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Research Article

Comparison of mean duration of analgesia between tramadol in combination with 0.25% bupivacaine versus 0.25% bupivacaine alone for brachial plexus block

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ABSTRACT

Objective: To compare the efficacy of tramadol and 0.25% bupivacaine versus 0.25% bupivacaine alone for brachial plexus block.

Material and methods: This randomized controlled trial was conducted at Department of Surgery, Services Hospital, Lahore from March 2018 to September 2018. Total 120patients undergoing upper abdominal surgery were selected for this study and divided into two group A and B randomly. Comparison of mean duration of postoperative analgesia between perioperative infusions of magnesium sulfate versus placebo was done.

Results: Mean age of the patients was 41.82 $\pm$ 13.67 years ranging from a minimum of 18 to a maximum of 70. Mean weight of the patients was 56.50 $\pm$ 11.50 Kg ranging from a minimum of 35 to a maximum of 78 Kg. In treatment group A, mean duration of analgesia was 355.85 $\pm$ 42.18 minutes and mean duration of analgesia in treatment group B was 310.47 $\pm$ 38.79 minutes. Mean duration of analgesia in treatment group A was significantly high as compared to treatment group B with p value 0.000.

Conclusion: In conclusion, the addition of tramadol to local anesthetic mixtures as an adjuvant agent for axillary block provide better postoperative analgesia for upper extremity surgery. Of course, in order to further support this statement larger studies need to be performed.

KEYWORDS: analgesia, tramadol, 0.25% bupivacaine, brachial plexus block

INTRODUCTION

Pain is the most common reason for which an individual seeks medical care. Pain management is used to alleviate anxiety, fear and uneasiness of patients which develop due to pain. Pain is defined as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.[1]Pain is classified as acute (immediate, short term) and chronic (long term). Pain itself imposes a diversity of changes and effects normal physiological functions in many ways. Most common effects are hypertension, tachycardia, increased myocardial irritability, increased minute ventilation, decreased tidal volume, increased Co_2

production, enhanced sympathetic tone and excessive release of catabolic hormones.Pain relief is achieved by using systemic drugs like opioids[2], paracetmol and NSAIDS[3], local nerve blocks[4], central neuraxial blocks[5], use of adjuncts like antidepressants, anticonvulsants and magnesium sulphate, Transcutaneous electrical nerve stimulation (TENS)[6], acupuncture, psychological interventions, cryoanalgesia[7] and radiofrequency ablation.Upper extremity surgery can be performed by employing various techniques like general anaesthesia, intra venous regional anaesthesia[8] and local nerve blocks. Currently the trend of peripheral nerve blocks both for anaesthesia and postoperative analgesia has gained popularity. In addition to conventional local anaesthetic solutions various adjuncts like clonidine[9], opioids, NSAIDS, reserpine and neostigmine are commonly used to enhance the duration of analgesia. Duration of analgesia shows the length of time that a particular drug is effective. These adjuncts are used to increase the analgesic effect of local anaesthetic solutions.

OPERATIONAL DEFINITION

Brachial plexus block: It was regional anaesthesia of shoulder, arm and hand by injection of a local anesthetic in proximity of brachial plexus. Supraclavicular approach was used because was given most effective block for all portions of upper limb.

MATERIAL AND METHODS

This randomized controlled trial was conducted at Department of anesthesia, Services Hospital, Lahore from March 2018 to September 2018. Total 120 patients from department of orthopedic surgery both male and female coming for upper limb surgeries, ASA grade I to III between ages 18 to 70 years were selected for this study.

Patients with known neurological deficit, history of seizures, compromised cardiorespiratory profile, bleeding problems, sepsis, pregnancy, pneumothorax, very obese and with local bony deformities were excluded from this study.

Selected patients were divided into two equal groups A and B. Group A were given solution with 38 ml 0.25% bupivacaine with 100 mg tramadol 2 ml and group B was given solution with 38 ml 0.25% bupivacaine and 2 ml 0.9 % normal saline. All patients were pre-medicated with half tablet lexilium 3 mg a night before operation.

Before starting the procedure, 18 G venous cannula was passed in the opposite hand of selected patients and routine monitors were attached like pulse oximeter, blood pressure cuff, ECG electrodes.Supraclavicular brachial plexus block was performed in supine position with head turned to opposite side and arms extended and pulled towards the knee.

About 2 cm above the midclavicular point 22 G 1.5 inch needle was introduced and directed lateral to subclavian artery until paresthesia encountered. 40 ml of local anaesthetic (inj bupivacaine 0.25%) with or without tramadol was injected in this area. Sensory block was tested by alcohol swabs.

