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TO STUDY THE EFFECT OF DEXAMETHASONE AS AN ADJUVANT TO LOCAL ANAESTHETICS IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

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Abstract-**Background-**

There is an increase in use of regional anaesthetic techniques in various surgeries.

Steroids have anti inflammatory and analgesic properties. Hence , we decided to study the efficacy of dexamethasone as an adjuvant to local anaesthetic agents in supraclavicular brachial plexus block via landmark approach for upper limb orthopaedic surgeries.

Materials and Methods-

After ethical clearance, and informed written consent, this prospective randomised controlled clinical study was carried out in 50 patients, aged 18-50 years, ASA grade I or II, scheduled for elective or emergency orthopaedic upper limb surgeries.

Patients were randomly divided into two groups,

Group A- received Inj. Bupivacaine 0.5% 10 ml, Inj. Lignocaine + Adrenaline (1.5%) 20 ml and Inj. Normal saline (0.9%) 2 ml

Group B- received Inj. Bupivacaine 0.5% 10 ml, Inj. Lignocaine + Adrenaline (1.5%) 20 ml and Inj. Dexamethasone (8 mg) 2 ml

After confirming complete motor and sensory blockade, surgery was commenced.

VAS score was recorded for 18 hours postoperatively where 0 equals no pain and 10 as worst possible pain.

Results-

- The onset of sensory and motor block was significantly faster in patients who received combination of local anaesthetic and dexamethasone.
- The duration of motor and sensory block in dexamethasone group was significantly higher than control group.
- There was no significant difference in the hemodynamics found between the two groups perioperatively.
- The duration of post operative analgesia was prolonged in dexamethasone group as compared to control group.
- Postoperatively, no complications were observed in any group.

Conclusion-

The addition of dexamethasone to local anaesthetics in supraclavicular approach of brachial plexus block produces adequate anaesthesia with following advantage.

- Dexamethasone hastens the time of onset of sensory and motor blockade.
- It prolongs the duration of sensory and motor blockade.
- It prolongs the duration of postoperative analgesia.
- Dexamethasone provides stable haemodynamics without any unwanted side effects in perioperative

Keywords: effect of dexamethasone, adjuvant to local anaesthetics, supraclavicular brachial plexus block, supraclavicular

Introduction

Peripheral nerve blocks can be used for anaesthesia, postoperative analgesia and treatment of chronic pain disorders. These techniques can be used in all age groups, with appropriate selection and sedation.

Peripheral nerve blocks are safer than general and spinal anaesthesia without any untoward systemic side effects. In addition, it offers a better preservation of mental functions in elderly; decreased risk of aspiration due to intact pharyngeal and laryngeal reflexes; avoids difficult intubation; decreases postoperative complications associated with intubation and provides better postoperative analgesia without undue sedation facilitating early mobilization and discharge¹.

Almost all the upper limb surgeries can be performed by blocking of brachial plexus using local anaesthetic solutions, with the advantage that the drug is limited to the part of the body

where it is injected and hence providing isolated and dense motor and sensory anaesthesia, good surgical field, hemodynamic stability, postoperative analgesia and patient satisfaction². The advantages of a supraclavicular technique over other brachial plexus block approaches are its rapid onset and complete and predictable anaesthesia for upper limb. Unfavourable factors of brachial plexus block are the time required for onset of action and duration of analgesia. Increasing the dose or volume of local anaesthetics increases the risk of systemic toxicity and continuous catheter block techniques require additional time, cost and skill. "Hence, there has always been a search for adjuvant to the regional block with drugs that prolongs the duration of analgesia with lesser adverse effects". Recently, dexamethasone has been studied as an adjuvant to local anaesthetic in peripheral nerve block. Steroids prolong the duration of nerve block by increasing the activity of inhibitory potassium channels³, thus blocking transmission of nociceptive myelinated c-fibres and suppressing ectopic neuronal discharge⁵.

