine position with the head turned to opposite side and the arms extended and pulled towards the knee. The midclavicular point, externaljugular vein and subcavian artery pulsation identified.

The stimuplex needle was connected with the Nerve stimulator, with the current output set at 2.0 mA and repeat twitch mode selected by the assistant under the guidance of an anaesthetist.About 2 cm above the midclavicular point the needle was directed caudad and medial, lateral to the subclavian artery pulsation.

On needle insertion, a twitch of the upper trunk (shoulder) was considered as the evidence of the needle approaching the brachial plexus. Wrist flexion and extension of the fingers were taken as acceptable responses and the current was gradually reduced between 0.2 to 0.5 mA, whereby maintaining the visible twitches. The total volume of the anaesthetic solution was injected at an incremental dose of 5ml each, preceded by negative aspiration in each group.

All patients were sedated with midazolam 0.05-0.1mg/kg body weight. Intercosto-brachial nerve is blocked with 5.0 ml of 0.5% bupivacaine to avoid tourniquet pain. Patients were monitored routinely and any untoward effects also noted. Vital parameters like pulse,BP and oxygen saturation were monitored.Respiratory rate and abnormalities of respiration were looked for through out surgery,

An assessment made for onset of analgesia,onset of motor block,duration of analgesia,duration of motor block and occurrence of any side effects during 1st 24 hrs of the post operative period.Post operative pain assessed by visual analogue scale of 10cm and 0-3cms was considered as good analgesia,3-6cms as moderate analgesia and 6-10cms as poor analgesia.Motor block assessed by modification of Lovett Rating Scale ranging from (complete paralysis)Grade 0 to (normal muscular force) Grade 6.

9.Outcome measure

Onset Of Analgesia
Onset of analgesia is considered as the time taken for establishment of

adequate analgesia that was checked by pin prick method and assessed by visual analogue scale and complete sensory block when no sensation felt along radial,median,ulnar and musculocutaneous nerve distribution.

.

Onset Of Motor Block

Onset of motor block is considered as the time when the patient feel heaviness on abducting the shoulder and complete motor block when there is complete absence of voluntary movement of the upper limb.

Duration Of Analgesia

Duration of analgesia is taken as the time between onset of analgesia and the reappearance of pain(6-10cms in VAS) or request for pain relief.

Duration Of Motor Block

Duration of motor block is the time taken between onset of motor block and the reappearance of voluntary movement.

Post operative pain was assessed every hour for the 1st 6hrs,every 2hrs for the next 6hrs and thereafter at 4th hrly intervals during the 24hr post operative period. Pulse, BP and SPO2 were also monitored during each visit.

10.Statistical Analysis

All continuous variables that follow normal distribution were measured using student T test. All proportions were analysed using Chi-square test. Those data that did not follow normal distribution were analysed by non parametric tests.

Data Analysis:

Data were analyzed using computer software, Statistical Package for Social Sciences (SPSS) version 10. Data are expressed in its frequency and percentage as well as mean and standard deviation. To elucidate the associations and comparisons between different parameters, Chi square (^{2}) test was used as nonparametric test. Paired Student's t test was used to compare mean values of different parameters between two groups. For all statistical evaluations, a two-tailed probability of value, <0.05 was considered significant.

Sixty patients who underwent upperlimb orthopaedic surgeries were allocated into two groups of 30 each as per the order they came for surgery.Group 1 received 2% lignocaine with adrenaline 1 in 200000 and 0.25% bupivacaine and Group II received 2 % lignocaine with adrenaline 1 in 200000 and 0.25% bupivacaine plus dexamethasone 8mg;both having a total volume of 40 ml each for supraclavicular brachial plexus block.

