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Original Research Paper

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COMPARATIVE STUDY BETWEEN TRAMADOL AND DEXAMETHASONE AS AN ADMIXTURE TO BUPIVACAINE IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

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ABSTRACT

Aims: The aims of the study were to compare the effects of Dexamethasone and Tramadol as an admixture to Bupivacaine following supraclavicular brachial plexus block in upper extremity surgery.

Methods: Total 120 patients of ASA I and II undergoing upper extremity surgery under supraclavicular brachial plexus block were randomly divided into three groups; first group (group C) received 0.25% bupivacaine for supraclavicular block, second group (group T) received Tramadol 2mg/kg in addition to the drug given to group C and third group (group D) received Dexamethasone 8 mg in addition to the drug given to group C. The onset of block, the duration of block and the post operative analgesia was determined.

Conclusion: We concluded that both dexamethasone and tramadol hasten the onset of block, both increases the duration of block but dexamethasone is better than tramadol.

KEYWORDS : Supraclavicular Brachial Plexus Block, Visual Analogue Scale, Nerve Stimulator.

MATERIAL AND METHODS

After approval from Hospital Ethical committee, and written informed consent from patients, a randomized controlled double-blinded study was conducted on 120 patients undergoing upper limb orthopedic surgeries.

Study Groups

The patients were divided into three groups of 40 patients ($n = 40$) each using sealed opaque envelopes containing computer-generated numbers, into:

Group C : This group received 0.25% bupivacaine for supraclavicular block

Group T : This group received Tramadol (2mg/kg) in addition to drug given to group C for supraclavicular block.

Group D : This group received dexamethasone (8mg) in addition to drug given to group C for supraclavicular block.

Group Selection Criteria

Inclusion Criteria

1. ASA I and ASA II
2. Both male and female
3. Age 18- 70 years
4. Upper limb orthopedic surgery

Exclusion Criteria

1. Patient not fulfilling eligibility criteria
2. Lack of patient consent
3. History of allergic reaction to study drugs
4. Systemic use of corticosteroid for 2 weeks or longer
5. Contraindication to supraclavicular block with either anatomical abnormality or infection at site
6. Patient with peripheral neuropathy, psychiatric disorder, bleeding disorder, head injury, severe pulmonary, cardiac, renal or endocrine disorder, peptic ulcer disease
7. Pregnant women
8. Patients converted to general anaesthesia intra-operative or failure to achieve adequate block within 30 min of administration.
9. Patients needing parenteral opiates intra-operative

Technique:

In all the patients Supraclavicular block was given under strict aseptic precautions with adequate monitoring including ECG, NIBP and SpO_2. The classical approach to the block was performed, using a single injection with a nerve stimulator and a multiple stimulation technique for precise localization of each nerve in all the patients. All Supraclavicular Subclavian perivascular brachial plexus blocks was performed as described by Winnie[1] using 22 G, a 50 mm insulated blunt needle (Stimuplex (B Braun)/8 Locoplex (Vygon) needles with extension tubing), and an nerve stimulator (Stimuplex Dig RC; *Braun Melsungen AG, Germany*) was used in the procedure. After localizing, as manifested by desired muscle contraction at a current of approx 0.2- 0.5mA, the drug was injected.

The study drug was prepared by an operation theatre technician not involved in the care or monitoring of the patients. The patients and the observing anesthesiologist and nurses were blinded to the study drug used.

Monitoring:

Onset of Sensory Block:

The time from injection to the onset of analgesia in each of the major peripheral nerve distribution (Ulnar, Radial, Median, and Musculocutaneous nerve) was noted. Sensory block was assessed by pinprick using the blunt end of the needle at 0, 10, 20, 30, 50 mins and cold temperature. Sensory block was graded according to following scale:

0; No block (normal sensation)
1; Partial block (decreased sensation)
2; Complete block (no sensation)

Onset of Motor Block:

The time from injection to the loss of motor function was assessed every 10 min till complete block or till 30 min when the block was declared not effective. Plexus block was considered successful when at least two out of four nerve territories (ulnar, radial, median and musculocutaneous) were effectively blocked. Motor block was measured at 0, 10, 20, 30, 50 mins.

Motor Block was assessed by following scale:

0; No block (Full muscle activity)
1; Partial block (Decreased muscle activity)
2; Complete block (No muscle activity)

Duration of Motor Block:

The duration of motor block was assessed by the difference

between the onset time and the time taken for the patient to perform full motor functions.

Duration of Analgesia:
The duration of analgesia was noted according to 0-10 VAS for pain at 0 hour, every 1 hour for first 3 hour, and then 3 hourly for next 24 hours.

