

Supraclavicular Brachial Plexus Block With and Without Dexamethasone- A Comparative Study

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Abstract:

Introduction: Corticosteroids are widely used in peripheral nerve blocks for acute pain control and are routinely injected into the epidural space for treating radicular pain with a reliably acceptable side effect profile .This study has been undertaken to evaluate the adjuvant use of dexamethasone in supraclavicular brachial plexus nerveblocks with a focus on block characteristics.

Aims And Objectives: To evaluate the efficacy of Dexamethasone as an adjuvant to Lidocaine with Adrenaline in supraclavicular brachial plexus block in terms of Onset of sensory block,Onset of motor blockade,Duration of sensory block ,Duration of motor blockade.

Conclusion: In conclusion, admixture of dexamethasone (8 mg) and adrenalized lidocaine 1.5% in supraclavicular brachial plexus block resulted in Faster onset of sensory block,Faster onset of motor block, Prolonged duration of analgesia which also resulted in decreased post-operative analgesic requirement.Prolonged duration of motor blockade. No significant changes in hemodynamic parameters.

Key Words: Dexamethasone, Brachial Plexus Block, Lidocaine1.5%.

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I. Introduction

Regional anaesthesia is an excellent adjunct or alternative to general anaesthesia for extremity surgery. Post anaesthetic nausea, vomiting and other side effects of general anaesthesia such as atelectasis, hypotension, ileus, and DVT are reduced¹. It provides superior postoperative analgesia and hastens recovery from anaesthesia. Strategies to prolong brachial plexus block analgesia beyond the pharmacological duration of the local anesthetic used include placement of indwelling perineural catheters to allow prolonged infusion or the co-administration of adjuvants such as Epinephrine, α 2 agonists (i.e. Clonidine and Dexmedetomidine),Ketamine, Neostigmine, Morphine, Pethidine, Butorphanol, Tramadol, Buprenorphine, Midazolam, or the Corticosteroid Dexamethasone.

Corticosteroids are widely used in peripheral nerve blocks for acute pain control and are routinely injected into the epidural space for treating radicular pain with a reliably acceptable side effect profile .Intravenous Dexamethasone has been previously shown to be opioid-sparing in the earlypostoperative phase between 24 – 48 hours following its administration and also serves to reduce postoperative nausea and vomiting (PONV).

This study has been undertaken to evaluate the adjuvant use of dexamethasone in supraclavicular brachial plexus nerveblocks with a focus on block characteristics,clinical outcomes and safety.The nerve stimulation technique we used in this study makes use of electric current to elicit motor stimulation of nerves and confirm the proximity of the needle to the nerve. Motor fibers have a lower electrical threshold than sensory fibers. So the patient need not be subjected to the discomfort of paraesthesias when the nerve is stimulated to produce a motor twitch. A satisfactory block may be performed when the patient is uncooperative, or uncommunicative, as a result of a psychotic state, coma, or language barrier and in any position.

II. Aims And Objectives

To evaluate the efficacy of Dexamethasone as an adjuvant to Lidocaine with Adrenaline in supraclavicular brachial plexus block in terms of:

- ❖ Onset of sensory block
- ❖ Onset of motor blockade
- ❖ Duration of sensory block
- ❖ Duration of motor blockade

III. Materials And Methods

This is a controlled, randomized, prospective study. 60 patients posted for upper limb surgeries below shoulder joint were given brachial plexus block by supraclavicular approach using nerve stimulation technique. The patients were randomly allocated into two groups using standard randomization code. The group D (cases or study group) received 1.5% Adrenalized Lidocaine (7mg/kg) plus dexamethasone 8mg(2ml) . The group C (control group) received 1.5% adrenalized lidocaine (7mg/kg) plus 0.9% normal saline (2ml).Volume of the local anaesthetic used in both the groups is not constant. The assessment of onset and duration of block was carried out by the principal investigator who was blinded to the drugs administered in the block.

IV. Observations And Results

Demographic Data

Age Distribution: Age group of the study population was 18-70 years. The mean age of the study population in group D was 39.66 ± 11.60 years. The mean age of the population in group C was 40.26 ± 11.62 years. By applying independent samples ‘t’ test, the P value is found to be 0.84 which was statistically insignificant and hence both the groups are comparable.

Sex Distribution:

Out of 30 patients in GroupD, 16 were males and 14 were females. In Group C, 15 were males and 15 were femalesand both the groups were comparable.

Weight Of Patients:

Mean weight of the patients in Group D is 68.3 ± 5.06 Kg while the Mean weight of the patients in the Group C is 68.6 ± 4.484 Kg. By applying independent samples t test, the P value is found to be 0.809 which is statistically insignificant and hence both the groups are comparable.