Table 3.Distribution of surgical procedure in two study groups

Procedure	Group	
	Group I (without Dexamethasone)	Group II (with Dexamethasone)
BB Fore Arm ORIF	8	7
	26.70%	23.30%
Flexor Tendon Repair Forearm	2	
	6.70%	
Radial Head Excision	2	2
	6.70%	6.70%
Supra Condylar Humerus ORIF	4	3
	13.30%	10.00%
Ellis Plating Ulna	2	1
	6.70%	3.30%
Montaggia ORIF	2	3
	6.70%	10.00%
Galaezzi ORIF	2	3
	6.70%	10.00%
Olecrenon ORIF	4	2
	13.30%	6.70%
Lower End Humerus ORIF	1	3
	3.30%	10.00%
Lower End Radius ORIF	1	
	3.30%	
Thumb Reimplantation	1	1
	3.30%	3.30%
Multiple Tendon Injuries & Repair	1	1
	3.30%	3.30%
Debridement & Tendon Repair Hand		1
		3.30%
Tendon (Flexor) Repair		1
		3.30%
Radius ORIF		2
		6.70%
Chi Square:	9.611	P > 0.05

Both the groups were comparable for age,sex and weight.

Table 2.Distribution of gender in two study groups

Gender	Group	
	Group I (without Dexamethasone)	Group II (with Dexamethasone)
Male	16	16
	53.30%	53.30%
Female	14	14
	46.70%	46.70%
Chi Square:	0.001	P > 0.05

Sex: Both the groups had 16 males and 14 females each.

Table 4.Comparison of mean age (years) and weight (Kg) between two study groups

Parameter	Group	Mean	+ SD	t' value	p value
Age (years)	Group I	28.10	4.01	- 0.242	> 0.05
	Group II	28.37	4.51		
Weight (Kg)	Group I	62.73	6.12	- 0.809	> 0.05
	Group II	63.97	5.68		

Age: The mean age of patients in Group 1 was 28.10 with a standard deviation of ± 4.01 and Group II patients had a mean age of 28.37 with a standard deviation of ±4.51.

Weight: The mean weight of patients in Group I was 62.73 with a standard deviation of ± 6.12 and Group II patients had a mean weight of 63.97 with a standard deviation of ±5.68.

Onset of analgesia: Onset of analgesia occurred within a time of 368.00 seconds in Group I patients with a standard deviation of ± 66.35.In Group II patients onset of analgesia occurred with a mean time of 204.20 seconds with a standard deviation of ±29.21.

Onset of complete sensory block: Complete sensory block in all dermatomes occurred with a mean time of 848.00 seconds in Group I patients with a standard deviation of ±73.46.In Group II patients complete sensory block occurred with a mean time of 618.00 seconds with a standard deviation of± 90.26.

Table 5.Comparison of mean onset of analgesia and complete sensory block (sec.) between two study groups

Parameter	Group	Mean	+ SD	t' value	p value
Onset of Analgesia	Group I	368.00	66.35	12.375	< 0.001
	Group II	204.20	29.21		
Onset of Complete Sensory Block	Group I	848.00	73.46	10.825	< 0.001
	Group II	618.00	90.26		

Onset of motorblock: Onset of motor block in Group I took a mean time of 466.00 seconds with a standard deviation of+ 64.36.In Group II patients the onset of motor block took a mean time of 284.67 seconds with a standard deviation of +44.47.

Onset of complete motor block:

In Group I patients complete motor block occurred with a mean time of1062.00 seconds with a standard deviation of +94.74.In Group II patients the same occurred with a mean time of 758.00 seconds with a standard deviation of +82.60.

Table 6.Comparison of mean onset of motor block and complete motor block (sec.) between two study groups

Parameter	Group	Mean	+ SD	t' value	p value

Onset of Motor Block	Group I	466.00	64.36	12.696	< 0.001
	Group II	284.67	44.47		
Onset of Complete Motor Block	Group I	1062.00	94.74	13.247	< 0.001
	Group II	758.00	82.60		

Duration of analgesia:
The duration of analgesia was significantly increased in Group II with the addition of dexamethasone.A mean time of 834.00 mins with a standard deviation of + 77.75 in Group II as compared to a mean duration of 276.00mins with a standard deviation of + 51.30 in Group I.

