ORIGINAL ARTICLE

CLINICAL COMPARISON BETWEEN 0.25% BUPIVACAINE AND BUPIVACAINE 0.25% AND TRAMADOL (2MG/KG) IN BRACHIAL PHLEXUS BLOCK BY SUPRACLAVICULAR APPROACH

Suresh C[1], Rajlaxmi V[2]

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ABSTRACT: BACKGROUND AND OBJECTIVES: Adjuncts to local anaesthetics for brachial plexus block may enhance the quality and duration of analgesia. Tramadol a synthetic 4-phenylpiperidine analog of codeine is known to produce antinociception and enhance the effect of local anaesthetics when given epidurally, intrathecally or in various peripheral nerve blocks. The purpose of this study was to assess the effect of Tramadol added to brachial plexus block by supraclavicular approach. **METHODS**: A prospective, randomized, single blinded study was conducted on 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 I (n=30) were given 38mL of 0.25% Bupivacaine plus 2ml NS and Group II (n = 30) were given 38 mL of 0.25% Bupivacaine plus 2 ml Tramadol (2mg/kg). The onset time and duration of sensory and motor blockade were recorded. Haemodynamic variables (i.e. heart rate, noninvasive 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 II compared to Group I (P <0.05). Rescue analgesic requirements were significantly less in Group II compared to Group I (P, 0.05). Haemodynamic variables did not differ between groups in the post-operative period. **CONCLUSION:** Tramadol (2mg/kg) in combination with 38mL of Bupivacaine (0.25%) hastened 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; Bupivacaine.

INTRODUCTION: Brachial plexus blocks provide a useful alternative to general anaesthesia for upper limb surgeries. They achieve near ideal operating conditions by producing complete muscular relaxtion, maintaining stable intraoperative haemodynamic condition and sympathetic block which reduces postoperative pain, vasospasm and edema.

Bupivacaine is one of the local anaesthetics used most frequently as it has a longer duration of action varying from 3 to 8 hours. However, it has limiting factors like delayed onset, patchy or incomplete analgesia. To minimize these drawbacks many drugs like neostigmine, opioids, hyaluronidase, midazolam, clonidine[1-3] 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 tramadol hydrochloride. Tramadol is a synthetic 4-phenyl- piperidine analog of codeine with a dual mechanism of action. Firstly, it stimulates the μ receptor and to lesser extent k-opioid receptors.

Secondly it activates spinal inhibition of pain by decreasing the reuptake of nor epinephrine and serotonin. It is one fifth to one tenth as potent as morphine.

The present study is being undertaken in a randomized single blinded manner to evaluate the onset time, duration and analgesic efficacy of bupivacaine 0.25% and tramadol (2mg/kg/) for brachial plexus block by supraclavicular approach.

OBJECTIVES

- The study of adding tramadol (2mg/kg) to bupivacaine (0.25%) in brachial plexus block for upper limb surgeries has the following objectives.
- To evaluate the:
  - Onset of sensory and motor blockade.
  - Duration of sensory and motor blockade.
  - Haemodynamic variables (HR, VP, O_2 saturation).
  - Number of rescue analgesics in postoperative 24 hours.
- Compare the above effects with that of 0.25% bupivacaine in brachial plexus block for upper limb surgeries.

REVIEW OF LITERATURE: Supraclavicular brachial plexus block provides safe, effective, low cost anesthesia with good postoperative analgesia. The current study aims to evaluate whether the weak opioid tramadol with nonopiod mechanisms of action improves post-operative analgesia when used as an additive along with bupivacaine. 70 patients of age 18 to 70 years posted for various upper limb surgeries were chosen for this prospective double blind study and randomly allocated into 2 equal groups of 35 each. Control group (C) received inj. Bupivacaine (0.25%) -38ml+NS. Tramadol group (T) received inj. Bupivacaine (0.25%) -38ml+tramadol 100mg (2 ml) [total volume in both group 40 ml].

