ORIGINAL ARTICLE

Does the addition of Tramadol to local anaesthetic mixture improve the quality of axillary brachial plexus block: a comparative study at the teaching hospital, Dera Ghazi Khan

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ABSTRACT

Background: In peripheral nerve blocks, adjuvants are added to local anaesthetics to improve the quality of anaesthesiaand analgesia. This study was conducted to evaluate the efficacy of tramadol when combined with bupivacaine in axillary brachial plexus block for upper limb surgery.

Method: In this prospective randomized control trial, two groups of 30 patients each were investigated. Group I was administered 32ml of tramadol- local anaesthetic mixture[20ml 0.5% bupivacaine + 10ml xylocaine with 1:200,000 adrenaline + 2ml Tramadol (100mg)] and Group II was given saline-local anaesthetic mixture [20ml 0.5% bupivacaine + 10ml xylocaine with 1:200,000 adrenaline + 2ml saline]. The onset of sensory and motor block, duration of sensory and motor block and time of first request for analgesia postoperatively were assessed.

Results: The onset of motor and sensory block was faster in tramadol-bupivacaine mixture than bupivacaine alone and difference was significant (p=0.001) (p=0.01). In Group I, significantly prolonged duration of motor and sensory block was seen.(p=0.000). In comparison to Group II, prolonged time of first request for rescue analgesia was seen in Group I(p=0.04). In group I, 5 patients (16%) did not require analgesia postoperatively. Only one patient complained of nausea in group I.

Conclusion: The study suggests that tramadol when added to local anaesthetic enhances the quality of anaesthesia and analgesia.

Keywords: Axillary plexus block, Tramadol, Bupivacaine, Sensory Block, Motor Block.

INTRODUCTION

Brachial plexus block is used in our clinical practice as an alternative to general anaesthesia for upper limb surgeries.The axillary approach first demonstrated by William Halsted in 1884, later became popular among anaesthetists in 1959 after the publication by Burnham[1]. It isoften used for wrist, hand and forearm surgery because of its several advantages. It provides complete muscle relaxation, intraoperative haemodynamic stability, effective postoperative analgesia, early ambulation, early resumption of oral feeding andavoids the use of multiple drugs. Thus,the incidence of postoperative cardiovascular, pulmonary, gastrointestinal and thromboembolic complications is decreased[2,3].

Combinations of local anaesthetics have been used in peripheral nerve blocks. Bupivacaine is the most commonly used local anaesthetic because of its prolong duration of action and easy availability in developing countries. Studies have been published emphasizing the use of adjuvants with local anaesthetics to lower the dose of each agent, to improve the quality and duration of anaesthesia and postoperative analgesia, promoting early recovery and discharge[4,5]. Most commonly used opioids aremeperidine, fentanyl and morphine.

Tramadol, a synthetic 4-phenyl-piperidine analog of codeine exerts its centralanalgesic activity through activation of mu-receptor. It also has peripheral local anesthetic properties that led to its use as an additive in peripheral nerve blocks[6].Its addition with bupivacaine in brachial plexus block has been studied in the past suggesting varying results.

In this study, we aimed to compare the onset time of sensory block, motor block, duration time of sensory and motor block andpostoperativetime of first request for analgesia with tramadol as adjuvant to local anaesthetic mixture (bupivacaine+Lignocaine) in axillary plexus block.

METHOD

This randomized study was performed after approval from ethical committee of Teaching Hospital Ghazi Medical College, Dera Ghazi Khan, from January 2015 to June 2015. Sample size was calculated using data of previous study keeping alpha at 0.05 and power of study 80%. 60 patients,aged 18-60 years of ASA I and II, scheduled for surgery of

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forearm or hand were recruited after written informed consent.Patients giving history of psychiatric illness, renal or hepatic disease,neurological disease, anticoagulants, allergy to study drugs were excluded.