AIMS AND OBJECTIVES

- 1) To evaluate the onset and duration of sensory and complete motor blockade.
- 2) To study the perioperative hemodynamic stability.
- 3) To observe the perioperative complications.
- 4) To study the duration of postoperative analgesia.

MATERIALS AND METHODS

After approval from the Institutional Ethical Committee and informed written consent from the patients, this prospective, randomised controlled, clinical study was carried out in 50 patients.

INCLUSION CRITERIA

- Patients aged 18-50 years,
- ASA physical status I or II,
- scheduled for elective and emergency upper limb orthopaedic surgeries

EXCLUSION CRITERIA

Patients having

- Previous nerve injury
- History of drug dependence/abuse
- History of drug allergy
- Patients on chronic analgesics drugs, antiplatelets agents
- Any major systemic/psychiatric illness
- Uncooperative patients/mental retardation
- Patients who refused for consent
- Local infection, swelling, trauma, hematoma, deformity
- Bleeding disorders

Patients were randomly divided into two groups of 25 patients each by computer generated random numbers.

Group A- received Inj. Bupivacaine 0.5% 10 ml, Inj. Lignocaine + Adrenaline (1.5%) 20 ml and Inj. Normal saline (0.9%) 2 ml

Group B- received Inj. Bupivacaine 0.5% 10 ml, Inj. Lignocaine + Adrenaline (1.5%) 20 ml and Inj. Dexamethasone (8 mg) 2 ml

Preoperative evaluation of the patients was done. Each patient was explained in detail regarding the procedure of anaesthesia and was explained 0–10-point visual analogue scale (VAS) on a sheet of paper where score of 0 was labelled as no pain and 10 as worst possible pain.

Supraclavicular brachial plexus block was given with the help of peripheral nerve locator with landmark technique.

Sensory characteristics of the block were assessed using response to pinprick to 23 G hypodermic needle at respective areas of median, ulnar and radial nerve supply.

Onset of sensory blockade was taken as the time from the end of injection to feeling of numbness in areas of nerve to be assessed.

Peak (complete) of sensory blockade was taken as the time from end of injection to complete loss of pin prick sensation in areas of nerve to be assessed.

Motor characteristics of block were assessed by asking the patient to flex the forearm and hand against gravity and adduct the shoulder.

Onset of motor blockade was considered as the time from end of injection to the time of heaviness in movements to be assessed.

Peak (complete) motor blockade was considered as the time from end of injection to the time of inability to do movements to be assessed.

Only patients with complete motor and sensory block were included in the study.

Inj. Midazolam 1 mg IV was given after 15 minutes of drug injection.

Neurological assessment (sensory and motor), hemodynamic vitals (Pulse rate, blood pressure, spo2) were recorded at 0, 15, 30, 60, 90, 120, 150 mins till the end of surgery from the end of injection of local anaesthetics.

The duration of sensory block (time elapsed between injection of the drug to return of pin prick sensation) and the duration of motor block (time elapsed between injection of the drug to return of motor power evaluated by finger and shoulder movement) were recorded.

Postoperatively, pulse rate, blood pressure, Spo2, and VAS scores were recorded at 0, 30 minutes then at 1, 2, 3, 4, 6, 9, 12, 15, 18 hrs. Duration of postoperative analgesia was taken as time from onset of sensory block to the time of administration of first rescue analgesic and was noted down. When VAS \geq 5 or patient complained of pain, Inj. Diclofenac Sodium (1.5 mg/kg) 75 mg IV was given as rescue analgesic.

Statistical analysis-

Results were expressed as mean SD (standard deviation). Statistical analysis was performed using unpaired student's t-test for intergroup comparison. $p < 0.05$ considered statistically significant.

RESULT

Demographic data-

Table 1

Demographic Data		
	Group A	Group B
	(n = 25)	(n = 25)
Sex (M/F)	20:5	20:5

Age (Years)	32.60 ± 9.26	32.84 ± 10.30
Weight (kg)	60.16 ± 6.53	60.28 ± 6.86

In this study (Table 1), both the groups were comparable in terms of age and weight (P>0.05)

Out of 50 patients, group A and group B consisted of 80% males and 20% of females, hence males outnumbered females in both groups.

