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A Study Of The Efficacy Of Tramadol As An Adjuvant To Bupivacaine In Brachial Plexus Block

Dr. V. Shanmugapriya
Associate Professor, Department Of Anesthesiology & Critical Care,
Government Medical College, Kallakurchi

***Corresponding Author:**
Dr. V. Shanmugapriya
Associate Professor, Department Of Anesthesiology & Critical Care,
Government Medical College, Kallakurchi

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Abstract

Introduction : 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.

Aim Of The Study : 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 prospective, randomized, double blinded study was conducted in the Department of Anesthesiology, Department Of Anesthesiology & Critical Care, Government Medical College, Kallakurchi from in the year 2021-2022on 60 ASA I or II adult patients undergoing upper limb 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. Haemodynamic variables (i.e., heart rate, systolic and diastolic blood pressure, oxygen saturation), 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 ($P < 0.05$). Haemodynamic variables did not differ between groups in the post-operative period.

Conclusion: Thus Tramadol (2mg/kg) in combination with 38mL of Bupivacaine (0.25%) was found to be good agent for hastening the onset of sensory and motor block and improved postoperative analgesia when used in brachial plexus block without producing any adverse events.

Keywords: Supraclavicular brachial plexus block; Tramadol

Introduction

Brachial plexus block is an alternative technique to general anaesthesia for upper limb surgeries. They produce complete muscular relaxation, maintaining stable intraoperative hemodynamic condition and sympathetic block which reduces postoperative pain. [1] Supraclavicular brachial plexus block is a very popular mode of anaesthesia for various upper limb surgeries. This approach is attractive due to its effectiveness in terms of cost and performance, margin of safety, along with good postoperative analgesia. It also has the reputation of providing most complete and reliable anaesthesia for upper limb surgeries. [2]The plexus is blocked at the level of trunk where it is most compact i.e. at the middle of brachial plexus, resulting in homogenous spread of anaesthetic throughout the plexus with a faster onset and complete block.Bupivacaine is one of the

commonly used local anaesthetics as it has a longer duration of action varying from 3 to 8 hours. [3]However, it has limiting factors like delayed onset, patchy or incomplete analgesia. To minimize these drawbacks many drugs like neostigmine, opioids, hyaluronidase, midazolam, clonidine etc., have been added to local anaesthetics to improve the quality and duration of action and postoperative analgesia..A variety of opioids have been studied for brachial plexus blockade including tramadolκ[4]. 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.[5] 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.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.[6]

Methods: A prospective, randomized, double blinded study was conducted in the Department of Anesthesiology, Department Of Anesthesiology & Critical Care, Government Medical College, Kallakurchi from in the year 2021-2022on 60 ASA I or II adult patients undergoing upper limb 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. Haemodynamic variables (i.e., heart rate, systolic and diastolic blood pressure, oxygen saturation), and rescue analgesic requirements were recorded for 24 hrs postoperatively.

Inclusion Criteria

The following criteria were taken for including the patients in this study.

1. ASA Status I and II
2. Age between 19 and 72 years
3. Patients undergoing surgeries in distal end of arm, forearm and hand

Exclusion Criteria

1. Patient refusal
2. Local infections at the site of puncture for block / Sepsis
3. Known allergy for the drugs to be studied.
4. Coagulation abnormalities
5. H/o significant systemic disorders
6. Alcohol/drug abuse
7. Pregnancy/lactating women
8. Chronic analgesic therapy (other than NSAIDS)
9. Peripheral neuropathy
10. Very obese
11. Not fulfilling inclusion criteria

Patients were pre-operatively assessed and the procedure was explained to the patient. Written informed consent was obtained. They were assessed with particular attention to any contraindications.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.

Stastical analysis :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.

Results

Table 1: Demographic profile of the patients

Sl.No.	Demographic profile	Control group (B)	Tramadol Group (BT)

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1	No. of patients	30	30
2	Average age (years)	38.87 ± 13.544	36.40 ± 11.440
3	Weight (in Kgs)	66.70 ± 5.914	66.90 ± 5.026
4	Gender ratio (Male : Female)	17:13	24:6

The above table shows that the average age was 38.87 ±13.544 years in group B and 36.40 + 11.440 years in group BT. Youngest patient in our study group was 19 yrs and oldest was 72 years. The average weights of the patients were 66.70 + 5.914 kgs in.

