

Effect of Addition of Dexamethasone to Local Anaesthetics in Supraclavicular Brachial Plexus Block

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Abstract

Original Research Article

Background: In many cases, local anesthesia may be just as effective as general. The regional embargo has been maintained with the use of several additives. **Objective:** In this study our main goal is to evaluate the effect of dexamethasone added to local anaesthetics on the onset and duration of supraclavicular brachial plexus block. **Method:** This cross sectional study was carried out at tertiary hospital from January 2021 to January 2022. Where 100 adult patients undergoing various orthopaedic surgeries on forearm and around the elbow under supraclavicular brachial plexus block were selected and divided into 2 groups of 50 each. In group-A patients received 35 ml of mixture of lignocaine 2%, bupivacaine 0.5% while in group-B patients received the same amount of local anaesthetics with dexamethasone (8 mg). The onset of sensory and motor block and duration of analgesia in two groups were compared and development of complications was observed. **Results:** During the study most of the patients belong to 41-50 years age group for both Group A (48%) and group B (42%). Group A 80% were male and 20% were female. In Group B 90% and 10% were male and female respectively. Onset of sensory as well as motor blocks were early in group B and was statistically significant ($p < 0.05$) too. Duration of analgesia was markedly prolonged in group B and was statistically highly significant ($p < 0.001$). Plus in group A horners syndrome cases were 45% followed by 7% had Dyspnoea or chest discomfort 3% had Recurrent laryngeal nerve block and 2% had Inadequate block. Whereas in group B horners syndrome cases were 31% followed by 5% had Dyspnoea or chest discomfort 2% had recurrent laryngeal nerve block and 1% had inadequate block. **Conclusion:** Dexamethasone is not recommended for use in extending the effects of local anesthetics. It might be helpful in conditions where epinephrine usage is restricted (such as high blood pressure or heart disease).

Keywords: dexamethasone local anesthesia supraclavicular brachial plexus block.

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INTRODUCTION

The brachial plexus block is an effective and safe regional anesthetic method with a wide range of potential uses. For certain patients, it has replaced the need for general anesthesia in recent years [1]. Halsted initially did this in 1884, and it entails cutting a block of roots, divisions, and cords. Compared to alternative methods of brachial plexus block, the supraclavicular technique offers many benefits [2-4]. For procedures involving the upper limbs, this anesthetic method is often regarded as the gold standard.

The plexus is most tightly displayed at the trunk level, thus this is where the procedure is carried out. Because of the tightness of the anatomy, anesthetic can be administered safely and effectively. Excellent anesthesia for elbow, forearm, and hand surgery⁵ may be achieved in any position of the patient's arm.

When used alone, local anesthetics don't give relief from pain for more than four to eight hours at most. Extending the anesthetic and pain-blocking effects of a local anesthetic during surgery is an

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attractive option. The regional embargo has been maintained with the use of several additives [5].

If the arteries are constricted using a vasoconstrictor, less of the local anesthetic will be absorbed into the bloodstream. Opioid, clonidine, verapamil, and other additives were added to local anesthetics, however the outcomes are either ambiguous or have negative side effects [6-8].

Although arachnoiditis has been linked to intrathecal steroid usage, studies on its use in peripheral nerve blocks have shown no evidence of neuritis. Steroids' anti-inflammatory and painkilling properties are quite potent. It has been observed that a perineural injection of steroids may affect pain relief after surgery. Pain is alleviated because inflammation is lowered, nociceptive C-fiber transmission is blocked, and ectopic neural discharge is quelled [9]. Combining bupivacaine with local spinal and systemic corticosteroids has been shown to have analgesic effects in several studies [10, 11]. Studies on both animals and humans show that the use of dexamethasone microspheres, or the addition of methyl prednisolone to local anesthetic, significantly enhances the duration of axillary brachial block [12-15].

OBJECTIVE

In this study our main goal is to evaluate the effect of dexamethasone added to local anaesthetics on the onset and duration of supraclavicular brachial plexus block.

METHODOLOGY

This cross sectional study was carried out at tertiary hospital from January 2021 to January 2022. Where 100 adult patients undergoing various orthopaedic surgeries on forearm and around the elbow under supraclavicular brachial plexus block were

selected and divided into 2 groups of 50 each. In group-A patients received 35 ml of mixture of lignocaine 2%, bupivacaine 0.5% while in group-B patients received the same amount of local anaesthetics with dexamethasone (8 mg). The onset of sensory and motor block and duration of analgesia in two groups were compared and development of complications was observed.