Patients were given oxygen through mask and vitals monitoring (pulse, respiratory rate, BP) and side effects were noted every 5 min for first 30 min then after every 10 min till end of surgery. Time of onset of analgesia and time of injection of local anaesthetic was noted. Throughout operation, patients were checked for any side effects and complications like respiratory distress, pneumothorax and seizures. All the observations were recorded and entered in the proforma specifically designed for the study by the researcher. Time for requirement of first rescue analgesia was noted and entered in the performa and thus duration of analgesia was measured. Bias, if any, was controlled by standardization of measurement technique. All the data was entered in SPSS version 18 and analyzed. Mean and SD was calculated for numerical data frequencies were calculated for categorical data.

RESULTS

Mean age of the patients was 41.82 $\pm$ 13.67 years ranging from a minimum of 18 to a maximum of

70. Mean weight of the patients was 56.50 ± 11.50 Kg ranging from a minimum of 35 to a maximum of 78 Kg. In treatment group A, mean duration of analgesia was 355.85 ± 42.18 minutes and mean duration of analgesia in treatment group B was 310.47 ± 38.79 minutes. Mean duration of analgesia in treatment group A was significantly high as compared to treatment group B with p value 0.000. (Table 1)

In male patients of treatment of group A and B, mean duration of analgesia was 353.28 ± 41.36 minutes and 316.90 ± 39.57 minutes and the difference was statistically significant with p value 0.001. In female patients of both groups, mean duration of analgesia was 358.71 ± 43.50 minutes and 301.41 ± 36.50 minutes and the difference was statistically significant with p value 0.001. (Table 2) In age group <45 years, mean duration of analgesia in group A was 343.88 ± 38.17 minutes and in group B was 299.29 ± 35.23 minutes. Treatment group A had significantly higher mean duration of analgesia as compared to treatment group B with p value 0.001. In age group ≥ 45 years, mean duration of analgesia was 370.73 ± 42.73 minutes and 325.32 ± 39.49 minutes respectively in treatment group A and B and the difference of mean duration of analgesia was statistically significant with p value 0.001. (Table 3)

In weight group < 45 kg, mean duration of analgesia was 359.90 ± 45.732 minutes and 303.26 ± 39.15 minutes respectively in study group A and B and the difference was significant (P = 0.001). In weight group ≥ 45kg, mean duration of analgesia was 351.34 ± 37.99 minutes in study group A while 313.73 + 38.57 minutes in study group B. Difference of mean duration of analgesia between the both groups was significant with p value 0.001. (Table 4)

Table 1: Comparison of mean duration of analgesia between group A and B

Group	Mean duration of analgesia	P value
A	355.85 ± 42.18	0.001
B	310.47 ± 38.79	

Table 2: Comparison of mean duration of analgesia between male and female patients of both groups.

Group	Mean duration of analgesia	P value
Male patients		
A (N = 38)	353.28 ± 41.36	0.001
B (N = 35)	316.90 ± 39.57	
Female patients		
A (N = 22)	358.71 ± 43.50	0.001
B (N = 25)	301.41 ± 36.50	

Table 3: Comparison of mean duration of analgesia between both groups for age

Group	Mean duration of analgesia	P value
Age group Age < 45 years		
A (N = 42)	343.88 ± 38.17	0.001
B (N = 33)	299.29 ± 35.23	
Age group ≥ 45 years		
A (N = 18)	370.73 ± 42.73	0.001
B (N = 27)	325.32 ± 39.49	

Table 4: Comparison of mean duration of analgesia between both groups for weight

Group	Mean duration of analgesia	P value
Weight < 45 **kg**		
A (n = 24)	359.90 ± 45.732	0.001
B (n = 27)	303.26 ± 39.15	
Weight ≥ 45**kg**		
A (n = 36)	351.34 ± 37.99	0.001
B (n = 33)	313.73 + 38.57	

DISCUSSION

The axillary approach to the brachial plexus is a commonly used and efficient analgesia technique for hand wrist and/or forearm surgery.[10] Local anesthetics, are often used in axillary block application. Considerable research has been conducted in order to determine the ideal drug or combination. An ideal drug would have a fast sensory onset time and a differential offset, with an earlier offset of motor rather than sensory blockade, thus enabling patients to move their arms while enjoying continued analgesia. Combinations of local anesthetics are employed for peripheral nerve blocks to accelerate the onset time of sensorial and motor blocks.[11]

In addition, adjuvant agents are used to improve the quality and duration of nerve blocks and to reduce the need for supplementary analgesics for postoperative pain. There have been several studies concerning opioids, and particularly the use of fentanyl or tramadol as an adjuvant agent. Fentanyl has been added to local anesthetics, with different results, increase the success rate of sensory blockade and prolong the duration of analgesia in contrast did not find any effects on the time to onset of nerve block or time to first request for postoperative pain medication being obtained.[12-13] Tramadol, a synthetic codeine analogue, has been used as an adjuvant to improve peripheral block quality in peripheral nerve block and to extend postoperative analgesia.[14]

