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A STUDY OF THE EFFICACY OF TRAMADOL AS AN ADJUVANT TO BUPIVACAINE IN BRACHIAL PLEXUS BLOCK

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ABSTRACT

Background and objectives: Supraclavicular plexus block provides good alternative to General anaesthesia for upper limb surgeries with good postoperative analgesia. Various drugs have tried as adjuncts to local anaesthetics for brachial plexus block to enhance the quality and duration of analgesia. The present study was undertaken to assess the effect of Tramadol added to brachial plexus block by supraclavicular approach for onset and duration of block and postoperative analgesia.

Methods: A study was conducted on 60 ASA I or II adult patients undergoing upper lim surgeries under supraclavicular brachial plexus block. Patients were randomly divided into two groups. Patients in Group B (n = 30) were administered 38mL of 0.25% Bupivacaine + 2ml Normal saline and Group BT (n = 30) were given 38mL of 0.25% Bupivacaine + 2ml Tramadol (2mg/kg). The onset time and duration of sensory and motor blockade were recorded. Hemodynamic variables and rescue analgesic requirements were recorded for 24 hrs postoperatively.

Results: The onset of sensory and motor block was significantly faster in Group BT compared to Group B ($P < 0.05$). Rescue analgesic requirements were significantly less in Group BT compared to Group B ($P < 0.05$). Hemodynamic variables did not differ between groups in the post-operative period.

Conclusion: Thus Tramadol (2mg/kg) in combination with Bupivacaine was found to be good agent for hastening the onset of sensory and motor block and improved postoperative analgesia in brachial plexus block.

KEYWORDS : Brachial plexus block; Tramadol, Bupivacaine.

INTRODUCTION:

The supraclavicular brachial plexus approach is an alternative technique to general anaesthesia, resulting in rapid onset of reliable blockade of the brachial plexus, to provide excellent anaesthesia for elbow, forearm and hand surgery and also provides good postoperative analgesia of short duration, even when a long acting local anaesthetic like bupivacaine is used alone. The nerve stimulator can be used to aid the location of the brachial plexus and plain bupivacaine used by this method has been claimed to produce the block as long as 3 – 8 hours. Practically the same result could not be produced in series of study with sole bupivacaine.

To extend the analgesia beyond the operation rooms, various local anaesthetic action like continuous infusion of local anaesthetic via in dwelling catheters, use of different additives in local anaesthetics like narcotics, opioids, calcium channel blockers and benzodiazepine have been added to the local anaesthetics and their effect on the quality of block studied.

A variety of opioids have been studied for brachial plexus blockade including tramadol hydrochloride. Tramadol is a synthetic 4-phenyl-piperidine analog of codeine has a unique mode of action. First, it stimulates the μ receptor and to lesser extent δ and κ-opioids receptors. Then by nonopioid mechanism it also activates spinal inhibition of pain by decreasing the reuptake of norepinephrine and serotonin from the nerve endings and potentiates the effect of local anaesthetics when mixed together in peripheral regional nerve block. It has less respiratory depressant effect due to weak μ receptor affinity[2].

The present study is being undertaken to evaluate the onset time, duration and postoperative analgesic efficacy of bupivacaine and tramadol for brachial plexus block by supraclavicular approach.

MATERIALS AND METHODS

A prospective double – blinded randomized control study conducted on 60 patients of ASA grade I or II of either sex and age more than 19 years undergoing upper limb surgery, in orthopaedic and plastic surgery theatres, under supraclavicular brachial plexus block performed by subclavian perivascular approach with nerve stimulator were included after institutional ethical committee approval. Excluded from the study were Patient refusal, Local infections at the site of block ,history of drug allergy, Coagulation abnormalities , significant systemic disorders ,Alcohol/drug abuse ,Pregnancy/lactating women , Chronic analgesic therapy (other than NSAIDS) ,Peripheral neuropathy and Very obese.

Patients were pre-operatively assessed and the procedure explained and written informed consent was obtained. They were randomly divided into two groups namely-

Group B (Bupivacaine)**:** 30 patients received 38ml of 0.25 % Bupivacaine + 2ml normal saline and Group BT (Bupivacaine and Tramadol)**:** 30 patients received 38ml of 0.25%

Bupivacaine + 2ml Tramadol (2mg/kg).

Postoperative assessment of pain was done using Visual Analogue Scale (VAS).

Patient was explained pre operatively about the visual analogue scale as 0 – No pain and 10 the worst possible pain and was asked the score in visual analogue scale. Tab. Ranitidine

150mg 2 hours before surgery with sips of water given as premedication.

