

COMPARATIVE STUDY OF TRAMADOL AND CLONIDINE AS AN ADJUVANT TO LOCAL ANESTHETIC DRUG IN SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK

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Abstract

Background: Peripheral nerve blocks with local anesthetics provide excellent operating conditions but the duration of analgesia may not be sufficient even with the longest acting local anesthetics. The study was conducted to evaluate the efficacy of injection tramadol (100 mg) versus injection clonidine (90 mcg) as an adjuvant to bupivacaine (20 ml 0.5%) in supraclavicular brachial plexus block in adult patients. **Materials and Methods:** This study was carried out in 50 adult patients of ASA grade I/II posted for various elective upper limb surgeries. The patients were divided in two groups; each group containing 25 patients. This study is comparative observational study. Patients in Group T received inj. bupivacaine 0.5% 20ml with inj. tramadol 100 mg and patients in Group C received inj. bupivacaine 0.5% 20ml with inj. clonidine 90 mcg through ultrasound guided supraclavicular block. sensory block was assessed by pin prick test in areas innervated by nerves of brachial plexus in hand and forearm. Motor block was assessed by Modified Bromage score scale. Post operative pain was assessed frequently using 10 point Visual Analogue Score (VAS). **Result:** Mean time of onset of sensory and motor block which is significantly lower in Group C as compared to Group T. Mean duration of motor and sensory block is significantly longer in Group C than in Group T. Baseline hemodynamic parameters like pulse rate, blood pressure, respiratory rate, SpO₂ were stable and comparable in both the groups. There was no incidence of heavy sedation or major complication observed in both group. **Conclusion:** Addition of clonidine to bupivacaine in supraclavicular brachial plexus block produces faster onset and prolonged duration of sensory and motor blockade when compared with tramadol. Both the drugs are comparable in terms of hemodynamic changes and complications. When compared with tramadol, clonidine prolongs the duration of analgesia which reduces the need for additional analgesics.

INTRODUCTION

The international association for the study of pain has defined pain as “unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.”^[1]

In every surgery adequate postoperative pain management is an essential component. The benefit

of effective postoperative pain management includes:

- Minimal psychological stress
- Improved hemodynamic stability and respiration
- Early mobilization
- Reduced postoperative complications
- Faster recovery and reduced cost of care

For comprehensive anaesthesia care, regional blocks remain a well-accepted component as it provides the

anaesthesia in operating room and analgesia in postoperative and chronic pain. With appropriate selection of technique and patients it can be given in all age groups.

Peripheral nerve blocks are ideally suited for limb surgeries because of the peripheral location of the surgical site and potential to block pain pathways at multiple levels. Brachial plexus block is a regional anaesthesia technique that is employed as an alternative or as an adjunct to general anaesthesia for surgery of the upper extremity.

Advantages of peripheral nerve block over general anaesthesia are,

- It avoids stress response to laryngoscopy and tracheal intubation.
- It prevents risk of aspiration of gastric content.
- It decreases postoperative nausea and vomiting.
- It also facilitates early oral intake, return to normal activity. Hence, reducing hospital stay and cost.
- It facilitates early ambulation. Hence, reduces the chances of thromboembolism.

Advantages of supraclavicular technique over other brachial plexus block,

- It is performed at the level of trunk where the plexus is presented most compactly.^[2] Hence, providing isolated and dense motor and sensory anaesthesia.
- Once it is described as the “spinal of the arm” due to its relatively rapid onset and reliability.^[3]

The conventional blind technique relies on surface landmarks before needle insertion and elicitation of paresthesia while ultrasound guidance detects the anatomical variants of brachial plexus, related anatomical structures, accurate needle placement and monitoring of drug spread in the appropriate tissue planes with painless performance. Ultrasound increases the success rate and reduces the injury to adjacent structures. It also minimized the local anaesthetic volume, there by reduction in the incidences of systemic toxicity.^[4-6]

Peripheral nerve blocks with local anesthetics provide excellent operating conditions but the duration of analgesia may not be sufficient even with the longest acting local anesthetics. So, various drugs like opioids, magnesium sulphate, clonidine, neostigmine, midazolam, dexamethasone etc. are used as an adjuvant to local anesthetic to enhance analgesic efficiency and the duration of block.

Bupivacaine is less neurotoxic and have longer duration of action than other local anaesthetic agents. Hence, it is most commonly used for peripheral nerve blocks.

Tramadol is a synthetic 4-phenyl-piperidine analogue of codeine, and it displays central analgesic effects because of monoaminergic and μ -receptor agonistic activity; also has peripheral local anaesthetic properties.^[7]

Clonidine is alpha₂ adrenergic agonist and stimulation of presynaptic alpha₂ adrenergic receptors cause the inhibition of release of

norepinephrine from the sympathetic terminals at periphery and noradrenergic neurons in CNS.^[8]

The study was conducted to evaluate the efficacy of injection tramadol (100 mg) versus injection clonidine (90 mcg) as an adjuvant to bupivacaine (20 ml 0.5%) in supraclavicular brachial plexus block in adult patients.