Duration of motor block:
Duration of motor block was also increased in Group II with a mean duration of 658.00mins with a standard deviation of +71.31 as against 206.00mins with a standard deviation of + 37.56. in Group I.

Table 7.Comparison of mean duration of analgesia and motor block (min.) between two study groups

Parameter	Group	Mean	+ SD	t' value	p value
Analgesia Duration	Group I	276.00	51.30	- 32.812	< 0.001
	Group II	834.00	77.75		
Motor Block Duration	Group I	206.00	37.56	- 30.723	< 0.001
	Group II	658.00	71.31		

No significant side effects were noted among patients in either of the groups.

OBSERVATIONS AND RESUTLS

Table 1.Distribution of age (years) in two study groups

Age (years)	Group	
	Group I (without Dexamethasone)	Group II (with Dexamethasone)
<= 30	23	23
	76.70%	76.70%
> 30	7	7
	23.30%	23.30%
Chi Square:	0.001	P > 0.05

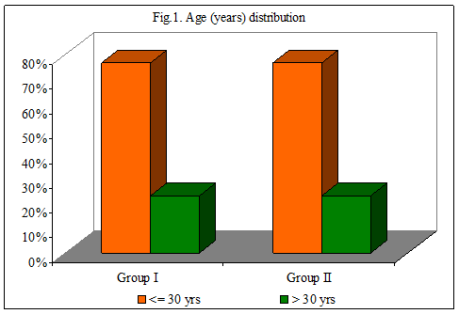
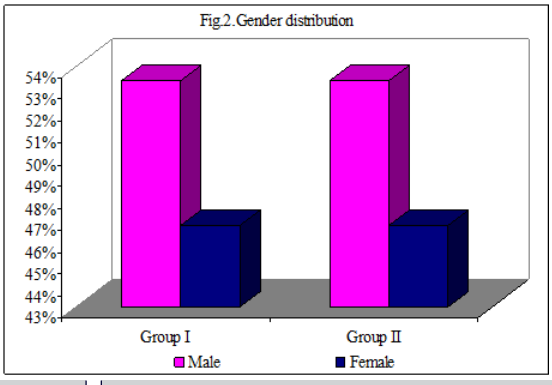


Table 2.Distribution of gender in two study groups

Gender	Group	
	Group I (without Dexamethasone)	Group II (with Dexamethasone)
Male	16	16
	53.30%	53.30%
Female	14	14
	46.70%	46.70%
Chi Square:	0.001	P > 0.05



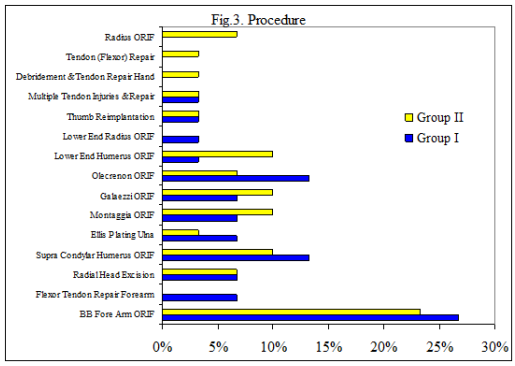


Table 3.Distribution of surgical procedure in two study groups

Procedure	Group	
	Group I (without Dexamethasone)	Group II (with Dexamethasone)
BB Fore Arm ORIF	8	7
	26.70%	23.30%
Flexor Tendon Repair Forearm	2	
	6.70%	
Radial Head Excision	2	2
	6.70%	6.70%
Supra Condylar Humerus ORIF	4	3
	13.30%	10.00%
Ellis Plating Ulna	2	1
	6.70%	3.30%
Montaggia ORIF	2	3
	6.70%	10.00%
Galaezzi ORIF	2	3
	6.70%	10.00%
Olecrenon ORIF	4	2
	13.30%	6.70%
Lower End Humerus ORIF	1	3
	3.30%	10.00%
Lower End Radius ORIF	1	
	3.30%	
Thumb Reimplantation	1	1
	3.30%	3.30%
Multiple Tendon Injuries & Repair	1	1
	3.30%	3.30%
Debridement & Tendon Repair Hand		1
		3.30%
Tendon (Flexor) Repair		1
		3.30%
Radius ORIF		2
		6.70%
Chi Square:	9.611	P > 0.05