Two groups of 30 patients in each were made using random number table.Group I (Bupivacaine+Lignocaine-Tramadol) received 32ml of study drug mixture [20ml 0.5% bupivacaine +10ml xylocaine with 1:200,000 adrenaline+ 2ml Tramadol(100mg)].Group II (Control) (Bupivacaine+Lignocaine-saline) received 32 ml of drug mixture [20ml 0.5%bupivacaine+10ml xylocaine with 1:200,000 adrenaline+2ml saline]Xylocaine with 1:200,000 adrenaline was added to bupivacaine for a quick onset and detection of intravascular injection.

In the operation theatre, monitors were applied to record the heart rate, blood pressure and oxygen saturation. An intravenous line with 18G cannula was taken on the opposite hand and patient was given 0.03mg midazolam to relieve anxiety. A standard transarterial technique of axillary block was applied in all cases (arm abducted, supine, forearm flexed, externally rotated). After aseptic measures and infiltration of 1ml plain xylocaine subcutaneously, the axillary pulse was palpated. A 22G needle was inserted keeping negative pressure and was passed posterior to artery where 13 ml of the drug was injected.The needle was withdrawn keeping negative pressure and injection of study drug (13 ml),anterior to the artery was administered.The needle was then directed superiorly and proximally to pierce coracobrachialis muscle and 8 ml of drug was injected in a field block manner to block the musculocutaneous nerve.

After injection, patients were assessed for onset of sensory block using pinprick and graded as follows: 1=No block (sharp sensation), 2=partial block (blunt sensation), 3=Complete block (No sensation)[7].

Modified Bromage scale (0=no motion, 1= finger movement, 2=wrist flexion, 3=elbow flexion) was used to evaluate the time of onset of motor block[8].

The degree of pain was assessed by Verbal rating scale (VRS) on a 5 point rating. Patients with VRS of 2 were given 0.5mg/kg nalbuphine intravenously. General anesthesia was induced to patients with VRS of more than 2.Additional adverse events such as bradycardia, dizziness, nausea and vomiting were also recorded. The postoperative pain was recorded at 1,2,4,6,8,12,and 24 hours and time of first request for rescue analgesia was noted.

Demographic data was expressed as mean±SD. Data was analysedusing SPSS 15. The time of onset, duration of motor and sensory blockand postoperativefirst analgesic requirement time were compared by Independent sample t-test. Qualitative variables were analysed by Chi square. $P<0.05$ was taken as significant.

RESULTS

Patients were similar in age and weight.Sex is expressed as Male/female ratio(Table1). Group I (Bupivacaine+Lignocaine+Tramadol) showed early onset of sensory block (16.20±0.96min) than Group II (17.3±1.49 min) (p=0.001). The onset of motor block also showed significant difference between the two groups. (p=0.01) In group I motor block occurred earlier than group II (22.83±8.1min vs 28.5±8.6min)(p=0.01).Sensory blockduration was prolongedin group I (6.9±0.76 hours) as compared to group II (4.7±1.07hours).This difference was significant(p=0.000).In group I, increase in duration of motor block was seen(6.5±0.73 hours) as compared to group II (4.5±0.98 hours) (p=0.000)(Table 2).

In group I,95% of patients achieveda successful block. Only two were given injection nalbuphine as they complained of mild discomfort at bone manipulation.General anesthesia had to be given to 4 (10%) patients in group II due to failure of block. The mean time of first request for rescue analgesia was noted. It was significantly prolonged in group I (6.7±4.3 hours) as compared to group II (5.02±1.2 hours) (p=0.04)(Table 2). In group I, 5 patients (16%) did not require any analgesia postoperatively. No adverse events were reported in either group except one patient complained of nausea in group I.