MATERIALS AND METHODS

This study was carried out in 50 adult patients of ASA grade I/II posted for various elective upper limb surgeries. The patients were divided in two groups; each group containing 25 patients. This study is comparative observational study. Patients in Group T received inj. bupivacaine 0.5% 20ml with inj. tramadol 100mg and patients in Group C received inj. bupivacaine 0.5% 20ml with inj. clonidine 90 mcg through ultrasound guided supraclavicular block.

All the patients were subjected to detailed preanaesthetic evaluation with clinical history general and systemic examination and routine investigation like hemoglobin, RBS, RFT, LFT, serum electrolytes, x ray, ECG and other specific investigations according to patient's clinical evaluation.

Inclusion Criteria

- ASA class I and class II patients posted for elective upper limb surgeries
- Age 18-65 years

Exclusion Criteria

- Patient refusal
- Infection at local site
- Hypersensitivity to local anesthetic agents
- Existing neurological disorder/ nerve palsy, psychiatric, neuromuscular, cardiovascular, pulmonary, renal or hepatic disease
- Pregnancy or lactating women

Pre-Anaesthetic Preparation

A thorough general and systemic examination was conducted and all the routine investigations were reviewed. All the patients were kept nil per orally for six hours before the surgery. In the operation theatre, after securing an intravenous cannula, lactated ringer's solution was commenced. After establishing standard monitoring, baseline parameters such as heart rate, blood pressure, electrocardiogram and oxygen saturation were recorded.

Under all aseptic precautions the block was performed with the patient in supine position with his/her head turned to the contralateral side and with the ipsilateral arm adducted gently by an assistant and the shoulder slightly pulled down. The ultrasound probe (linear) was put in the supraclavicular fossa, parallel to the middle third of clavicle, in the sagittal plane, to visualize the brachial plexus as a bunch of grapes like cluster of 5-6 hypoechoic circles located lateral and superior to the subclavian artery between the anterior and

middle scalene muscles at the lower cervical region. A 23 gauge, 1.5 inches, hypodermic needle was inserted using in-plane technique. Upon visualising its path to the desired location the local anesthetic mixture was injected according to the allocated Group T or C. The drug solution was administered after negative aspiration around the brachial plexus. Proper dispersion of the local anaesthetic agents (areas shaded in blue) within the tissue sheath containing the brachial plexus through two different needle position.

Sensory block was assessed by pin prick test in areas innervated by nerves of brachial plexus in hand and forearm. Motor block was assessed by Modified Bromage score scale.^[9] After achieving adequate effect of block, surgery was started and time of starting of surgery was noted.

The heart rate, blood pressure, ecg, oxygen saturation (SpO₂) and respiratory rate were noted at 0 minute, thereafter every 5 minutes for the initial 15 minutes, then every 30 minutes till 3 hr, then every hourly up to 2 hours and then every 2 hourly up to 16 hours in post operative period. Sedation was assessed by Campbell Sedation score.^[10,11] Post operative pain was assessed frequently using 10 point Visual Analogue Score (VAS).^[12,13] Time interval from onset of sensory block to the need for

first rescue analgesic. (VAS \geq 4) is considered as duration of analgesia. Patients were observed for various complications.

Statistical Analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

RESULTS

In a study of 50 cases, comprising of 25 patients in each group, observations and results are summarized in the tabulated form and described below.

[Table 1] shows no significant differences in male-female ratio, weight, height and age of patients and mean duration of surgery between two groups.

[Table 2] shows mean time of onset of sensory and motor block which is significantly lower in Group C as compared to Group T (P<0.0001).

[Table 3] shows mean duration of motor and sensory block is significantly longer in Group C than in Group T (P<0.0001).

Table 1: Demographic Data

Variables	Group T	Group C	P Value
Sex(M/F)	10/15	13/12	-
Age(Years) (Mean±SD)	37.2±9.77	36.08 ±9.94	0.6898
Weight(kg) (Mean±SD)	69.12±9.16	66.92±7.11	0.3480
Height(cm) (Mean±SD)	164.84±7.98	163.44±4.94	0.4598
Duration of surgery (Min) (Mean±SD)	95.6±35.48	92.2±31.69	0.7224

Table 2: Onset of Anaesthesia

Onset	Group T (MEAN ±SD)	Group C (MEAN ±SD)	P value
Onset Sensory (min) block	16.32±1.18	13.12±2.00	<0.0001
Onset Motor (min) block	22.72±1.62	16.88±1.90	<0.0001

Statistically significance at p≤0.05

Table 3: Duration of Anaesthesia

Variable	Group T (MEAN ±SD)	Group C (MEAN ±SD)	P Value
Mean duration of sensory block(min)	438.76±6.82	535.72±22.46	<0.0001
Mean duration of motor block(min)	352.92±3.47	460.16±25.83	<0.0001

Table 4: Baseline Vital Parameters

VITALS	Group T (MEAN±SD)	Group C (MEAN±SD)	P VALUE	Inference
PULSE (per min)	82.56±4.70	84.24±8.17	0.3776	NS
SBP(mmHg)	124.48±6.69	124.16±4.07	0.8392	NS
DBP(mmHg)	82.84±4.97	81.68±4.01	0.3688	NS
MAP(mmHg)	96.84±4.2	95.84±2.78	0.3260	NS
SPO ₂ (%)	98.84±0.74	98.56±0.82	0.2129	NS
RR(per min)	14.88±1.42	15.04±1.13	0.6624	NS

