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Original Article

Comparison of Dexamethasone and Tramadol as Adjuvant to Levobupivacaine in Supraclavicular Block: A Clinical Study

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Abstract

Background: Application of supraclavicular block mostly includes surgery of elbow, forearm, and hand. The present study was conducted to evaluate and compare dexamethasone and tramadol as an adjuvant to levobupivacaine in supraclavicular block.

Materials and Methods: The present study was conducted on 60 patients of the American Society of Anaesthesiologists Grade I and II of age group of 18–60 years of either sex. Patients were divided into two groups: Group A (n = 30) in which 30 ml of 0.5% levobupivacaine hydrochloride plus 2 ml tramadol (100 mg) was administered and Group B (n = 30) in which 30 ml of 0.5% levobupivacaine hydrochloride plus 2 ml dexamethasone (8 mg) was administered. Both groups were compared statistically.

Results: The mean age ± standard deviation in Group A males was 40.2 ± 12.45 years and in females was 41.3 ± 12.10 years and, in Group B, males was 42.1 ± 11.61 years and in females was 41.6 ± 11.33 years. The difference was non-significant (P > 0.05). We found significant difference in onset of sensory block, motor onset, duration of sensory block, motor block, duration of surgery, and duration of analgesia in both the groups (P < 0.05).

Conclusion: Dexamethasone is a better adjuvant than tramadol when added to levobupivacaine in supraclavicular brachial plexus block for upper limb surgeries as it is faster in onset and it prolongs the duration of analgesia, sensory, and motor blockade and results in better satisfaction score.

Key words: Dexamethasone, Levobupivacaine, Supraclavicular blocks, Tramadol

INTRODUCTION

Anesthesia (defined as a reversible loss of sensation with or without loss of consciousness) can be effectively achieved with a wide range of drugs with very diverse chemical structures. The list of such compounds includes not only the classic anesthetic agents, such as the general and local anesthetics, but also many central nervous system depressants, such as analgesics, sedative, hypnotics (barbiturates and benzodiazepines), anticonvulsants, and skeletal muscle relaxants.[1]

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Application of supraclavicular block includes surgery of the elbow, forearm, and hand. Complication of brachial plexus block includes pneumothorax, ipsilateral phrenic nerve palsy, subclavian artery puncture, Horner syndrome, and recurrent laryngeal nerve palsy. Various local anesthetic agents are used for supraclavicular block such as lignocaine, mepivacaine, bupivacaine, ropivacaine, and levobupivacaine.[2]

Levobupivacaine which is less toxic is a better choice for local anesthesia, bupivacaine, the widely used local anesthetic in regional anesthesia is available in a commercial preparation as a racemic mixture (50:50) of its two enantiomers, levobupivacaine, S (−) isomer and dextrobupivacaine, R (+) isomer. The levorotatory isomers were shown to have a safer pharmacological profile with less cardiac and neurotoxic adverse effects.[3]

Recently, dexamethasone has been studied as a local anesthetic adjuvant for peripheral nerve block. As a

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perineural adjuvant, the safety profile of dexamethasone is promising. No trial reported neurotoxicity attributable to dexamethasone till date.[4] It is effectively and widely administered for prophylaxis against post-operative nausea and vomiting.

Tramadol, a synthetic 4-phenyl-piperidine analog of codeine, exerts its central analgesic activity through activation of mu-receptor. It also has peripheral local anesthetic properties that led to its use as an additive in peripheral nerve blocks.[5] The present study was conducted to evaluate and compare dexamethasone and tramadol as an adjuvant to levobupivacaine in supraclavicular block.

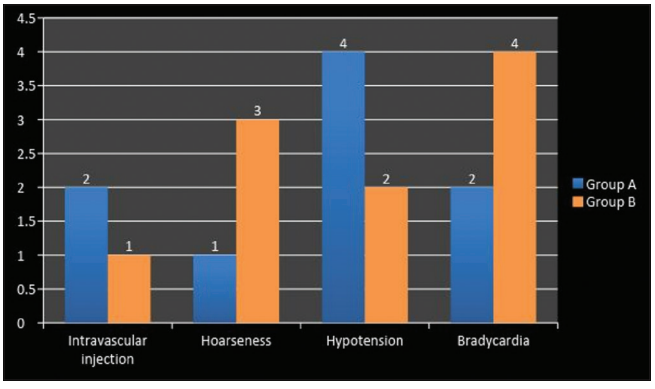
MATERIALS AND METHODS

The study protocol was a prospective, randomized, double-blind, single-center, in which 60 patients of the American Society of Anesthesiologists Grade I and II of age group of 18–60 years of either sex admitted in the Orthopedic Department of Guru Nanak Dev Hospital, Amritsar. Ethical approval was obtained from the Ethical Committee before the study.