The mean duration of surgery in group 1 was 89.00 ± 27.08 minutes and in group 2 was 98.40 ± 24.94 minutes (P>0.05). There was no statistical difference between both the groups.

ONSET OF ANAESTHESIA

Table 2 Onset of Anaesthesia

Onset of Anaesthesia (Min.)	Group A	Group B
Sensory effect (Mean ± SD)	4.16 ± 0.68	3.00 ± 0.70
Motor Effect (Mean ± SD)	5.36 ± 0.63	3.72 ± 0.73

In our study (table 2), significant difference was seen between the onset of sensory and motor blockade between the two groups(p<0.05). The mean duration of onset of sensory and motor blockade in Group B (Dexamethasone) was **3.00 ± 0.70** mins and **3.72 ± 0.73** mins as compared to **4.16 ± 0.68** mins and **5.36 ± 0.63** mins in Group A respectively.

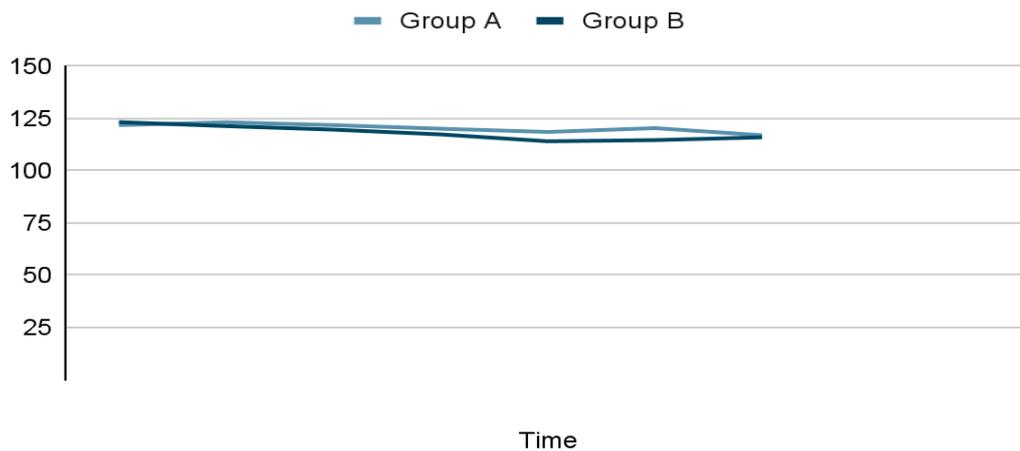
Table 3 Duration of Analgesia

Time	Group A	Group B
Mean duration of Sensory Block (Mins)	225.60 ± 31.86	738.00 ± 78.36
Mean duration of Motor Block (Mins)	170.40 ± 23.36	660.60± 76.43
Mean time of 1 st analgesic (Hrs)	4.76 ± 0.66	13.40± 1.25

In our study (table 3), the time for first analgesic requirement in control group (Group A) was **4.76 ± 0.66hrs** compared to **13.40 ± 1.25hrs** in dexamethasone group (Group B) which means the difference in the duration of postoperative analgesia was statistically significant. (P < 0.001).

In our study (table 3), the mean duration of sensory and motor blockade was **225.60 ± 31.89 mins** and **170.40 ± 23.36 mins** in Group A and **738.00 ± 78.36 mins** and **660.60 ± 76.43 mins** in Group B respectively. Hence, the mean duration of sensory and motor block was significantly higher in Group B (P < 0.001).

BLOOD PRESSURE (SBP)



In our study, there was no significant difference in the hemodynamic found between the two groups perioperatively. ($p>0.05$)

DISCUSSION

The regional technique of brachial plexus block has become popular and gained importance for surgical, diagnostic and therapeutic purposes in interventional pain management. It provides ideal condition for surgery, maintains stable hemodynamic, decreases the risk of gastric aspiration, and decreases postoperative nausea, vomiting and postoperative pain along with early ambulation, return to work and other advantages of regional techniques which avoids general anaesthesia and its complications.