Onset Of Sensory Block

Table: Onset Of Sensory Block

ONSET OF SENSORY BLOCK (min)					
GROUP D		GROUP C		P value	Result
AVG	SD	AVG	SD		
10.73333	1.2298	15.0333	1.4735	<0.0001	Significant

Mean Time for onset of sensory block in Group D is 10.733 ± 1.22 min.

Mean Time for onset of sensory block in Group C is 15.033 ± 1.473 min. By applying independent samples ‘t’ test, the P value is found to be <0.0001 which is statistically significant.

Onset Of Motor Block

Table: Time (min) For Onset Of Motor Block

ONSET OF MOTOR BLOCK(min)					
GROUP D		GROUP C		P value	Result
AVG	SD	AVG	SD		
14.5666	1.3047	17.1	0.9948	<0.0001	Significant

Mean Time for onset of motor block in Group D is 14.566 ± 1.30 min.

Mean Time for onset of motor block in Group C is 17.1 ± 0.99 min. By applying independent samples ‘t’ test, the P value is found to be <0.0001 which is statistically significant.

Duration Of Sensory Block

Table: Comparison Of Duration Of Sensory Block

DURATION (min) OF SENSORY BLOCK					
GROUP D		GROUP C		P value	Result
AVG	SD	AVG	SD		
307.5667	35.7681	155.866	17.045	<0.0001	Significant

Average duration of sensory block in Group D is 307.56 ± 35.76 min.

Average duration of sensory block in Group C is 155.86 ± 17.045 min. By applying independent samples ‘t’ test, the P value is found to be <0.0001 which is statistically significant.

Duration Of Motor Block

Table: Comparison Of Duration Of Motor Block

DURATION (min) OF MOTOR BLOCK					
GROUP D		GROUP C		P value	Result
AVG	SD	AVG	SD		
253.933	18.022	137.333	13.501	<0.0001	Significant

Average duration of motor block in Group D is 253.93 ± 18.02 min.

Average duration of motor block in Group C is 137.33 ± 13.5 min. By applying independent samples ‘t’ test, the P value is found to be <0.0001 which is statistically significant.

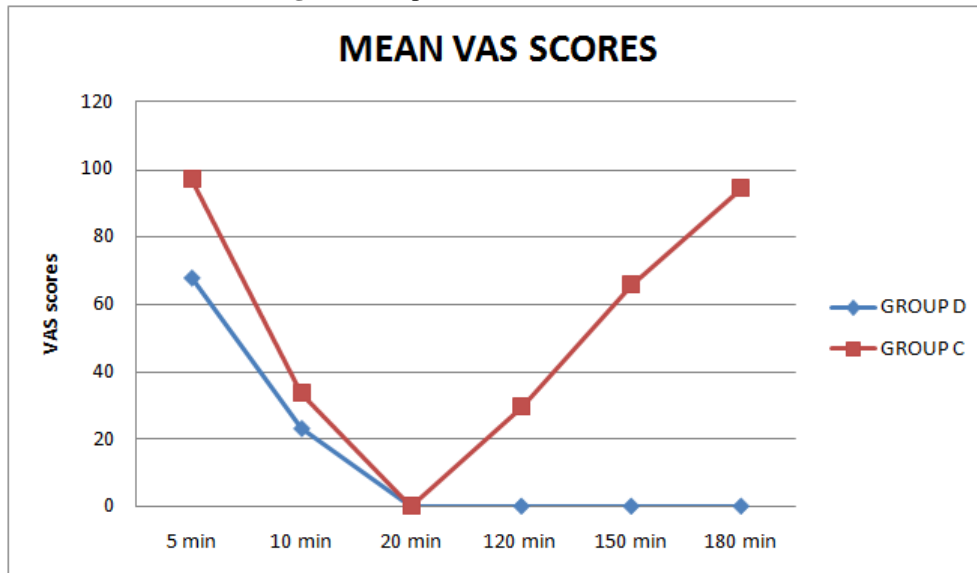
Verbal Analogue Scores (0-100) For Sensory Block

Table: Comparison Of Vas Scores

	5 min		10 min		20 min		120 min		150 min		180 min	
	AVG	SD	AVG	SD	AVG	SD	AVG	SD	AVG	SD	AVG	SD
GROUP D	67.66	26.48	23	14.17	0	0	0	0	0	0	0	0
GROUP C	97	16.43	33.66	10.66	0	0	29.66	15.19	65.66	22.69	94.33	10.72
P value	<0.0001		0.0017		-		<0.0001		<0.0001		<0.0001	

VAS scores are not statistically significant at 5 min, 10 min, 20 min, 120 min, 150 min, and 180 min in the two groups.