All the study drugs used were preservative free. Assessment of motor and sensory blockade, pulse rate, systolic blood pressure, respiration and side effects were noted every 5 minutes for first 30 minutes and 10 minutes thereafter. Other parameters observed were the duration of analgesia and incidence of various complications following the procedure. The onset of motor and sensory blockade was significantly faster in tramadol group in comparison to control group ($p<0.05$). The duration of pain relief was also greater in tramadol group (410.1+95.1 min vs 194.8+60.4 min) ($p<0.01$). No patients developed any significant side effects. Tramadol is a useful adjuvant for brachial plexus block.[4]

This is a prospective, randomized, controlled double blind study to evaluate the postoperative analgesia following Supraclavicular brachial plexus block with tramadol as an admixture to bupivacaine in upper extremity surgery. Total 60 patients of ASA I and II undergoing upper extremity surgery, under brachial plexus block with Bupivacaine were randomly divided into two groups; one group received Tramadol (2mg/kg) and the other group received Dexamethasone (8mg) as an admixture to bupivacaine. The duration of postoperative analgesia was recorded in both groups using pain VAS score of 8-10 and when patient demands for additional analgesics. The mean duration of postoperative analgesia in the Dexamethasone group was 1028.00 minutes while in the tramadol group it was 453.17 minutes.

Thus Dexamethasone with local anaesthetic prolongs postoperative analgesia significantly than Tramadol (P<0.05) when used as admixture to local anaesthetic in brachial plexus block in upper extremity surgery.[5]

Adjuncts to local anesthetics for peripheral plexus blockade may enhance the quality and duration of anesthesia and postoperative analgesia. The analgesic, tramadol, has a unique mechanism of action that suggests efficacy as such an adjunct. It displays a central analgesic and peripheral local anesthetic effect.

In this prospective randomized study, evaluated the effect of tramadol as an adjuvant to axillary block. Studied 102 patients scheduled for hand surgery under axillary block with lidocaine 1.5% (epinephrine ½, 00, 000) and the addition of either 4 ml saline (control group), 100 mg tramadol and 2 ml saline (TL group), or 200 mg tramadol (TH group). onset time was longer in the TH group, 1.6+7min (9+3 min control group p= 0.01) sensory block and time for first rescue analgesia were significantly prolonged in the TH group compared with both TL and control groups (265+19 min Vs 190+87 min Vs 126+48 min; p=0.018); (73+434 min Vs 573+516 min V/s 375+316 min; p=0.02). The benefit of block prolongation associated with addition of 200 mg tramadol to lidocaine during axillary block is limited by slow onset of the block 10.

Opioid agents are known to exert their effects peripherally. Adding small doses of opioids to local anaesthetic solutions for peripheral blocks have resulted in improvement in the onset time, quality and duration of nerve block. Small concentrations of fentany 1-2 ug/ ml, sufentanil 0.1 ug/ ml or morphine 0.03 mg/ ml have been suggested for continuous infusion. Tramadol has a local anaesthetic effect on peripheral nerves and this could provide potentially a synergistic effect in continuous infusion as an additive to local anaesthetic agent.[6]

To determine the effectiveness and duration of postoperative pain relief after – local infiltration of tramadol in comparison with bupivacacaine, in adult hernia surgery. Study was conducted on 60 patients aged between 20-60 years with elective mesh repair of inguinal hernia. Patients were divided into two groups of 30 patients for 0.25% bupivacaine (group A) and tramadol (group B). patients were assessed for pain at 1, 6, 12, 18, and 24 hours following surgery using visual analogue pain score (VAPS). Patients with score =5 were given rescue analgesia in the form of 75 mg intramuscular diclofenac sodium. Comparison of first analgesia requirement time and the VAPS between the two groups was done using "t" test taking a p- value of < 0.05 as significant. Patients in group A had a mean age of 46+11.03 years whereas in group B the mean age was 46+11.39 years.