Visual Analogue Scale (VAS):
The patient was instructed to indicate how much pain they are currently feeling; the far left end indicates 'NO Pain' and the far right end indicates 'Worst Pain Ever'.

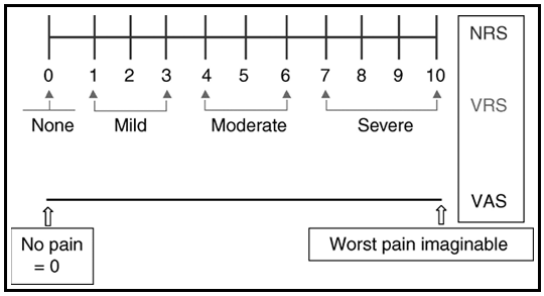


Figure 1: Visual Analogue Scale

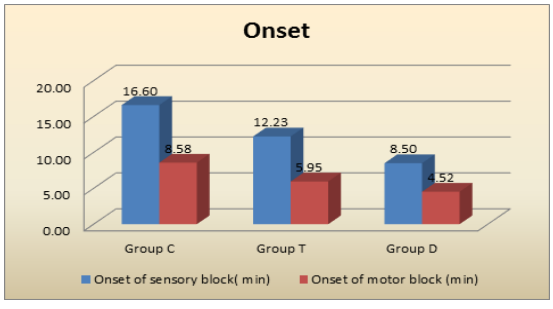
When the patients begins to experience the considerable pain and visual analogue scale measures VAS at 3-6, it was considered that analgesic action of the drug had terminated and rescue analgesic as tablet diclofenac 50 mg was given. Even if patient complained of pain and visual analogue scale measured VAS > 6, rescue analgesic as injection diclofenac 75 mg was given.

Statistical Methods:
Statistical analysis was done using SPSS version 12. Parametric data was reported as arithmetic mean ± standard deviation and analyzed by independent sample't' test. The comparison of normally distributed continuous variables between the groups was performed by one-way analysis of variance (ANOVA) and followed by Dunnett's multiple comparison tests, if required. P value was reported with the 95% confidence interval. P<0.05 was considered statistically significant.

RESULTS

Onset of Sensory and Motor Block:
There was significant mean difference among the three groups in regard to onset of sensory and motor block (p<0.001). Group D had minimum mean value of onset of sensory block (4.53±0.78 min), followed by group T (5.95± 0.93 min) and group C (8.58± 1.06 min) respectively. The onset of motor block in group D was 4.53± 0.78 min whereas in group T and group C were 5.95± 0.93 min and 8.58± 1.06 min respectively.

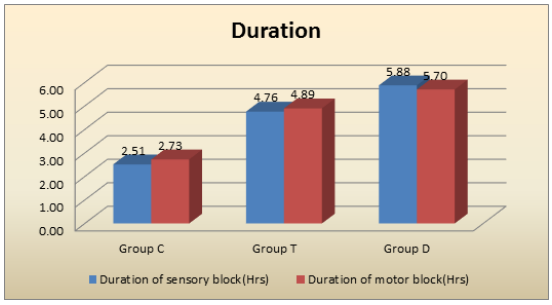
Graph 2: Mean time of onset of sensory and motor block among study groups.



Duration of Sensory Block:
There was significant mean difference among the three study groups in regard to duration of sensory block (in hrs) (p<0.001). Group D had maximum mean value of 5.88± 0.47 hrs. Group T and group C having values 4.76± 0.47 hrs and 2.51±0.28 hours respectively.

Duration of Motor Block:
There was significant mean difference among the three groups with regard to duration of motor block (hrs). Group D had maximum mean value of 5.70± 0.41 hrs. Group T and group C having values 4.90±0.47 hrs and 2.73± 0.29 hrs respectively.

Graph 3: Mean duration of sensory and motor block among the study groups



No of Rescue Analgesia (RA) Required:
With regard to the requirement of the rescue analgesia, Group C had significantly higher number of RA in 24 hours mean 2.53 as compared to group T(1.68) and group D(1.55) p<0.001.

In our study Statistical Data analysis was done using SPSS version 12. Parametric data was reported as arithmetic mean ± standard deviation and was analyzed by independent sample't' test. The comparison of normally distributed continuous variables between the groups was performed by one-way analysis of variance (ANOVA) and followed by Dunnett's multiple comparison tests, if required. P value was reported with the 95% confidence interval. P<0.05 was considered statistically significant.

DISCUSSION

Brachial plexus block [2,3] has been emerged as a popular technique among the anaesthetists for upper limb surgeries. It avoids the untoward effects of general anaesthesia like complications related to upper airway instrumentation. The research has also shown that this approach is attractive approach and effective in terms of cost, performance, margin of safety and also provides good post operative analgesia. Many approaches of brachial plexus block [4] are also described and the available literature has consistently shown that supraclavicular block is superior and easiest method for anaesthesia and post operative pain management.