On arrival of the patient in the operating room, monitors like pulse oximeter, non invasive blood pressure and ECG were connected and baseline values were recorded. An 18 G intravenous access was obtained in the opposite arm. 40ml prepared solution for Brachial plexus block Supraclavicular approach by the subclavian perivascular technique with nerve locator done. After evaluation of blocks patients were sedated with Inj. midazolam 0.05mg/kg slow iv along with inj. metaclopramide 10mg iv. Patients were given supplemental O2 through face mask and intravenous fluids throughout the procedure.

Parameters observed are

1. Onset of sensory blockade: - assessed every minute after the performance of the block by Hollman's scale. 1. normal sensation of pin prick, 2. pinprick felt as sharp but weaker compared with the same area in the other limb, 3. pinprick recognized as touch with blunt object and 4. no perception of pin prick.

Onset of blockade was taken as abolishment of pin prick pain (Hollman's ≥ 3) over the distribution of ulnar and median nerve.

2. Onset of motor blockade : was assessed every minute after the block using Bromage three

point score 0 – normal motor function with full flexion and extension of elbow, wrist and

fingers. 1- decreased motor strength with ability to move fingers and /or wrist only, 2-

complete motor blockade with inability to move fingers . Attaining a score of 2 was considered as the onset of motor block.

3. Duration of surgery: Time taken by the surgeon to do the surgical procedure.

4. Duration of motor blockade: When (2) in the three point score changes to (1) the motor blockade is said to reverse. The duration of motor block is noted from the time from score (2) to scale (0).

The patient were observed every 30 minutes after the surgery is over till the motor block reverses and there after hourly for 6 hours, 2 hourly for next 6 hours and then 24 hours.

5. Duration of Sensory block: Taken from the time of onset of block to first complaint of pain sensation (vas score 1)

6. Duration of analgesia: Taken from the time of the onset of block to appearance of pain requiring first supplement analgesia (vas score more than 4).

7. Rescue Analgesia: Time at which VAS score is greater than 4 is noted and patient was

given rescue analgesic in the form of inj. Diclofenac sodium intragluteally in the dose of 1.5mg/kg along with inj. ranitidine 50mg given intravenously. Numbers of rescue analgesics in 24hours of postoperative period were recorded.

8. Vital parameters: Pulse rate, blood pressure, saturation were monitored every 5min for first 30min and thereafter 15min till the end of surgery.

9. Perioperative complications and side effects were observed for 24hours

Respiratory Depression, Pneumothorax, Neurological sequale, Nausea & Vomiting, Hypotension & Bradycardia, Sedation, Shivering .Dry mouth, Arrhythmia, Local anaesthetic toxicity.

10. Block failure: to be established even after 30 minutes was taken as block failure. Patients in which the block was unsuccessful due to total failure or missed dermatomes which needed general anaesthesia or intravenous supplementation were excluded from the study.

11. All the data were subjected to statistical analysis.

OBSERVATIONS AND RESULTS

The information collected in our study Group B and Group BT were recorded in a Master Chart. Data analysis was done with the help of computer using SPSS. For statistical analysis students t test was used for comparison between the groups. Using this range, frequencies, percentages, means, standard deviations, chi square and 'p' values were calculated. A 'p' value less than 0.05 was considered statistically significant

Table 1: Demographic data of patients in two groups

Parameters	Groups	
	B	BT
Number of patients	30	30
Average Age (years)	38.87 13.544	36.40 11.440
Weight (kgs)	66.70 5.914	66.90 5.026
Gender (male : female)	17:13	24:6
ASA (1 : 2)	25:5	25:5
Type of operation (orthopaedic : Plastic surgeries)	16:14	19:11
Duration of surgery in hours	1.89 ± 0.484	1.77 ± 0.388

There were no differences between the Tramadol and the control groups regarding age, sex, weight, ASA, Type of operation and duration of surgery in hours [Table 1].

Table 2: sensory and motor block onset, duration time and duration of analgesia in both groups

	Group BT Mean ± SD	Group B Mean ± SD	Statistical inference
Onset of Sensory block (mins)	10.07 ± 1.837	17.20 ± 2.140	T= 13.854 0.000 < 0.05
Onset of motor block (mins)	5.83 ± 1.053	9.10 ± 1.373	T=10.338 0.000 < 0.05
Duration of Sensory block (hours)	5.88 ± 0.669	3.18 ± 0.524	T= 17.392 0.000 < 0.05
Duration of motor block (hours)	4.65 ± 0.654	2.34 ± 0.362	T= 16.916 0.000 < 0.05
Duration of analgesia (hours)	7.06 ± 2.894	3.42 ± 0.283	T= 6.849 0.000 < 0.05
Number of Rescue Analgesics in 24hours postoperatively	1.13 ± 0.434	2.43 ± 0.568	T= 9.956 0.000 < 0.05

It was observed in Table: 2 that the sensory onset time was faster in Group BT (10.07± 1.837 min) than in Group B (17.20 ± 2.140). Similarly, the onset of motor block in Groups B, BT was (9.10 ± 1.373 and 5.83 ± 1.053 min; P = 0.00), respectively. The mean duration of motor block was (2.34 ± 0.362 hours and 4.65 ± 0.654 hours) in Groups B and BT, respectively.