Mean visual analogue pain score after 1 and 6 hours of operation was 2.73 and 4.7 respectively in group A, while it was 1.43 and 3.43 in group B. VAPS after 24 hours of operation was 3.47 in group A and 2.53 in group B. mean time when 1st dose of rescue analgesic used was 8.20 hours in group A and 11.60 hours in group B. independent sample t- test for VAPS between the 2 groups revealed a highly significant difference (p- value <0.05) at 1, 6, 12, and 24 hours but no significant difference was seen at 18 hours. Independent sample t- test for time required for rescue analgesia and total number of doses required was also highly significant (p-value <0.05) between the two groups. Locally infiltrated tramadol provided an improved postoperative analgesia in comparison to bupivacaine and decreased the requirement of postoperative analgesics with early patient mobility and discharge.[7]

METHODOLOGY[8,9]: This study was conducted on 60 patients undergoing upper limb surgeries aged between 18 to 65 years under supraclavicular block in District Hospital Belagavi attached to BIMS, Belagavi.

Informed written consent was taken. Result values were recorded using a preset proforma.

Inclusion Criteria:

- Patients with ASA class I and II
- Patients aged between 18 to 65 years
- Patients with SBP : 100-139 mm of Hg
- Patients with DBP: 60-89 mm of Hg.

Exclusion Criteria:

- Patients belonging to ASA III and IV.
- Known case of hypersensitive reaction to tramadol and local anesthetic.
- Patients with abnormal BT, CT or on anticoagulation therapy, severe anaemia,
- Hypovolemia, shock, septicemia and h/o seizures.
- Local infection at the site of proposed puncture for supraclavicular block.

Investigation Required:

- Hb%, TC, DC, BT, CT.
- Urine routine.
- RBS, Blood urea serum creatinine.
- Chest x-ray, ECG.
- HIV, HBsAg.

Preliminaries:

- Written informed consent.
- Intravenous access with a 20 guage I.V cannula on the contralateral upper limb under aseptic techniques.

Equipments:

a) For the procedure: A portable tray covered with sterile towels containing:

- Sterile syringes-one 20 ml and one 10 ml.
- Hypodermic needles of 5 cm length, 22 G.
- Bowl containing Povidone iodine and spirit.
- Sponge holding forceps.
- Towels and towel clips.
- Sterile gauze pieces.

b) For emergency resuscitations:

- The anaesthesia machine, emergency oxygen source (E type cylinders), pipeline O2 supply, working laryngoscopes, appropriate size endotracheal tubes and connectors.

- Working suction apparatus with suction catheter.
- Oropharyngeal airways.
- Intravenous fluids.
- Drugs: thiopentone, Diazepam, Succinylcholine, Hydrocortisone, Atropine, Adrenaline, Aminophylline, Mephenteramine, Calcium gluconate and Sodium bicarbonate.

c) Monitors:

- Pulse oximeter.
- Non-invasive blood pressure monitor by sphygmomanometer on the opposite upper limb.

PROCEDURE: A prospective, randomized, single blinded study would be undertaken. 60 patients posted for upper limb surgeries under supraclavicular block would be assigned to two groups, each containing 30 patients:

- Control group- Group I: Would receive 38 ml, bupivacaine 0.25%+2ml NS.
- Study group- Group II: Would receive 38 ml mixture of bupivacaine 0.25% and + 2ml tramadol (2mg/kg).
- All the study drugs used were preservative free.
- 40ml solution for 'single shot' supraclavicular brachial plexus blockade would administer.
- Pre-anaesthetic check-up would be done and informed about the procedure.
- Patients were fasted overnight.
- IV line secured and patients would be connected to monitors to record pulse, O_2 saturation, NIBP and ECG.
- Premedication with inj. Midazolam 0.05mg/kg body weight before the procedure. Durg solutions are prepared.
- Patient lays supine, arms by the side and head turned to other side.
- After aseptic preparation of the area, at a point 1.5 to 2.0 cm posterior and cephalic to midpoint of clavicle, subclavian artery pulsations are felt. A skin wheel is raised with local anesthesia is elicited or first rib is encountered.