For each of seven separate tests, the findings are presented as a Mean SD. The degree of significance was determined using the unpaired student's t-test. A statistically significant p-value was defined as less than 0.05. When comparing more than two groups, an ANOVA test was employed to determine statistical significance, and a p value of less than 0.05 was regarded to be significant.

RESULTS

In table-1 shows age distributions of the patients where most of the patients belong to 41-50 years age group for both Group A (48%) and group B (42%). The following table is given below in detail:

Table-1: Age distributions of the patients

Group	Group A %	Group B %
31-40	7%	6%
41-50	48%	42%
51-60	35%	37%
>60	10%	15%

In figure-1 shows gender distributions of the patients. This study patient was divided into Group A and Group B, where in Group A 80% were male and 20% were female. In Group B 90% and 10% were male and female respectively. The following figure is given below in detail:

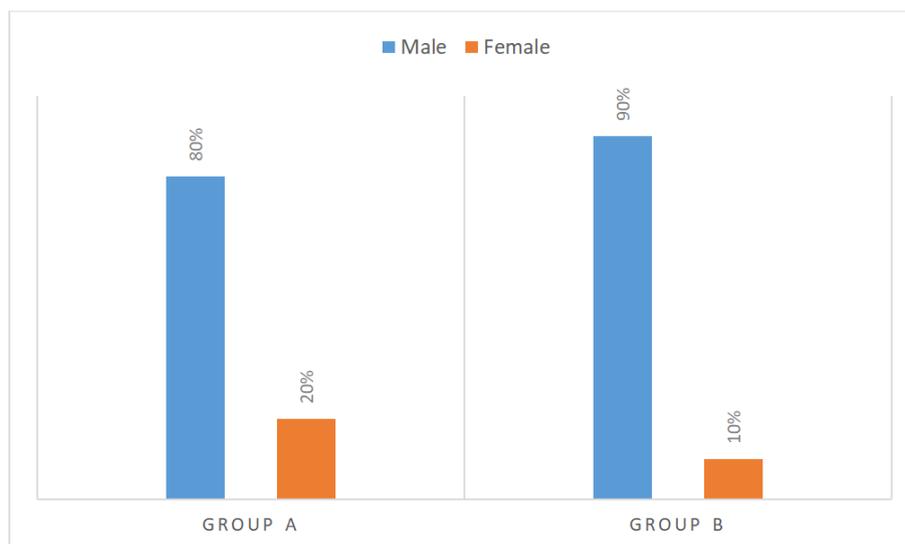


Figure-1: Gender distributions of the patients

In table-2 shows socio demographic characteristics of the patients where, in group A 60% patients were diabetic where as in group B it was 71%.

In addition, mean weight of group A 69 ± 9.0 kg whereas in group B 62 ± 9.1 kg.

The following table is given below in detail:

Table-2; Socio demographic characteristics of the patients

Variable	Group A	Group B
Weight	69 ± 9.0	62 ± 9.1
Height	173 ± 6.0	172 ± 5.0
Educational Status		
Illiterate	6%	1%
Primary	12%	19%
Secondary	23%	21%
Graduate	59%	60%
Working status:		
Service holder	32%	28%
Business Man	15%	11%
House wife	27%	25%
Others	26%	36%
Diabetic status of the patients:		
Diabetic:	60%	71%
Non-diabetic:	40%	29%

Table-3 shows distribution of the patients according to duration of surgery where in group A

mean duration of surgery was 78.75 ± 10.50 min whereas in group B it was 82.50 ± 11.12 .

Table-3: Distribution of the patients according to duration of surgery

Group	Duration of Surgery, min	P value
Group A	78.75 ± 10.50	>0.005
Group B	82.50 ± 11.12	

Table-4 shows Comparison of quality of block in two groups in the patients where Onset of sensory as well as motor blocks were early in group B and was

statistically significant ($p < 0.05$) too. Duration of analgesia was markedly prolonged in group B and was statistically highly significant ($p < 0.001$).

Table-4: Comparison of quality of block in two groups

Quality of block Group	Group A	Group B	P value
Onset of sensory block (min)	11.64 ± 2.19	09.89 ± 1.97	<0.005
Onset of motor block (min)	13.32 ± 0.98	11.09 ± 1.28	<0.005
Total duration of analgesia (hour)	03.43 ± 0.49	11.87 ± 0.53	<0.001

Table-5 shows Incidence of side effects during block in two groups where in group A horners syndrome cases were 45% followed by 7% had Dyspnoea or chest discomfort 3% had Recurrent laryngeal nerve block and 2% had Inadequate block.