Table 4.Comparison of mean age (years) and weight (Kg) between two study groups

Parameter	Group	Mean	+ SD	t' value	p value
Age (years)	Group I	28.10	4.01	- 0.242	> 0.05
	Group II	28.37	4.51		
Weight (Kg)	Group I	62.73	6.12	- 0.809	> 0.05
	Group II	63.97	5.68		

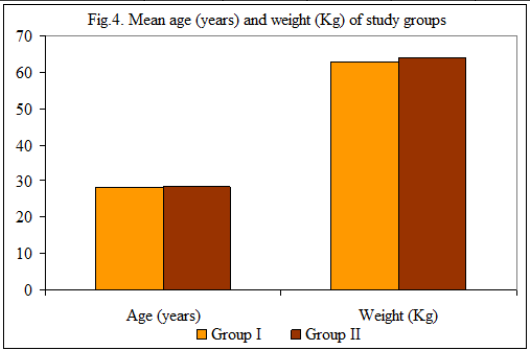


Table 5.Comparison of mean onset of analgesia and complete sensory block (sec.) between two study groups

Parameter	Group	Mean	+ SD	t' value	p value
Onset of Analgesia	Group I	368.00	66.35	12.375	< 0.001
	Group II	204.20	29.21		
Onset of Complete Sensory Block	Group I	848.00	73.46	10.825	< 0.001
	Group II	618.00	90.26		

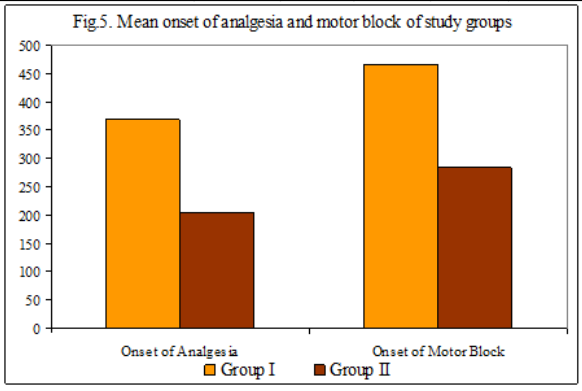


Table 6.Comparison of mean onset of motor block and complete motor block (sec.) between two study groups

Parameter	Group	Mean	+ SD	t' value	p value
Onset of Motor Block	Group I	466.00	64.36	12.696	< 0.001
	Group II	284.67	44.47		
Onset of Complete Motor Block	Group I	1062.00	94.74	13.247	< 0.001
	Group II	758.00	82.60		

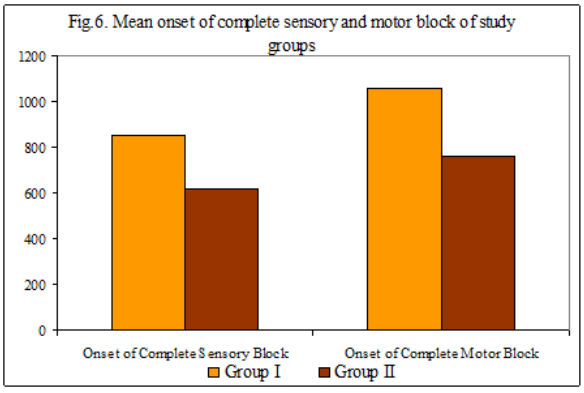
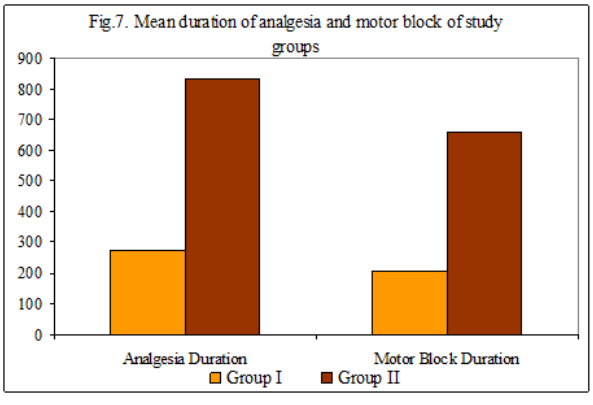