If the rib is encountered, the needle would be moved over the first rib until par aesthesia is elicited in the arm or hand.

After eliciting par aesthesia and negative aspiration of blood, keeping the needle in the same position the study medication would be injected slowly ruling out intravascular injection intermittently.

Sensory block is evaluated by pin prick method with a 23 gauge needle. The onset time was defined as the time between injection and complete loss of pin prick sensation in C_2 and T_2 dermatome and temperature testing using spirit soaked cotton on skin dermatomes C_2 to T_2. The time when complete sensory blockade achieved would be noted.

Motor block was assessed by 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]. The time when motor block achieved would be noted:

- Onset of sensory block was defined as the time elapsed between injection of drug and complete ioss of cold perception of the hand, while onset of motor blockade was defined as the time elapsed from injection of drug to complete motor block.
- Heart rate, non-invasive blood pressure and O_2 saturation were also monitored.
- Duration of sensory block (The time elapsed between injection of drug and appearance of pain requiring analgesia) and duration of motor block (The time elapsed between injection of drug and complete return of muscle power) would also be recorded.
- IM injection of diclofenac sodium would be given as rescue analgesic when patients complain of pain.
- Number of rescue analgesics in 24 hours of post-operative period would also be recorded.
- Quantitative data will be analysed by student's 't' test
    - Quantitative data will be analysed by chi-square test
- P value<0.05 would be considered statistically significant.
- Side effect and complication would also be noted.

RESULTS: Sixty ASA I and II of either sex aged between 18-65 years, posted for upper limb surgeries under supraclavicular brachial plexus block were selected for the study. The study was undertaken to evaluate the efficacy of Tramadol (2mg/kg) as adjuvant to Bupivacaine (0.25%) in comparison with plain Bupivacaine (0.25%) for brachial plexus block by supraclavicular approach.

	Treatment group		**Total**
	Bupivacaine Group	**Bupivacaine – Tramadol group**	
Less than 30 year	10 (33.3)	10(33.3)	20(33.3)
31-40 years	9(30.3)	15(50.0)	24(40.0)
41-50 years	9(30.0)	4 (13.3)	13 (21.7)
51 years and above	2 (6.7)	1 (3.3)	3 (5.0)
Total	**30 (100)**	**30 (100)**	**60 (100)**
Mean + SD	36.77±10.72	35.23±7.42	36.00±9.92

Table 1: age distribution of study group

t value =0.642 p=0.523

*Students unpaired 't' test NS – Nothing significant

The minimum age of the patient was 18 years and the maximum age was 65 years. The mean age of the patients in group II was 35.23±7.42 and in group I was 36.77±10.72 years. Age incidences between two groups were comparable.

Groups	Bupivacaine group	Bupivacaine Tramadol group	t value	p value	Sig
Onset of sensory block in mins Mean +SD	17.73+1.91	10.87+1.36	16.045	<0.001	HS

Table 2: Onset of sensory block between the study groups

*Students unpaired t test HS- Highly significant.

The mean time for onset sensory block in group II was 10.87 + 1.36 min and in group I was 17.73±1.91 min. The statistical analysis by student's unpaired 't' test showed that, the time for onset of sensory block in group II was significantly faster when compared to group I (P<0.001).

Groups	Bupivacaine group	Bupivacaine –Tramadol group	t value	p value	Sig
Onset of sensory block in mins Mean+SD	8.67+1.24	5.9+0.96	9.6	<0.001	HS

Table 3: Onset of sensory block between the study groups

- Student's unpaired t test, HS-Highly significant

The mean time for onset of motor block in group II was 5.9+0.96 min and in group I was 8.67±1.24 min. the statistical analysis by unpaired student's 't' test showed that, the time for onset of motor block in group II was significantly faster when compared to group I (P<0.001).