Whereas in group B horners syndrome cases were 31% followed by 5% had Dyspnoea or chest discomfort 2% had recurrent laryngeal nerve block and 1% had inadequate block.

Table-5: Incidence of side effects during block in two groups

Side effects	Group A	Group B	P value
Horner's syndrome	45%	31%	>0.05
Dyspnoea or chest discomfort	7%	5%	>0.05
Recurrent laryngeal nerve block	3%	2%	>0.05
Inadequate block	2%	1%	>0.05

DISCUSSION

Brachial plexus block is an easy and relatively safe procedure for upper limb surgeries. A combination of lignocaine and bupivacaine provided better operating

conditions but the duration of analgesia is rarely maintained for more than 4-6 hours. Addition of steroid to local anaesthetics effectively and significantly prolongs the duration of analgesia as well as producing earlier onset of action [16]. Steroids are very potent

antiinflammatory and immunosuppressive agents. Perineural injection of steroid is reported to influence postoperative analgesia. Epidural steroids were used for treatment of back pain and sciatica [9]. Various steroids has been used for this purpose, but dexamethasone a 9aderivative synthetic glucocorticoid is preferred because of its highly potent anti-inflammatory property, about 25-30 times as potent as hydrocortisone and without any mineralocorticoid activity. Thus was found to be safer and devoid of potential side effects.

Pre-operative administration of dexamethasone by oral and intravenous routes has been shown to reduce overall pain scores and analgesic requirements in the postoperative period without any adverse effects in various oral and general surgical procedures [17]. Dexamethasone is also known to reduce post-operative nausea and vomiting. The possible mechanism of analgesic and antiemetic actions are due to antiinflammatory property of Dexamethasone [18, 19]. In reported study significantly early onset of sensory and motor block was noticed in group-B compared to group A.

That steroid significantly prolong the duration of analgesia in extremity nerve blocks [21]. A study in axillary block, suggested that dexamethasone when added to lignocaine significantly prolonged duration of analgesia without any change in onset time [21]. Another study in supraclavicular block reported that dexamethasone when added as adjuvant to mixture of local anaesthetics resulted in significantly early onset and longer duration of analgesia [22]. Both the groups had high success rate (>90%). The incidence of complication was low and comparable between the groups except higher incidence of Horner's syndrome. No case of clinical pneumothorax was observed in the present study.

Horner's syndrome was observed in 45% patients in group A and 31% patients in group B which is comparable to the study of Niazi *et al.*, [23]. Dyspnoea or chest discomfort was encountered in 7% in group A and in 5% patient in group B respectively. Recurrent laryngeal nerve block was encountered in 2% patient in group A and 1% patient in group B, respectively; inadequate block was observed in one patient in either groups. Brand and Papper injected local anaesthetic agent by Murphy's supraclavicular route but had 6.1% incidence of pneumothorax. In another study by this route Pham Dang *et al.*, observed asymptomatic phrenic nerve paralysis (60%), Horner's Syndrome (10%) and transient recurrent nerve paralysis [25]. Dupre *et al.*, and Hampel *et al.*, also reported Horner's syndrome in their studies [26, 27]. Kumar *et al.*, and Ross reported epidural and subdural blockade due to widespread distribution of anaesthetic agent with interscalenous route [28, 29]. Dupre *et al.*, and Moore *et al.*, had 11% and 8% failure rates [26, 30]. Brand and Papper had 84.4% success rate [24].

Although corticosteroids have been used successfully for postoperative pain relief in oral, general and orthopedic surgery [31, 32]; other studies have not corroborated these reports [33, 34]. The mechanism of the analgesia induced by corticosteroids is not fully understood. This effect is suspected to be mediated by their anti-inflammatory or immune-suppressive effects [35, 36]. The use of corticosteroids as an adjuvant to local anesthetic for peripheral nerve blocks rarely has been described and its mechanism of action is not clearly understood. According to the traditional theory of steroid action, steroids bind to intracellular receptors and modulate nuclear transcription. In this study, dexamethasone produced a relatively rapid effect which cannot be explained by the above mechanism [37]. Corticosteroids may have a local effect on the nerve; the dexamethasone effect may be related to this action [38]. Adverse effects with a single dose of dexamethasone are probably extremely rare and minor in nature and previous studies have demonstrated that short-term (24 hours) use of dexamethasone as safe [39]. Adding a steroid to local anesthetic solution may not be indicated in all patients.

CONCLUSION

Dexamethasone is not recommended for use in extending the effects of local anesthetics. It might be helpful in conditions where epinephrine usage is restricted (such as high blood pressure or heart disease).

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