Table : 2 Surgical profile of the patients:

Surgical Profile			
1	ASA Status(I : II)	25:5	25:5
2	Duration of surgery (in hours)	1.89 ± 0.484	1.77 ± 0.388
3	Type of operations (orthopaedic : Plastic surgeries)	(16:14)	(19:11)

Table 3:ASA Status

ASA Status	**Group R**		**Group R C**	
	No	**%**	**No**	**%**
I	25	83.3	25	83.3
II	5	16.7	5	16.7
Total	30	100	30	100
'p'	2 >0.05 not significant			

Table 4 :Duration of surgery in hours

Duration of surgery in hours	**Mean**	**S.D**	**Statistical inference**
B (n=30)	1.89	.484	T=1.089 .281>0.05 Not Significant
BT (n=30)	1.77	.388	

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ASA Status, type and duration of surgery were similar in both groups. The mean duration of surgery was 1.89 + 0.484 hours in group B compared to 1.77 + 0.388 hours in BT group. There was no clinical or statistical significance.

Table: 5 Onset of sensory block between study groups:

onset of Sensory block in Minutes	Mean	S.D	Statistical inference
B (n=30)	17.20	2.140	T=13.854
BT (n=30)	10.07	1.837	.000<0.05 Significant

The mean time for onset of sensory block in Group B was 17.20 ± 2.140 and in Group BT was10.07 ± 1.837 .the statistical analysis by students 't' test showed that the time for onset of sensory block in group BT was significantly faster when compared to Group B ($p < 0.05$)

Table :6 Onset of motor block between study groups:

Onset of motor block in minutes	Mean	S.D	Statistical inference
B (n=30)	9.10	1.373	T=10.338
BT (n=30)	5.83	1.053	.000<0.05 Significant

The mean time for onset of motor block in Group B was 9.10 ± 1.373minutes and in Group BT was5.83 ± 1.053minutes as shown in table 9 and Graph 7.The statistical analysis by students 't' test showed that the time for onset of motor block in group BT was significantly faster when compared to Group B ($p < 0.05$).

Table :7 Duration of sensory block in hours

Duration of sensory block in hours.	Mean	S.D	Statistical inference
B (n=30)	3.18	.524	T=-17.392
BT (n=30)	5.88	.669	.000<0.05 Significant

The duration of sensory blockade in Group B was 3.18 ± 0.524 hours and in Group BT, was 5.88 ± 0.669 hours as shown table 10, Graph 9.The statistical analysis by students 't' test showed that the time for duration of sensory block in group BT was significantly longer when compared to Group B (.000<0.05)

Table :8 Duration of motor block in hours:

Duration of motor block in hours.	Mean	S.D	Statistical inference
B (n=30)	2.34	.362	T=-16.916

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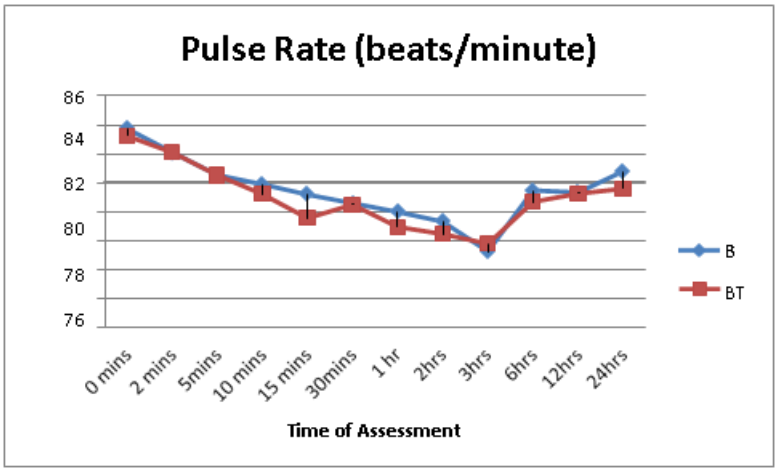
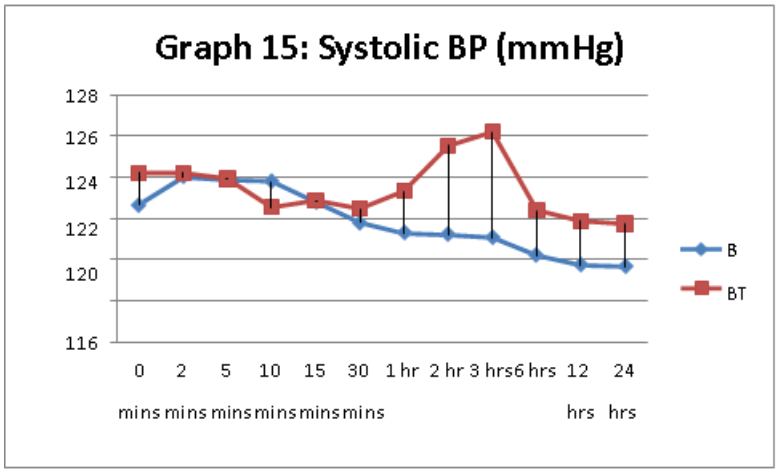
BT (n=30)	4.65	.654	.000<0.05 Significant