Tramadol exhibits both opioid and non-opioid activities. Recent clinical and laboratory studies have concluded that tramadol displays a peripheral local anesthetic effect. Tramadol has been used as an adjunct to peripheral plexus anesthesia in recent publications. The results of our study showed that the addition of 100 mg of tramadol to local anesthetic mixtures for axillary brachial plexus block improves the speed of block onset and increases the duration of sensory block. In a study in which tramadol was added to 20 mL of ropivacaine 7.5 mg/mL, conducted by Antonucci, tramadol was shown to significantly reduce the onset time of brachial plexus block and to prolong the duration of anesthesia and post-operative analgesia.[97] In our study, and similarly to that of Antonucci, we added 100 mg of tramadol to bupivacaine and lidocaine and observed a longer analgesia duration. Kaabachi et al. investigated the addition of varying doses of tramadol to lidocaine 1.5% (epinephrine 1/200.000) solution and reported that the benefit of block prolongation associated with the addition of 200 mg of tramadol to lidocaine during axillary block was limited by the slow onset of the block.[15]Robaux et al. added different doses of tramadol to mepivacaine 15 mg/mL for axillary brachial plexus block and reported that tramadol extended the duration and improved the quality of post-operative analgesia in a dose-dependent fashion. In contrast, Kesimci et al. reported that the addition of 100 mg of tramadol to 7.5 mg/mL of ropivacaine, for axillary brachial plexus block, does not prolong the duration of motor and sensory block and analgesia.[16]Sarsu et al. performed axil¬lary blockade by adding 100 mg of tramadol to combination of levobupivacaine and lidocainee. They reported that tramadol was not effective on sensorial and motor block durations, onset time, and analgesia duration.[17]

In our study there were 120 patients in total with a slight male predominance as 81 (54.7%) were males while females were 67 (45.3%). This is explainable due to higher involvement of men in

fights, road traffic accidents and sports which are the main causes of injury to the upper limb. Mean age of the patients was 41.82 ± 13.67 years ranging from a minimum of 18 to a maximum of 70 which reflects the inclusion criteria for age which we set. Mean weight of the patients was 56.50 ± 11.50 Kg ranging from a minimum of 35 to a maximum of 78 Kg. While mean duration of analgesia was 333.16 ± 36.50 minutes. Mean duration of analgesia in treatment group A, those who received adjunctive tramadol in the local anaesthetic mixture was quite prolonged than that in treatment group B patients who received normal saline as placebo along with local anaesthetic (355.85 ± 42.18 for group A and 310.47 ± 38.79 for group B). This difference was found to be statistically significant as the p-value obtained after application of student's t-test turned out to be < 0.0001.When the effect of gender was noted it was found that duration of analgesia was significantly prolonged in both male and female patients in treatment group A (353.28 ± 41.36 and 358.71 ± 43.50 minutes respectively) as compared to those in treatment group B (316.90 ± 39.57 and 301.41 ± 36.50 minutes respectively for males and females) (p-value < 0.0001). When the effect of age was noted it was found that duration of analgesia was significantly prolonged in patients of both age groups i.e. < 45 years and ≥ 45 years in treatment group A (343.88 ± 38.17 and 370.73 ±42.73 minutes respectively) as compared to those in treatment group B (299.29 ± 35.23 and 325.32 ± 39.49 minutes respectively for those in age group < 45 and those in age group ≥ 45 years respectively) (p-value < 0.0001). When the effect of weight was noted it was found that duration of analgesia was significantly prolonged in patients of both weight groups i.e. < 55 Kg and ≥ 55 Kg in treatment group A (359.90 ± 45.73 and 351.34 ± 37.99 minutes respectively) as compared to those in treatment group B (303.26 ± 39..15 and 313.73 + 38.57 minutes respectively for those in weight group < 45 and those in weight group ≥ 45 years respectively) (p-value < 0.0001).In one study conducted by Kapral et al,[94] 60 patients (ASA physical status I or II) scheduled for forearm and hand surgery after trauma under brachial plexus anesthesia were included in the study. Patients were randomly assigned to receive either 40 mL of mepivacaine 1% with 2 mL of isotonic sodium chloride solution (Group A, n = 20); 40 mL of mepivacaine 1% with 100 mg of tramadol (Group B, n = 20); or 40 mL of mepivacaine 1% with 2 mL of isotonic sodium chloride solution and 100 mg of tramadol i.v. (Group C, n = 20). Sensory block, motor block, and hemodynamics were recorded before and 5, 10, 30, 60, 120, 180, and 360 min after local anesthetic injection. Duration of sensory and motor block was significantly longer (P < 0.01; P < 0.05) in Group B (299 +/- 84 and 259 +/- 76 min) than in Group A (194 +/- 35 and 181 +/- 24 min) and Group C (187 +/- 35 and 179 +/- 16 min). These results are similar to those observed in our study.

CONCLUSION

In conclusion, the addition of tramadol to local anesthetic mixtures as an adjuvant agent for axillary block provide better postoperative analgesia for upper extremity surgery. Of course, in order to further support this statement larger studies need to be performed.

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