Table 7.Comparison of mean duration of analgesia and motor block (min.) between two study groups

Parameter	Group	Mean	+ SD	t' value	p value
Analgesia Duration	Group I	276.00	51.30	- 32.812	< 0.001
	Group II	834.00	77.75		
Motor Block Duration	Group I	206.00	37.56	- 30.723	< 0.001
	Group II	658.00	71.31		



DISCUSSION:

It has been established that combined administration of local anaesthetics and dexamethasone into brachial plexus ensures a more even,adequate and durable analgesia during and after surgery.

In our study,onset of analgesia was quite earlier in dexamethasone group and this was 204.20 seconds with a standard deviation of ±29.21 when compared to 368.00 seconds with a standard deviation of ± 66.35 in the other group which received only local anaesthetics.Complete sensory blockade was also found to be earlier.The time took was 618.00 seconds with a standard deviation of± 90.26 in dexamethasone group as compared to 848.00 seconds in local anaesthetics only group patients with a standard deviation of ±73.46.Change in onset of analgesia and complete sensory block was found to be highly significant (p<0.001).

Onset of motor block in dexamethasone group occurred at 284.67 seconds with a standard deviation of ±44.47.When compared to 466.00 seconds with a standard deviation of± 64.36 of local anaesthetics alone group this was definitely earlier. In Group I patients who received only local anaesthetics complete motor block occurred with a mean time of1062.00 seconds with a standard deviation of ±94.74.In Group II patients who received dexamethasone as an adjuvant the same occurred with a mean time of 758.00 seconds with a standard deviation of ±82.60.This was also statistically significant as the p value was (<0.001).

Total duration of analgesia was also higher in dexamethasone group .A mean time of 834.00 mins with a standard deviation of ± 77.75 in Dexamethasone group as compared to a mean duration of 276.00mins with a standard deviation of ± 51.30 in local anaesthetics only group. The difference was statistically highly significant (p value<0.001) especially when significant pain relief in the immediate post operative period was considered.

The duration of motor block was also higher in the dexamethasone group (a mean duration of 658.00mins with a standard deviation of ±71.31 as against 206.00mins with a standard deviation of ± 37.56 in Group which received only local anaesthetics). No significant side effects were noted among patients in either of the groups.

These results were comparable to studies done by **Shrestha BR1, Maharjan SK1, Tabedar S1**1Lecturer, Dept. of Anaesthesiology, Kathmandu Medical College where they compared two groups of 20 each receiving 2% lignocaine with adrenaline 1 in 200000 and 0.5% bupivacaine ,a total volume of 40ml and one group had dexamethasone 8mg as an adjuvant for supraclavicular brachial plexus block for surgeries of upperlimb.The two groups were comparable in age,sex and weight.They came to the conclusion that addition of dexamethasone for brachial plexus block significantly prolongs the duration of analgesia without any unwanted effects.In that study patients were of comparable age and sex group. The age ranged from 12-60 years (mean 25.5 ± 12.02) in local anaesthetic group and 12-77 years (mean 28.05 ± 16.10) in dexamethasone group. There was no significant statistical difference in age group (p>0.05). Male and female ratio was also almost similar in both groups (12:8 in local anaesthetic group and 13:7 in LA + steroid group). Onset of action was 10-30 minutes in local anaesthetic group (mean 18.15 ± 4.25) and 10-20 minutes (mean 14.5 ± 2.10) in the local anaesthetic + steroid group. Statistical analysis revealed a significant difference between the two groups

(p<0.05). Regarding the duration of action the local anaesthetic group had ananalgesia time of 2.30 – 4.0 hours (mean 3.16 ± 0.48) and in the steroid group 8.0 – 24 hours (mean 12.75 ± 5.33). Statistical analysis revealed a significant difference (p = 0.00).