Exclusion Criteria

Allergy to study medicine, history of significant neurological, psychiatric, neuromuscular, cardiovascular, pulmonary, renal or hepatic disease, alcohol or drug abuse, pregnant or lactating women, patient on psychotropic or adrenergic drugs, patients receiving chronic analgesic therapy, and body mass index >35kg/m^2 were excluded from the study.

Patients were divided into two groups, Group A (n = 30) in which 30 ml of 0.5% levobupivacaine hydrochloride plus 2 ml tramadol (100 mg) was administered and Group B (n = 30) in which 30 ml of 0.5% Levobupivacaine hydrochloride plus 2 ml dexamethasone (8 mg) was administered.



Graph 1: Complications in both the groups

A pre-anesthetic checkup of the patient selected for the study was carried out a day before surgery and was recorded as per pro forma. The interpretation of the visual linear analog scale was carried out with a 10 cm line. The end mark "0" means "no pain" and end mark "10" means "severe pain."

All patients received tablet alprazolam 0.25 mg orally one night before surgery with 8 h of fasting. On the day of surgery, injection glycopyrrolate 0.2 mg and injection midazolam 2 mg were given 45 min before surgery. After administration of anesthesia in both the groups, various parameters such as sensory block and motor block were recorded. The data from the present study were systematically collected, compiled, and statistically analyzed after the completion of the study. Data were summarized as mean ± standard deviation (SD) or as percentages. $P < 0.05$ was considered to be statistically significant.

RESULTS

Table 1 shows that mean age ± SD in Group A males was 40.2 ± 12.45 years and in females was 41.3 ± 12.10 years and, in Group B, males was 42.1 ± 11.61 years and in females was 41.6 ± 11.33 years. The difference was statistically non-significant ($P > 0.01$).

Table 2 shows that mean ± SD onset of sensory block in Group A was 5.26 ± 0.69 min and in Group B was 3.90 ± 0.75 min, motor onset was 9.00 ± 1.33 and 7.93 ± 0.73, respectively, duration of sensory block (min) was 12.910 ± 0.815 and 15.121 ± 0.856, respectively, motor block was 14.241 ± 0.812 and 17.901 ± 0.874, respectively, duration of surgery (min) was 112.40 ± 16.12 and 110.32 ± 16.42, respectively, and duration of analgesia (h) was 16.323 ± 0.825 and19.411 ± 0.972, respectively. There was a statistically significant difference ($P < 0.05$) except the duration of surgery. Table 2 shows that mean ± SD onset of sensory block in Group A was 5.26 ± 0.69 min and, in Group B, was 3.90 ± 0.75 min, motor onset was 9.00 ± 1.33 and 7.93 ± 0.73, respectively, duration of sensory block (min) was 12.910 ± 0.815 and 15.121 ± 0.856, respectively, motor block was 14.241 ± 0.812 and 17.901 ± 0.874, respectively, duration of surgery (min) was 112.40 ± 16.12 and 110.32 ± 16.42, respectively,

Table 1: Age- and gender-wise distribution of patients

Groups	Male 15 (25%)	Female 15 (25%)
Group A (30)	40.2±12.45 years	41.3±12.10 years
Group B (30)	42.1±11.61 years	41.6±11.33 years

P value 0.21

Table 2: Parameters in both the groups

Parameters	Group A	Group B	*P* value
Sensory onset (min)	5.26±0.69	3.90±0.75	0.05
Motor onset (min)	9.00±1.33	7.93±0.73	0.01
Duration of sensory (h)	12.910±0.815	15.121±0.856	0.001
Duration of motor (h)	14.241±0.812	17.901±0.874	0.001
Duration of surgery (min)	112.40±16.12	110.32±16.42	0.698
Duration of analgesia (h)	16.323±0.825	19.411±0.972	0.001

Table 3: Baseline parameters in both the groups

Parameters	Group A	Group B	*P* value
RR (per min)	14.85±1.05	14.80±1.23	0.08
PR (per min)	81.46±6.05	82.30±8.17	
SBP (mm Hg)	131.70±8.24	134.10±11.18	
DSP (mm Hg)	78.36±5.63	76.57±7.20	
SpO2 (%)	99.27±0.23	99.80±0.20	

RR: Respiratory rate, PR: Pulse rate, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, SpO_2: Percentage saturation of peripheral oxygen

Table 4: Intraoperative and postoperative VAS scores

Time (h)	Group A	Group B
0.5	0	0
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
10	0	0
12	0	0
15	0.73±1.22	0
18	2.76±1.30	1.53±1.97
21	2.83±1.23	2.76±1.33
24	2.33±1.42	2.26±1.20

VAS: Visual analog scale

and duration of analgesia (h) was 16.323 ± 0.825 and 19.411 ± 0.972, respectively. There was a statistically significant difference ($P < 0.05$) except the duration of surgery.