Local anaesthetics used alone for supraclavicular brachial plexus block provide good operative conditions but they have shorter duration of postoperative analgesia. The discovery of opioid and GABA receptors in spinal cord and peripheral nerves led to use of various additives^{6,7,8,9,10}. So various drugs like fentanyl, clonidine, tramadol, neostigmine, Midazolam, buprenorphine, dexmedetomidine and butorphanol were used as adjuvant with local anaesthetics in brachial plexus block so as to achieve quick, dense and prolonged block. We used lignocaine with Adrenaline as it provides early onset of action and bupivacaine is known for longer duration of action. We preferred to use Dexamethasone as it has desirable properties of stable hemodynamic, no sedation, no respiratory depression, along with potentiating and prolonging the duration of analgesia due to its (i) vasoconstrictive effect that reduces the local anaesthetic absorption and (ii) increases the activity of inhibitory potassium channels on nociceptive C-Fibres (via glucocorticoid receptors), thus decreasing their activity without any untoward side effects.^{11,12,13}

In our study, the onset of sensory and motor block was significantly faster in patients who received combination of local anaesthetic and dexamethasone with the mean duration in Group B (Dexamethasone) being 3.00 ± 0.70 mins and 3.72 ± 0.73 mins as compared to 4.16 ± 0.68 mins and 5.36 ± 0.63 mins in Group A respectively. This is in conjunction with the study carried out by M.P. Golwala et al¹⁴ (2009) where the difference in mean duration in Group B was 196.33 ± 26.45 sec and 225.66 ± 26.86 sec were statistically significant as compared to Group A, 275.66 ± 30.32 sec and 326.66 ± 27.70 sec. ($P<0.05$)

In our study, the mean duration of sensory and motor blockade was 225.60 ± 31.89 mins and 170.40 ± 23.36 mins in Group A that is significantly higher as compared to 738.00 ± 78.36

mins and **660.60 ± 76.43** mins in Group B respectively. ($P < 0.001$). Thus, duration of motor and sensory block in dexamethasone group was significantly higher than control group. In our study, the mean time for 1st analgesic requirement for Group B was **13.40 ± 1.25** Hrs as compared to **4.76 ± 0.66** Hrs in Group A which means duration of postoperative analgesia was higher in Group B which was statistically significant. ($P < 0.001$). M. P. Golwala et al¹⁴(2009) concluded that addition of dexamethasone produces prolonged duration of pain relief (postoperative analgesia) of **12-18 hrs** as compared to **4-6 hrs** in control group. Shrestha B. R. et al¹⁵ (2003), Islam S. M. et al¹⁶ (2011), Metei AJ et al¹⁷ (2016) also show findings consistent with these results.

In our study there was no significant difference in the hemodynamic found between the two groups perioperatively. Shrestha B. R. et al¹⁵ used dexamethasone with local anaesthetic in supraclavicular brachial plexus block and concluded that hemodynamic remained stable in both groups intraoperatively and postoperatively.

In our study no major side effects like nausea, vomiting, bradycardia, hypotension was noted in both groups intraoperatively. M. P. Golwala et al¹⁴(2009) showed in their study that no adverse effects occurred in dexamethasone group as well as control group intraoperatively and postoperatively.

Postoperatively, no complications were observed in any group.

CONCLUSION

In conclusion, the addition of dexamethasone to local anaesthetics in supraclavicular approach of brachial plexus block produces adequate anaesthesia with following advantage.

- Dexamethasone hastens the time of onset of sensory and motor blockade.
- It prolongs the duration of sensory and motor blockade.
- It prolongs the duration of postoperative analgesia.
- Dexamethasone provides stable haemodynamic without any unwanted side effects in perioperative period.

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Conflict of Interest:

Nil

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