Table 5: Mean Time of 1st Rescue Analgesic Drug

Variables	Group T (MEAN±SD)	Group C (MEAN±SD)	P value	Inference
Mean time of 1 st rescue analgesic (min)	453.16±7.00	580.48±26.98	<0.0001	S

Table 6: Perioperative Complications

Complication	Group T	Group C
Tachycardia	0	0
Bradycardia	0	0
Horner's syndrome	0	0

Hypotension	0	0
Pneumothorax	0	0
Respiratory Depression	0	0
Neurological sequelae	0	0
Nausea	3	0

[Table 4] shows there is no statistically significant difference in baseline hemodynamic parameters in both groups ($P>0.05$).

There is no statistically significant difference in perioperative pulse rate, perioperative systolic blood pressure, perioperative diastolic blood pressure, perioperative mean arterial pressure, perioperative oxygen saturation and perioperative respiratory rate in both groups ($P>0.05$).

[Table 5] shows that Mean time for 1st analgesic requirement for Group C is (580.48 ± 26.98 min) and it is significantly longer than that in Group T (453.16 ± 7.00 min) ($P<0.0001$).

There is certain amount of sedation while using adjuvant (tramadol/clonidine) but there are no any cases of respiratory depression.

[Table 6] shows three patient complain of nausea postoperative in Group T, which was treated with Inj. ondansetron 4mg iv.

DISCUSSION

Use of ultrasound for supraclavicular brachial plexus block improves the success rate of the block with excellent localization as well as improves safety margin as it provides real-time visualization of underlying structures and the spread of local anesthetic. Bupivacaine is the commonly used local anaesthetic drug in peripheral nerve blocks. Tramadol is a synthetic 4-phenyl-piperidine analogue of codeine, and it displays central analgesic effects because of monoaminergic and μ -receptor agonistic activity; also has peripheral local anaesthetic properties. Clonidine is alpha2 adrenergic agonist and stimulation of presynaptic alpha2 adrenergic receptors cause the inhibition of release of norepinephrine from the sympathetic terminals at periphery and noradrenergic neurons in CNS.

A total of 50 patients within the age group of 18-65 years were included in the study, 25 in each group. Mean age was 37.2 ± 9.78 years in Group T and the mean age in Group C was 36.08 ± 9.94 years. Hence both groups were comparable in regard to age. Other demographic data like sex, weight, height, duration of surgery were comparable in both groups. Duration of Surgery was 95.6 ± 35.48 min in Group T and 92.2 ± 31.69 min in Group C ($p>0.05$).

Onset of sensory and motor blockade was faster in Group C as compared to Group T (p value < 0.0001). Prakash Keilka,^[14] did a study of Evaluation of clonidine as an adjuvant to brachial plexus block and its comparison with tramadol. There was a statistically significant difference in the onset of both the sensory and motor components of the block with the fastest onset seen when clonidine was used in a dose of 1.5 μ g/kg.

In the present study duration of sensory and motor block in Group C was significantly longer than Group T. Dr. Rupal et al,^[15] did a comparative study of tramadol and clonidine as an Adjuvant in brachial plexus block tramadol 100mg or clonidine 150 μ g is added to local anesthetic solution in supraclavicular brachial plexus block and concluded that total duration of sensory and motor block was significantly ($p<0.05$) prolonged in clonidine group. The duration of analgesia was assessed when VAS ≥ 4 and 1st dose of rescue analgesic given. In our study the time for first analgesic requirement in Group T 453.16 ± 7.00 min as compared to 580.48 ± 26.98 min in Group C which means duration of postoperative analgesia was significantly longer in Group C ($P < 0.001$). Bhavna H Sojitra et al,^[16] In her study, the mean of total duration of analgesia was 206.5 ± 8.45 minutes in control group, 426.5 ± 32.16 minutes in tramadol group and 632.45 ± 89.9 minutes in clonidine group.

In our study there was no significant difference in heart rate, blood pressure, SpO2 and respiratory rate between the two groups. Dr Rupal et al,^[15] Found in her study that there were no hemodynamic changes in tramadol group and clonidine group as compared to control group.

There was no incidence of heavy sedation while using tramadol or clonidine in supraclavicular block in both the group. Moderate sedation observed in both the group. In our study there was no any complication which may occurred due to supraclavicular block like Horner's syndrome, pneumothorax etc. In our study three patient complain of nausea postoperative in Group T, which was treated with inj.ondansetron 4 mg iv. Kelika Prakash et al,^[14] studied that Patients who received tramadol reported higher incidence of nausea.

CONCLUSION

From this study, it can be concluded that addition of clonidine to bupivacaine in supraclavicular brachial plexus block produces faster onset and prolonged duration of sensory and motor blockade when compared with tramadol. Both the drugs are comparable in terms of hemodynamic changes and complications. When compared with tramadol, clonidine prolongs the duration of analgesia which reduces the need for additional analgesics.

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