The mode of analgesic effect of steroids is ill defined, it may be due to their anti-inflammatory action resulting in decrease of production of various inflammatory mediators that play a major role in amplifying and maintenance of pain perception. They have also been seen to increase the endorphin levels and mood elevation. Steroids also have found to modulate the potassium channels in pain pathway and they relieve pain by reducing inflammation and by blocking transmission in nociceptive c-fibres1. Phospholipase *A*2 is the enzyme responsible for liberation of arachidonic acid leading to the production of prostaglandins and leukotriones. These mediators sensitize small neurons and enhance pain generation by abnormal conduction and intraneural edema.Steroids produce analgesia by blocking transmission in nociceptive c-fibres and suppressing ectopic neuronal discharge. Local application of methylprednisolone has been found to block transmission in c-fibres but not in *a* and *B* fibres1. The effect was

reversible, suggesting a direct membrane action of steroids.

Reports of corticosteroid mediated neurotoxicity seem to be related to the vehicle polyethylene glycol and the preservative benzyl alchohol in steroid preparations as well as the presence of insoluble steroid particulate matter in the injectate. .In vivo and in vitro animal studies have demonstrated that locally applied ccorticosteroids have no long term effect on the structure,electrical properties or function of peripheral nerves and that the extrafascicular and intrafascicular injection of dexamethasone in a rat sciatic experimental model cause no or minimal peripheral nerve damage.

CONCLUSION:

It can be concluded from the above study that addition of Dexamethasone to local anaesthetics in brachial plexus block quickens the onset of analgesia and prolongs the duration of blockade .The main advantage was that no significant side effects were noted during the study eventhough rarely neuritis has been reported in similar studies.Thus compared to all other adjuvants like clonidine, buprenorphine etc,dexamethasone appears to be superior in improving the duration and quality of blockade.

study eventhough rarely neuritis has been reported in similar studies.Thus compared to all other adjuvants like clonidine, buprenorphine etc,dexamethasone appears to be superior in improving the duration and quality of blockade.

REFERENCES

1. Nguyen HC, Fath E, Wirtz S, Bey T. Transscalene brachial plexus block: A new posterolateral approach for brachial plexus block. Anesth Analg. 2007; 105:872–875.
2. Lanz E, Theiss D, Jankovic D. The extent of blockade following various techniques of brachial plexus block. Anesth Analg 1983; 62:55-58.
3. Bromage PR and Gertel M. Improved Brachial Plexus Blockade with Bupivacaine Hydrochloride and Carbonated Lidocaine. Anesthesiology1972; 36:479-487.
4. Wakhlo R, Gupta V, Raina A, Gupta SD, Lahori VU. Supraclavicular plexus block: Effect of adding tramadol or butorphenol as an adjuncts to local anesthetics on motor and sensory block and duration of postoperative analgesia. J Anaesth Clin Pharmacol 2009; 25(1):17-20.
5. Lalla RL, Anant S, Nanda HS. Verapamil as an adjunct to local anaesthetic for brachial plexus block. MJAFI 2010; 66:22-24.
6. Vieira PA, Pulai I, Tsao GC, Manikantan P, Keller B, Connelly NR. Dexamethasone with bupivacaine increases duration of analgesia in ultrasound-guided interscalene brachial plexus blockade. Eur J Anaesthesiol 2010; 27(3):285-288.
7. Parrington SJ, Donnell DO, Chan VWS, Shreves DB, Subramanyam R, Qu M, et al. Dexamethasone added to mepivacaine prolongs the duration of analgesia after supraclavicular brachial plexus blockade. Reg Anesth Pain Med 2010; 35:422-426.