Groups	Bupivacaine group	Bupivacaine Tramadol group	t value	p value	Sig
Duration of sensory block in mins Mean +SD	3.23+4.51	5.65+0.52	2.91	<0.001	HS

Table 4: Duration of sensory block between the groups

- Student's unpaired t test, HS-Highly significant

Patient of both groups were observed for 24 hours. Time was noted when the patient asked for rescue analgesics. The mean duration of sensory block in group II was 5.65±0.52 hours and in group I was 3.23=4.51 hours. The statistical analysis by students unpaired 't' test showed that the duration of sensory block in group II was significantly longer when compared to group I (P<0.001).

Groups	Bupivacaine group	Bupivacaine – Tramadol group	t value	p value	Sig
Duration of motor block in mins Mean +SD	2.10+1.01	4.50+0.57	11.28	<0.001	HS

Table 5. Duration of motor block between the study groups

- Student's unpaired t test, HS-Highly significant.

The mean duration of motor block in group II was 4.50±0.57 hours and the group I was 2.10±1.01 hours. The statistical analysis by students unpaired 't' test showed that, the difference between duration of motor block in group II was significantly longer when compared to group I (P<0.001).

Groups	Bupivacaine group	Bupivacaine Tramadol group	t value	p value	Sig
No. of RA in 24 hours Mean +SD	2.47 +0.51	1.30+0.47	9.275	<0.001	HS

Table 6: No. of RA in 24 hours between the study groups

- Student's unpaired t test, HS-Highly significant

In group II patient required only 1 rescue analgesic dosage. In group I patients required 2-3 rescue analgesic dose in postoperative 24 hours. This difference in number of rescue analgesic doses required by patients of both group is statistically significant (P<0.0001).

Time of Assessment	Mean +/-SD		Mean Difference	t* Value	P Value	Signifi-Cance
	Bupivacaine	Bupivacaine Tramadol				
0 min	77+6.8	78+7.4	1.48	1.03	p>0.05	NS
5 min	77+6.6	78+7.0	1.24	0.91	p>0.05	NS
15 min	76+7.0	78+7.0	1.44	1.03	p>0.05	NS
30 min	76+6.6	78+7.4	1.46	1.04	p>0.05	NS
60 min	77+6.5	78+7.2	1.36	0.99	p>0.05	NS
2 hrs	77+7.0	78+7.0	1.1	0.79	p>0.05	NS
6 hrs	77+6.6	78+7.0	1.48	1.05	p>0.05	NS
12 hrs	76+6	78+7.0	2.04	1.49	p>0.05	NS
24 hrs	77+7.0	79+7.0	1.52	1.09	p>0.05	NS

Table 7: Pulse Rate (beats/min)

- Student's unpaired t test, NS-Not significant

In group I, the mean pulse rate ranged from 76+6.0 to 77+7.0 beats / min. In group II, the mean puls rate ranged from 78+7.0 to 79+7.0 beats /min. the statistical analysis by student's unpaired 't' test showed that there was no significant difference in puls rate between the two group (p>0.05).

Time of Assessment	Mean +/-SD		Mean Difference	t* Value	P Value	Signifi Cance
	Bupivacaine	Bupivacaine Tramadol				
0 min	117+10.45	117+10.53	0.76	0.36	p>0.05	NS
5 min	118+10.37	117+10.88	0.1	0.047	p>0.05	NS
15 min	118+010.01	118+10.84	0.08	0.038	p>0.05	NS
30 min	118+10.38	118+11.01	0.12	0.056	p>0.05	NS
60 min	118+9.47	117+10.86	0.02	0.01	p>0.05	NS
2 hrs	117+10.04	118+10.99	0.7	0.33	p>0.05	NS
6 hrs	117+10.01	118+11.19	0.48	0.22	p>0.05	NS
12 hrs	117+9.96	118+11.10	0.68	0.32	p>0.05	NS
24 hrs	117+9.85	118+11.07	1.04	0.49s	p>0.05	NS

Table 8: Systolic blood pressure (mm of Hg)

- Student's unpaired t test, NS-Not significant

In group I, the mean systolic blood pressure ranged from 117+9.85 to 118+10.38 mm of Hg. In group II, the mean systolic blood pressure ranged from 117+10.53 to 118+11.19 mm of Hg. The statistical analysis by unpaired student's 't' test showed that there was no significant difference in systolic blood pressure between the two group (P>0.05).