Figure: Comparison Of Mean Vas Scores



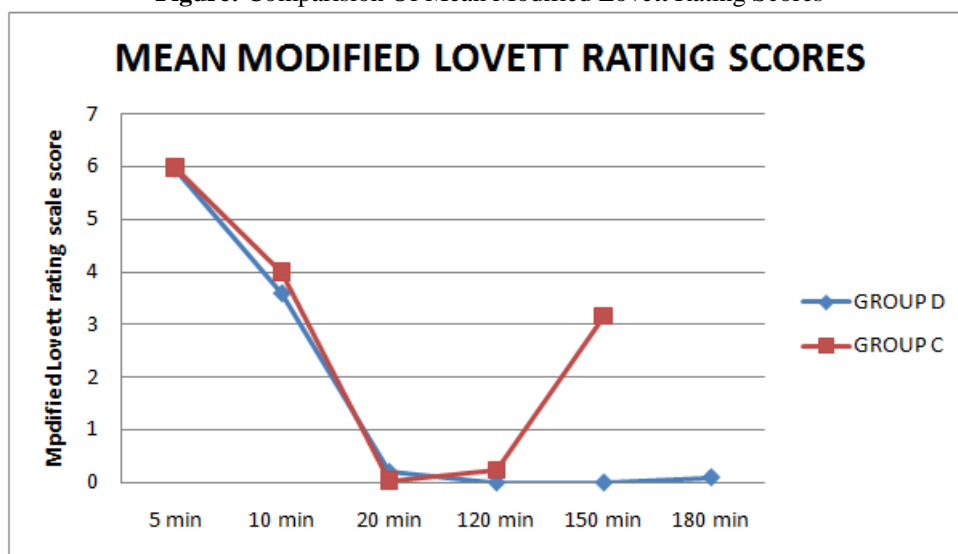
Modified Lovett Rating Scale Scores For Duration Of Motor Block:

Table: Modified Lovett Rating Scale Scores:

	5 min		10 min		20 min		120 min		150 min		180 min	
	AVG	SD	AVG	SD	AVG	SD	AVG	SD	AVG	SD	AVG	SD
GROUP D	5.96	0.18	3.6	0.72	0.2	0.4	0	0	0	0	0.1	0.4
GROUP C	6	0	4	0.64	0.03	0.18	0.23	0.81	3.16	2.15	5.83	0.64
P value	0.3105		0.0273		0.0446		0.123		<0.0001		<0.0001	

Modified Lovett rating scale scores are statistically significant at 150 min and 180 min in the two groups.

Figure: Comparison Of Mean Modified Lovett Rating Scores



V. Discussion

In the present study, the mean age of patients in group D (cases or study group) is 39.66 ± 11.60 years. Mean age of patients in group C (control group) is 40.26 ± 11.62 years. Using unpaired t test; there is no significant difference in the two groups statistically ($p > 0.05$). These values concur with the findings in the study done by B T Arish (36.88 ± 11.501 vs. 37.32 ± 11.814). Mean weight of the patients in group D and group C were 68.3 ± 5.06 and 68.6 ± 4.48 kgs respectively. This was not statistically significant ($p > 0.05$). These values are in concurrence with the study done by Ritu Baloda et al (66.20 ± 6.172 vs. 67.20 ± 5.054).

There were 16 male patients in group D while 15 male patients in group C and there was no significant difference regarding the sex distribution between two groups.

In group D, mean duration of surgery was 98.66 ± 24.45 minutes. While in group C it was 96.76 ± 25.17 minutes. Thus the duration of surgery was similar in both the groups ($p > 0.05$). These findings are in concurrence with the study done by Walid Trabelsi et al (85 ± 47 vs. 113 ± 60).

Sensory blockade is assessed using pin prick method using the blunt end of a 27-G needle at 0, 5, 10, 20, 120, 150, 180 min. In the present study, the mean time taken for onset of sensory blockade in dexamethasone group is 10.733 ± 1.22 min and in the control group is 15.033 ± 1.473 min which is statistically significant ($P < 0.001$).

These findings in terms of onset of sensory block concur with the studies done by Shrestha BR, Maharjan SK, Tabedar S². In their study, onset of sensory block was 10-30 minutes in local anesthetic group (mean 18.15 ± 4.25 min) and 10-20 minutes (mean 14.5 ± 2.10 min) in the local anesthetic plus steroid group and found statistically significant difference between two groups.