Table 1.Demographic Data.Mean±SD

	Group I	**Group II**
Age (yrs)	34.87±13.9	34.87±9.9
Weight (kg)	72±5.8	76±4.6
Male/female	19/11	25/5

Table 2.Characteristics of Block. Mean ±SD

	Group I	**Group II**	**P value**
Onset of sensory block (min)	16.20±0.96	17.3±1.49	0.001
Duration of sensory block (hours)	6.9±0.76	4.7±1.07	0.000
Onset of motor block (min)	22.83±8.1	28.5±8.6	0.01
Duration of motor block (hours)	6.5±0.73	4.5±0.98	0.000
Rescue Analgesia Time (hours)	6.7±4.3	5.02±1.2	0.04

DISCUSSION

In recent years the administration of peripheral nerve blocks has increased in our clinical institution. Axillary brachial plexus block is ideal for surgical anaesthesiaof handandforearm. It not onlyprovides

an adequate block with minimum discomfort and complications but also gives a wide margin of safety.[1,7] Bupivacaine, the most frequently used, when administered alone provides a short duration of postoperative analgesia.[9] Various additves have been used with local anaesthetics such as opioids, midazolam, dexamethasone, clonidine, magnesium and dexmedetomedine.

In this study tramadol was used as adjuvant with bupivacaine-lignocaine mixture because of its two effects; 1) It does not cause respiratory depression like other opioids.2) It enhances the effect of block by inhibiting the reuptake of serotonin at nerve endings[10].

The results of our study showed significant difference in the onset of sensory block (p=0.000) and motor block (p=0.01). No anaesthetic effect was seen in 4 patients of group II and General anaesthesia had to be given. This failure to achieve the block could be due to anatomical variation of brachial plexus. Injection nalbuphineadministered to two patients in group I could be because of difference in pain perception and anxiousness. In group I, only one patient complained of nausea that corrected on its own and antiemeticwas not given.

The results of earlier studies using tramadol as adjuvant to local anaesthetic in brachial plexus block have shown comparable results. Nagpal et al demonstrated that the onset time of sensory and motor block was significantly early in tramadol-bupivacaine mixture as compared to bupivacaine alone when given in supraclavicular plexus block. The mean time of duration for rescue analgesia was prolonged in tramadol-bupivacaine mixture[11].

Ahmet et al also found significant difference in the onset time of motorand sensory block and prolonged analgesia time with combination of tramadol &ropivacaine vsropivacaine alone.No adverse effects were reported with combination of tramadol[8].

Likewise, Suresh C et al assessed the efficacy of tramadol as adjuvant to bupivacaine (0.25%) in supraclavicular approach. They found thedifference significant in time of onset and duration of sensory block and requirement for rescue analgesia in the first 24 hours postoperatively[12].

The parameters evaluated byChatopadhyay et al. in use of tramadol (100mg) as adjuvant to bupivacaine (0.25%) were similar to our study. Their results were comparable to our study results and showed a quick onset in sensory and motor block and also enhancedanalgesia postoperatively[13].

Geze et al compared the addition offentanyl and tramadol to local anaesthetic mixture in axillary brachial plexus block and found tramadol to be superior in providing better quality of block and postoperative analgesia in upper limb surgery[14].

Limited number ofstudies are available in contrast to the results of our study.Kesimci et al. did not observe an improvement in speed of onset or an increase in duration of block with addition of tramadol (100 mg) to ropivacaine (40 ml).The reason could be due to difference in localanaesthetic used[15].

The difference in onset and duration of motorand sensory block was not significant whenDikmen et al added tramadol to ropivacaine in axillary block in uraemic patients. Thisdifference from results of our study could be because of acidosis and hyperdynamic circulatory status of patients with chronic renal failure[16].

Adequate pain control and patient comfort is a significant concern. The success of effective anaesthesia and optimal analgesia with tramadol-bupivacaine combinationin our patients provided early ambulation and thus early discharge.Limitation of our study was non-availability of nerve stimulator in our institution. Though we measured the first request for analgesia time, we did not measure plasma levels of tramadol. Further studies can be done to evaluate the plasma levels and also use tramadol with different combinations in catheter placement for continuous analgesia with help of nerve stimulator.

In conclusion, tramadol provides good anaesthesia and analgesia in combination with bupivacaine when used in peripheral nerve blocks.