The duration of motor blockade in Group B was 2.34 ± 0.362 hours and in Group BT, was 4.65 ± 0.654 hours as shown table 11,graph 10.The statistical analysis by students't' test showed that the time for duration of motor blockade in group BT was significantly longer when compared to Group B (P < 0.05).

GRAPH 1: CHANGES IN PULSE RATE (beats/minute)



GRAPH 2 CHANGES IN MEAN SYSTOLIC BLOOD PRESSURE(mmHg)



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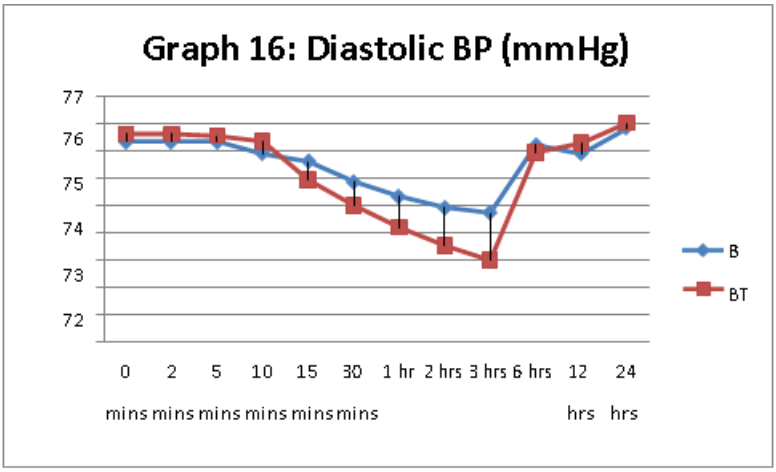
GRAPH 3: CHANGES IN MEAN DIASTOLIC BLOOD PRESSURE(mmHg)



Discussion

The supraclavicular brachial plexus approach is a very popular mode of anaesthesia, in which a small volume of solution can be delivered at a point where three trunks are compactly arranged, 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.[7] 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 couldnot 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.[8] A variety of opioids have been studied for brachial plexus blockade including tramadol hydrochloride. Tramadol is known to produce antinociception and to enhance the effect of local anaesthetic. Tramadol produces this effect by its dual mechanism of action. [9]Firstly it stimulates μ receptor and to lesser extent δ and κ - opioid receptors. Secondly it activates spinal inhibition of pain by decreasing the reuptake of norepinephrine and serotonin (non opioid mechanism) in peripheral nerve blocks. Several studies have demonstrated the advantage of using tramadol hydrochloride through various routes for analgesia.Hence 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.[10]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 .[11]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. Onset of motor block (group BT, 5.83 ± 1.053 min; group B, 9.10 ± 1.373 min).Onset of sensory block (group BT 10.07 ± 1.837 min; group B 17.20 ± 2.140 min).This could be due to a local direct action of Tramadol and its synergistic action with that of local anaesthetics.[12] In our study mean duration of motor block was prolonged when tramadol was added to bupivacaine. (Group BT, 4.65 ± 0.654 hours; Group B, 2.34 ± 0.362 hours). In our study, the mean duration of sensory block was significantly higher ($P < 0.05$) in group BT than in group B. (Group BT, 5.88 ± 0.669 hours; Group B, 3.18 ±0.524 hours). In our study duration of analgesia (from onset of blockade to requirement of first

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supplement analgesic) was significantly higher in Tramadol Group BT (7.06 ± 2.894) compared to Group B (3.42 ± 0.283).[13,14,15]

Conclusion

From our study we conclude that the addition of the tramadol 2mg/kg to 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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