Time of Assessment	Mean +/-SD		Mean Difference	t* Value	P Value	Signifi Cance
	Bupivacaine	Bupivacaine Tramadol				
0 min	76+7.72	77+6.8	0.38	0.26	p>0.05	NS
5 min	76+7.52	77+6.74	1.02	0.71	p>0.05	NS
15 min	76+7.07	77+6.72	1.14	0.82	p>0.05	NS
30 min	77+7.10	77+6.85	0.38	0.27	p>0.05	NS
60 min	76+7.03	77+6.66	0.74	0.54	p>0.05	NS
2 hrs	76+7.06	77+6.82	0.48	0.34	p>0.05	NS
6 hrs	76+7.15	77+6.73	0.52	0.37	p>0.05	NS
12 hrs	76+6.9	77+6.92	0.52	0.37	p>0.05	NS
24 hrs	76+6.9	77+6.67	0.5	0.36	p>0.05	NS

Table 9: Diastolic blood pressure (mm of Hg)

- Student's unpaired t test, NS-Not significant

In group I, the mean diastolic blood pressure ranged from 76+6.9 to 77+7.1 mm of Hg. In group II, the mean diastolic blood pressure ranged from 77+6.6 to 77+6.9 mm of Hg. The statistical analysis by student's unpaired't' test showed that there was no significant difference in diastolic blood pressure between the two group (P>0.05).

Time of Assessment	Mean +/-SD		t* Value	P Value	Signifi-cance
	Bupivacaine	Bupivacaine Tramadol			
0 min	99+0.56	99+0.49	0	p>0.05	NS
5 min	99+0.47	98+0.50	1.8	p>0.05	NS
15 min	99+0.49	99+0.50	0.39	p>0.05	NS
30 min	98+0.54	98+0.05	2.09	p>0.05	NS
60 min	99+0.50	98+0.50	0.19	p>0.05	NS
2 hrs	99+0.48	99+0.47	0.2	p>0.05	NS
6 hrs	98+0.49	99+0.47	2.45	p>0.05	NS
12 hrs	98+0.57	99+0.46	2.09	p>0.05	NS
24 hrs	98+0.48	99+0.46	3.58	p>0.05	NS

Table 10: Oxygen saturation (%)

- Student's unpaired t test, NS-Not significant

In group I mean O2 saturation ranged from 98+0.5% to 99+0.57%. In group II, the mean O2 saturation ranged from 98+0.5%. The statistical analysis by students unpaired 't' test showed that there was no significant difference in O2 saturation between the group (P>0.05)

DISCUSSION: Brachial plexus block provides postoperative analgesia for upper limb surgeries. Bupivacaine is used as it has longer duration of action varying from 3-8 hours. Various adjuvant drugs like Midazolam, Neostigmine, dexamethasone and Hyaluronidase, clonidine have been evaluated, in conjunction with local anaesthetics to produce the period of analgesia, but they were found to be either ineffective or produce high incidence of adverse effects. Tramadol is known to produce antinociception and enhance the effect of local anaesthetic. Tramadol produces this effect by its dual mechanism of action. Firstly it stimulates u receptor and to lesser extent δ and k - opioid receptors. Secondly it activates spinal inhibition of pain by decreasing the reuptake of norepinephrine and serotonin (non-opioid mechanism) in peripheral nerve blocks.

Hence an attempt has been made to assess the efficacy of Tramadol as an adjuvant to Bupivacaine (0.25%) in brachial plexus block (supraclavicular approach) in terms of onset time, duration of analgesia. Haemodynamic variables and rescue analgesic requirements in first 24 hours.