Table 3 shows baseline parameters including respiratory rate, pulse rate, systolic blood pressure, diastolic blood pressure, percentage saturation of peripheral oxygen in both the groups. The mean baseline parameters were noted preoperatively and compared statistically. The two groups were found to be comparable and insignificant with respect to the baseline parameters ($P > 0.05$).

Table 4 shows the visual analog scale (VAS) score which was significantly better in Group B as compared to Group A depicting a longer duration of analgesia in the Group B ($P < 0.05$).

DISCUSSION

The brachial plexus is a somatic nerve plexus with complex intra- and inter-neural anatomy. Upper limb regional anesthesia by brachial plexus block has become a significant anesthesiologist's armamentarium as it can be used to provide both anesthesia for surgery and analgesia thereafter.[6] As compared to general anesthesia, brachial plexus block is relatively easy to learn and execute and does not require bulky equipment for administration. Brachial plexus block provides complete relaxation of muscles of the upper extremity, thus making approximation of tendons and reduction of fractures easier. It reduces post-operative spasm, pain, and edema due to sympathetic blockade of blood vessels. In 1884, Halsted first operated under brachial plexus block when he exposed the nerve roots in the neck and blocked them with direct application of the cocaine solution.[7]

In the present study, Group A consisted of 15 (50%) male patients and 15 (50%) female patients, and similarly, Group B consisted of 15 (50%) male patients and 15 (50%) female patients.

We found a significant difference in onset of sensory block, motor onset, duration of sensory block, motor block, duration of surgery, and duration of analgesia in both the groups. This is in accordance with a study done by Alarasan *et al*.[8] who found that the onset of sensory and motor block was significantly earlier in dexamethasone group (10.36 ± 1.99 and 12 ± 1.64 min) compared to control group (12.9 ± 2.23 and 18.03 ± 2.41) min. Meitei *et al*.,[9] in their study, found that there was significantly faster onset of sensory blockade and prolonged duration of analgesia in the dexamethasone group than the saline group. Bais *et al*.,[10] in their study, found that the mean onset of motor block in Group A was 8.04 ± 1.35 min and in Group B was 6.94 ± 0.54 min.

The surgeries were started after surgical anesthesia developed. In case, patient experienced mild pain (VAS >3), and intraoperative supplementation was given with injection ketamine 0.5mg/kg. In our study, three patients in Group A and two patients in Group B required supplementation with injection ketamine in the first ½ h of giving the block. The two groups were found comparable with regard to need of supplementation.

The VAS score was monitored ½hourly until 1 h, hourly until 8 h, 2 hourly until 12 h, and then 3 hourly until 24 h. The VAS score was 0 for all patients (except those who required ketamine supplementation) until about 15 h in Group A and 18 h in Group B, following which VAS score gradually increased, and patients were given rescue analgesia in the form of injection diclofenac sodium intramuscularly

when the VAS score >3. VAS score was checked for 24 h after the block and rescue analgesia was given whenever it was more than three. The number of analgesic doses given within 24 h was statistically significant between two groups with Group B having less requirement of analgesic.

We observed that addition of dexamethasone to levobupivacaine increases the mean duration of sensory and motor block. This is in accordance with a study done by Choi *et al.*[11] who found that dexamethasone prolonged the analgesic duration for long-acting intermediate-acting from 730 to 1306 min and for intermediate from 168 to 343 min. Motor block was prolonged from 664 to 1102 min. The most recent trial demonstrated equivalent prolongation with perineural or systemic administration of dexamethasone compared with placebo.

There were few adverse events in the two study groups and were statistically insignificant ($P > 0.05$). No side effects such as respiratory depression, bronchospasm, and symptoms of local anaesthetic toxicity or neurological sequelae were observed in any groups. Complications such as intravascular injection, hoarseness of voice, hypotension, and bradycardia occurred, but the differences in the two groups were statistically insignificant ($P > 0.05$) [Graph 1]. This is in agreement with various studies.[12-15]

CONCLUSION

We conclude that dexamethasone is a better adjuvant than tramadol when added to levobupivacaine, for supraclavicular brachial plexus block used in orthopedic surgery as it is faster in onset and it prolongs the duration of sensory and motor blockade and duration of analgesia and has a better patient satisfaction score.

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