The mean duration of sensory block in hours was maximum in Group BT (5.88 ± 0.669 hours) compared to Group B (3.18 ± 0.524 hours).The mean duration of analgesia was (7.06 ± 2.894 hours) in Group BT followed by Group B (3.42 ± 0.283 hours), respectively.

Group
B received maximum doses of rescue analgesics (2.43 ± 0.568) followed by Group BT (1.13 ± 0.434) over a period of 24 h in the post-operative period.

Patients remained haemodynamically stable and also without any complications throughout perioperative period.

DISCUSSION

An attempt has been made to assess the efficacy of tramadol (2mg/kg) as an adjuvant to bupivacaine (0.25%) in brachial plexus block (supraclavicular approach) in terms of onset time, duration of analgesia, hemodynamic variables and rescue analgesic requirements in the first 24 hours.

We used nerve stimulator technique which has the advantage of minimizing neuropathy by avoiding actual physical contact with a nerve compare to paresthesia technique. When an electrical current is used to stimulate a nerve, at lower current the motor fibres depolarizes than the sensory fibers leading to a painless visible muscle contraction without eliciting a paresthesia. The high success rate and absence of complications in performing the subclavian perivascular technique of brachial plexus block by nerve stimulator indicate that our technique is safe and effective also said by Carlo D. Franco et al[12] in his study.

A volume of 40ml of local anaesthetic agent was taken as this volume was associated with a more complete spread for brachial plexus block as found by Winnie and colleagues[13].

The particular dose of Tramadol 2mg/kg (100mg) was selected after previous studies like Kapral et al[10], Antonucci et al[7], Renu Wakhlo et al[6], Geze et al[8] and Shrestha BR et al[9] used the same dosage in peripheral nerve block without any significant adverse effects.

A total of 60 patients within the age group of 19-72 were in included in the study, 30 in each Group B and Group BT.

In our study we found that the onset of sensory and motor block were significantly faster in patients who received a combination of tramadol and bupivacaine. This could be due to a local direct action of Tramadol and its synergistic action with that of local anaesthetics. The onset of motor block was significantly faster than the onset of sensory block in both groups, this can be explained by 'Core and Mantle' concept of Winnie et al[1], He observed and attributed this to the somatotrophic arrangement of fibres in a nerve bundle at the level of the trunks in which motor fibres are located more peripherally form the mantle and are blocked earlier than the sensory fibres at the core. Hence a local

anaesthetic injected perineurally will begin to block the motor fibres before it arrives at the centrally located sensory fibres.

In our study mean duration of motor block and sensory block was prolonged when tramadol was added to bupivacaine. Our results showed that sensory block tended to last longer as compared to motor block which agrees with the observation by de Jong et al[14]. These authors explained that large fibres require a higher concentration of local anaesthetic than small fibres. The minimal effective concentration of local anaesthetic for large (motor) fibres is greater than for small (sensory) fibres. Thus, motor function returns before pain perception and duration of motor block is shorter than the sensory block.

In our study duration of analgesia was significantly higher in Tramadol Group compared to

Group B.

In our study, the number of patients who required rescue analgesia was also significantly lower in patients in Group BT. The prolonged analgesia in Group BT could be due to local anaesthetic type effect of Tramadol on peripheral nerves as demonstrated by Yu-Chan Tsai et al[11].Tramadol, an analgesic with peripheral effects similar to clonidine, moderately increases sensory block duration when compared with placebo or systemic control as mentioned in study by Joseph M. Neal et al[15].

No significant side effects like respiratory depression, pneumothorax, signs and symptoms of local anaesthetic toxcity or neurological sequale were observed in any of the two groups. The lack of significant side effects like respiratory depression and sedation make Tramadol as an adjuvant for supraclavicular brachial plexus block.

In this study there was no significant change in the hemodynamic parameters between the groups. This was consistent with the observation by Suman Chattopadhyay et al[5].

CONCLUSION:

From our study we conclude that the addition of the tramadol 2mg/kg to 38ml of 0.25% bupivacaine solution in brachial plexus block shows early onset of sensory and motor blockade and prolongs the duration of analgesia when compared to Bupivacaine alone. There are no significant side effects like respiratory depression and sedation. Hence tramadol may be considered as a useful adjuvant for bupivacaine when used for brachial plexus block.

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