Bupivacaine [5,6,7,8,9] is one of the local anesthetic used most frequently as it has longer duration of action, varying from 3 to 8 hours. However, it has got limiting factors like delayed onset or a patchy or incomplete analgesia. To minimize these drawbacks, many drugs like neostigmine, different opioids, midazolam, clonidine, etc have been used as adjuvant to the local anesthetic to improve quality and duration of action and postoperative analgesia. Steroids have been shown to have analgesic effects. These effects are due to both reductions of local inflammation as well as blocking the transmission in nociceptive C- fibers. The predominant effect is that of anti-inflammation. Steroids reduce local inflammation by inhibiting local phospholipase A2. This enzyme is responsible for liberation of arachidonic acid leading to production of prostaglandins and leucotrienes. These inflammatory mediators induce membrane injury, intraneural edema and enhance pain generation by abnormal nerve conduction. These mediators also sensitize small neurons to pain.

Dexamethasone [10,11,12] is a very potent and highly selective glucocorticoid. It is used as an anti-inflammatory and immunosuppressant agent. Its potency is about 40 times that of

hydrocortisone.

A variety of opioids have been studied for brachial plexus blockade including tramadol hydrochloride. Tramadol [13,14,15,16] is an atypical, centrally acting weak opioid, with dual mechanism of action. It is one fifth to one tenth as potent as morphine. It stimulates μ-receptor and to a lesser extent, the delta and k-opioid receptors. It also causes spinal inhibition of pain by decreasing the reuptake of norepinephrine and serotonin. It also displays a peripheral local anaesthetic effect. Tramadol in contrast to a centrally acting opioid analgesic has minimal respiratory depressant effect in part because of its non-opioid receptor mediated action.

Some studies have shown that addition of tramadol and dexamethasone to bupivacaine increases the quality and duration of nerve block. [17]

Hence this study was under taken among 120 patient posted for upper limb orthopedic surgery who were aged between 18 to 70 years in ASA I and ASA II in the Department of Anaesthesiology and Critical Care, Base Hospital Delhi Cantt-110010, a Tertiary Care Centre, to compare the effect of tramadol and dexamethasone with bupivacaine in supraclavicular brachial plexus block.

CONCLUSIONS

a. There was significant mean difference between the three groups with regard to Onset of sensory block ($p<0.001$) and Group D (8.50$\pm$0.93 min) had minimum mean value followed by group T (12.23$\pm$1.14 min) and group C (16.60$\pm$ 2.07 min) respectively.
b. There was significant mean difference among the three groups in regard to onset of motor block ($p<0.001$), Group D had minimum mean value (4.53$\pm$0.78 min), followed by group T (5.95$\pm$ 0.93 min) and group C (8.58$\pm$ 1.06 min) respectively.
c. There was significant mean difference among the three study groups in regard to duration of sensory block (in hours) ($p<0.001$). Group D had maximum mean value of 5.88$\pm$ 0.47 hrs. Group T and group C having values 4.76$\pm$ 0.47 hrs and 2.51$\pm$0.28 hrs respectively. The statistical analysis showed that group D was having significantly longer duration of sensory block with comparison to group C and group T ($P< 0.001$).
d. There was significant mean difference among the three groups with regard to duration of motor block (Hrs). Group D had maximum mean value of 5.70$\pm$ 0.41 hrs. Group T and group C having values 4.90$\pm$0.47 hrs and 2.73$\pm$ 0.29 hrs respectively. The statistical analysis showed that group D was having significantly longer duration of motor block with comparison to group C and group T ($P< 0.001$).
e. Group C had significantly higher number of RA in 24 hrs mean 2.53 as compared to group T(1.68) and group D(1.55) $p<0.001$.
f. Regarding other vital parameters considered in this study like pulse rate, respiratory rate, oxygen saturation, systolic and diastolic blood pressures, mean arterial pressure, visual analogue score, no statistical significant result arrived.

To conclude, our study demonstrate that addition of tramadol and dexamethasone to the bupivacaine as an adjuvant, in supraclavicular block improves the block in terms of:

- Both hasten the onset of sensory block in comparison to bupivacaine alone. Dexamethasone is better than tramadol.
- Both hasten the onset of motor block in comparison to bupivacaine alone. Dexamethasone is better than tramadol.
- Both increases the duration of sensory block, dexamethasone is better than tramadol.
- Both increases the duration of motor block, dexamethasone is better than tramadol.

Number of rescue analgesia required in tramadol and dexamethasone group is less than the plain bupivacaine group.

CONFLICT OF INTEREST: None Declared

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