In another study done by Biradar et al³, a statistically significant difference in the onset of the sensory block (13.4 ± 2.8 min vs 16 ± 2.3 min) was observed which is in concurrence with the present study.

In the study done by Islam SM et al, also a statistically significant difference in the onset of the sensory block (9.89 ± 1.87 min vs 11.64 ± 2.19 min) was observed which is also in concurrence with the present study. These observations are also in concurrence with the studies done by Parrington et al⁴, Movafegh et al⁵, and Shaikh et al.⁶

Onset of Motor blockade is assessed at 0, 5, 10, 20, 120, 150, 180 min by assessing the flexion and extension of the upper limb. The mean time taken for onset of the motor blockade in dexamethasone group is 14.56 ± 1.30 min and in the saline group is 17.1 ± 0.99 min and the results are statistically significant ($P < 0.0001$).

The findings in terms of onset of motor block concur with the study by Pathak et al where the onset of motor block in dexamethasone group was 15.8 ± 5.6 min and 16.6 ± 5.11 min in the control group.

In the study done by Shrestha et al², a significant difference in the onset of the motor block (12.9 ± 1.49 vs 13.93 ± 1.96 min) was observed which is also in concurrence with the present study.

Results of the study done by Movafegh et al⁵ also found a statistically significant difference (26 ± 7 vs 22 ± 8 min) in the onset of motor block which is also in concurrence with the present study.

From the above observations, it is found that addition of dexamethasone has a positive impact on the time taken for onset of sensory and motor blockade.

Duration of analgesia among study subjects is assessed using VAS scores every 5, 10, 20,120,150,180 min. The mean duration of analgesia in the study subjects belonging to the dexamethasone group is 307.56 ± 35.76 min and the normal saline control group is 155.86 ± 17.045 min. The mean duration of analgesia in dexamethasone group is statistically significant ($P \leq 0.001$).

The above findings, in terms of duration of analgesia concur with the studies done by Shrestha et al².,Pathak et al⁷ Yadav et al⁸ indicating that Dexamethasone used as an adjuvant in brachial plexus block clearly prolongs the duration of sensory blockade.

Several other studies also have shown that addition 4-8 mg of dexamethasone to local anesthetics effectively and significantly prolongs the duration of analgesia.

Duration of motor blockade is assessed using Modified Lovett rating scale score. The mean duration of motor block in the dexamethasone group is 253.93 ± 18.02 min while the mean duration of motor block in the control group is 137.33 ± 13.50 min which is statistically significant.

The above findings, in terms of duration of motor block concur with the studies done by Biradar et al³., and Pathak et al⁷., indicating that Dexamethasone used as an adjuvant in brachial plexus blocks clearly prolongs the duration of motor blockade.

None of the patients had bradycardia or tachycardia, hypertension or hypotension following administration of dexamethasone along with local anaesthetic agent. These findings corroborated with that of Choi et al⁹., Persec et al¹⁰., and Shreshtha et al²., who also found no significant difference in hemodynamic parameters on addition of dexamethasone to Local Anesthetics.^{2,9,10}

- 1) Ultrasound guided block is not used because of unavailability in our institution during the study period.
- 2) Impact of dexamethasone on glucose homeostasis was not studied.
- 3) Effects of dexamethasone on wound healing were not studied.
- 4) Chronic neurological effects of dexamethasone are also not studied.

Recent studies point out that caution must be used while using dexamethasone as an adjuvant in patients with diabetic neuropathy, because of their property to exacerbate neuropathy. The outcomes associated with perineural dexamethasone is still unexplored, Christopher et al.,¹¹ from his meta-analysis on multiple studies which used dexamethasone as an adjuvant, did not find any favorable evidence pointing out to dexamethasone-induced neuropathy or neurotoxicity.

From the available data, it is cautiously concluded that perineural adjuvant dexamethasone is not overtly neurotoxic at 8 mg and has the potential for safe use as an adjuvant in regional anaesthesia. The dose what we used in this study is a safe dose, which was proved in several clinical trials and no significant side-effects were noted in the study group in the present study.

VI. Conclusion

In conclusion, admixture of dexamethasone (8 mg) and adrenalized lidocaine 1.5% in supraclavicular brachial plexus block resulted in

- Faster onset of sensory block
- Faster onset of motor block
- Prolonged duration of analgesia which also resulted in decreased post-operative analgesic requirement.
- Prolonged duration of motor blockade.
- No significant changes in hemodynamic parameters.
- Further studies are required to elucidate the precise mechanism of action of dexamethasone.

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