A total of 60 patients within age group of 18-65 were in included in the study, 30 in each group. Out of which the mean age group I (receiving only Bupivacaine) was 36.77±10.72 years

and the mean age of group II (receiving Tramadol with Bupivacaine) was 35.23±7.42 years. Hence both age groups were comparable in regard to age.

In our study we found that the onset of sensory and motor blocks was significantly faster in patients who received a combination of Tramadol and Bupivacaine. Onset of sensory block (group II 10.87±1.36 min; group I, 17.73+1.91 min). Onset of motor block (group II, 5.9±0.96 min; group I, 8.67±1.24 min).

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 found to be faster than the onset of sensory block in both groups. Winnie et al,[4] observed and attributed this to the somatotrophic arrangement of fibres in a bundle at the level of the trunks in which motor fibres are located more peripherally than sensory fibres. Hence, a local anaesthetic injected perineurally will begin to block motor fibres before it arrives at the centrally located sensory fibres.

In our study duration of motor block was prolonged when tramadol was added to bupivacaine. (Group II, 4.50±0.57 hrs; group I, 2.10±1.01 hrs). In our study, the mean duration of sensory block (i.e. time elapsed from time of injection to appearance of pain requiring analgesia) was significantly higher ($p<0.05$) in group II than in group I. (Group II, 5.65±0.52 hrs; group I, 3.23±4.51 hrs).

A prospective, randomized, double blind, placebo-controlled study was conducted by Suman Chattopadhyay, et al[10] to assess the efficacy of Tramadol as an adjuvant to Bupivacaine in brachial plexus block. 70 ASA Grade I or II patients undergoing upper limb surgery under supraclavicular brachial plexus block were allocated in to two groups of 35 each:

- Control Group (C) (n=35) received 38 ml of 0.25% Bupivacaine and 0.2 ml NS.
- Tramadol group (T) (n=35) received 38 ml of 0.25% Bupivacaine and 2 ml (100mg) Tramadol. (Total volume in both group 40ml).

The mean onset of sensory block (T group, 13.3±9.1) min, group C, 20.9±15.9 min) was significantly faster in group T than in group C ($p<0.01$). The duration of analgesia (group T, 6.1±35.1 hrs; group C, 3.2±0.4 hrs) was longer in T group than in C group. The duration of motor block (group T 6.3±0.4 hrs, group C, 2.4±0.8 hrs) was also longer group T than in group C. These results are comparable with our study.

Tramadol has local anaesthetic effects on peripheral as this could provide potentially a synergistic effect in continuous infusion as an additive to local anaesthetic agent has been studied by J. Balasavenkatasubramanian.[4]

We studied Tramadol at a dose of 2 mg/kg, as others have used the same dosage in peripheral nerve block without any significant adverse effects as Renu Wakhlo et al [10] showed addition of (100 mg) 2mg/kg of Tramadol to local anaesthetics.

In conclusion, Tramadol 2 mg/ kg when added to 38 ml of Bupivacaine 0.25 % for supraclavicular brachial plexus block, speeds the onset of sensory and motor blocks ($p< 0.05$). The combination produces improved analgesia, resulting in a prolonged effect and reduced requirements for rescue analgesics.

CONCLUSION: From our study, we conclude that, the addition of Tramadol (2mg/kg) as an adjuvant to bupivacaine (0.25%) has following effects:

1. Faster onset of sensory block.
2. Faster onset of motor block.
3. Longer duration of sensory block.
4. Longer duration of motor block.
5. Less number of rescue analgesics in post-op 24 hours.
6. No significant difference in haemodynamic variables i.e, pulse rate, systolic BP, diastolic BP and O_2 saturation.

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AUTHORS:

1. Suresh C.
2. Rajlaxmi V.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Anaesthesiology, Belgaum Institute of Medical Sciences, Belgaum.
2. Senior Resident, Department of Anaesthesiology, Belgaum Institute of Medical Sciences, Belgaum.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Suresh C,
S-20, Shraddha Residency,
Sampige Road, Vishweshwariah Nagar,
Belgaum-590001.
E-mail: csuresh095@gmail.com

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