Acknowledgement: We are grateful to the Department of Orthopaedics, Ghazi Khan Medical College for assisting us in this study. Our thanks to Dr. NailaAsad who assisted in the statistical analysis.

REFERENCES

1. SatapathyAR, David M. Axillary Brachial Plexus Block.Anesthesiol Res Pract2011; 2011: 173796.
2. Shaikh SI, Veena K. Midazolam as an adjuvant in supraclavicular brachial plexus block.Anaesth Pain & Intensive Care 2012;16(1):7-11.
3. Rathod H, Parikh H, Upadhayaya RM. Comparative study of 0.375% bupivacaine and 0.375% ropivacaine in brachial plexus block via supraclavicular approach. IJBR 2015; 6(02):77-82.
4. Lee HY, Kim SH, Yung So K, and Kim DJ. Effects of interscalene brachial plexus blockto intra-operative hemodynamics and postoperative pain for arthroscopic shoulder surgery. Korean J Anesthesiol. 2012; 62(1): 30–34.
5. Chakraborty S, ChakrabartiJ,Mandal MC, Hazra A, Das S. Effect of clonidine as adjuvant in bupivacaine-induced supraclavicular brachial plexus block: A randomized controlled trial. Indian J Pharmacol. 2010; 42(2): 74–77.
6. Robaux S, Blunt C, Viel E, Cuvillon P, Nouguier P, Dautel G, Soileau S, Girard F, Bouaziz H. Tramadol

added to 1.5% mepivacaine for axillary brachial plexus block improves postoperative analgesia dose-dependently. A &A 2004; 98(4):1172-1177.
7. JaiswalR, Bansal T, Mehta S, Ahlawat G.A study to evaluate the effect of adding clonidine to ropivacaine for axillary plexus blockade.Asian J Pharm Clin Res 2013; 6(3):165-168.
8. Senel AC,Ukinc O, Timurkaynak A. Does the addition of tramadol and ketamine to ropivacaine prolong the axillary brachial plexus block? Biomed Res Int 2014;2014:686287.
9. Laiq N, Khan MN, Arif M, Khan S. Midazolam with bupivacaine for improving analgesia quality in brachial plexus block for upper limb surgeries. JCPSP 2008;18(11):674-678.
10. Sherestha BR, Maharjan SK, Sherestha S, Gautum B, Thapa C, Thapa PB, et al. Comparative study between tramadol and dexamethasone as an admixture to bupivacaine in supraclavicular brachial plexus block. J Nepal Med Assoc 2007;46(168):158-64.
11. Nagpal V, Rana S, Singh J, Chaudhary SK. Comparative study of systemically and perineurally administered tramadol as an adjunct for supraclavicular brachial plexus block.JAnaesthesiolClinPharmacol. 2015; 31(2): 191–195.
12. Suresh C, Rajlaxmi V. Clinical comparison between 0.25% bupivacaine and bupivacaine 0.25% and tramadol (2mg/kg) in brachial plexus block by supraclavicular approach. JEBMH 2015;2(23): 3445-57.
13. Chatopadhyay S, Mitra LG, Biswas BN, Majumder P. Tramadol as an adjuvant for brachial plexus block. J AnaesthClinPharmacol.2007;23:187–9.
14. Geze S, Ulusoy H, Engin E, Cekic B, Arduc C. Comparison of Local Anesthetic Mixtures with Tramadol or Fentanyl for Axillary Plexus Block in Orthopaedic Upper Extremity Surgery. Eur J Gen Med 2012;9(2):118-123.
15. Kesimci E, Izdes S, Gozdemir M, Kanbak O. Tramadol does not prolong the effect of ropivacaine 7.5 mg/ml for axillary brachial plexus block. ActaAnaesthesiologicaScandinavica. 2007;51(6):736–741.
16. Dikmen B, Gamli M, Horasanli E, Örnek D, Pekel M, Selçuk A. The effects of adding tramadol to ropivacaine on axillary brachial plexus blockade in uremic patients. Turk J Med Sci 2009; 39 (5):733-739.