Original Article

Indian Journal of Anesthesia and Analgesia
2017, 4 (4, Part-II), 1110-1114
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.4417.31

Comparison of Tramadol and Butorphanol as Adjuncts to Lignocaine for Intravenous Regional Anaesthesia for Upper Limb Surgeries

Kaur Jasleen[1], Jagdev Jagjit Singh[2], Kirti Rishi[3], Sachin Arora[4]

[1]Associate Professor [3]Senior Resident [4]Junior Resident, Department of Anaesthesiology and Critical care, MMIMSR, Mullana, Ambala, Haryana 133207, India. [2]Senior Resident, Department of Anaesthesiology and Critical Care, Govt. Medical College, Patiala, Punjab 147001, India.

Abstract

Background: The use of adjuncts with local anaesthetics improve the quality of sensory block and prolong the postoperative analgesia in Intravenous Regional Anaesthesia (IVRA). *Material and Methods:* Ninety adult American Society of Anaesthesiologists (ASA) I and II patients in the age group of 20-50 years scheduled to undergo upper limb surgery were randomly divided into three groups (n=30). Group LT received lignocaine 3mg/kg with tramadol 50 mg; Group LB patients received lignocaine 3mg/kg with butorphanol 1mg and Group L received lignocaine 3mg/kg alone. Double tourniquet technique was used. Hemodynamic changes, onset of sensory block, need for analgesic supplement, time to first rescue analgesic requirement in the post-operative period and adverse effects were compared in the three groups. *Stastical Analysis* was performed using Chi-square test and students unpaired t-test. *Results:* The mean time of onset of analgesia was 3.35±1.24 min in Group LT, 3.5±2.4 min in Group LB and 5.5±1.23 min in Group L. Analgesic supplementation was required in 10%, 13.33% and 16.67% patients in Group LT, Group LB and Group L respectively. The mean time to first postoperative analgesic requirement was 282.5±9.84 min in Group LT, 184.50±9.25 min in Group LB and 124.5±14.25 min in Group L. *Conclusion:* The addition of tramadol or butorphanol to lignocaine in IVRA enhances the onset of sensory block, improves the quality of the block and provides prolonged postoperative pain relief with minimal adverse effects as compared to lignocaine alone.

Keywords: Butorphanol; Intravenous Regional Anaesthesia; Lignocaine; Tramadol; Upper Limb Surgeries.

Introduction

IVRA has evolved over the years as a simple, reliable and cost-effective technique for providing anaesthesia for forearm and hand surgeries. An additional advantage of this technique is a bloodless field during the surgery [1,2]. Certain undesirable characteristics of IVRA include slow-onset, tourniquet pain, time limitation, poor muscle relaxation, risk of local anaesthetic toxicity and minimal post-operative pain relief [3]. Various adjuncts like opioids, NSAIDS, dexmedetomidine, magnesium, muscle relaxants, neostigmine, etc. have been used with lignocaine to overcome these limitations.

Tramadol is a synthetic opioid with a double mechanism of action. It has a central analgesic effect with weak μ-receptor agonism. It also exerts a local anaesthetic effect by blocking Na^+ channels at the peripheral nerve endings and interferes with noradrenaline reuptake [4]. Unlike other opioids, tramadol has low abuse potential and minimal side effects. Butorphanol is also a synthetic mixed agonist-antagonist opiate. It exerts weak μ-receptor agonist and antagonist activity and strong k-receptor agonism [5]. Butorphanol provides strong analgesia and sedation without respiratory depression [6]. Like tramadol, it has low abuse potential. Tramadol has been widely used as an adjunct to lignocaine in IVRA but there is paucity

Corresponding Author: Jagdev Jagjit Singh, Senior Resident, Department of Anaesthesiology and Critical Care, Govt. Medical College, Patiala, Punjab 147001, India.
E-mail: jagjitjagdev@yahoo.com

Received on 15.07.2017, **Accepted on** 09.08.2017

of literature on the use of butorphanol. We proposed to compare tramadol and butorphanol with lignocaine in IVRA for upper limb surgeries.

Material and Methods

An approval from the hospital ethics committee and a written informed consent from the patients was obtained before enrolling the patients into the study. Ninety adult ASA I or II patients in the age group of 20-50 years scheduled for forearm and hand surgery were randomized into three groups (n=30) by a computer generated randomization table. Group LT patients received lignocaine 3mg/kg with 50 mg tramadol. Patients in Group LB received lignocaine 3mg/kg with 1 mg butorphanol. Group L patients received lignocaine 3mg/kg alone. In all the three groups, the drugs were diluted with normal saline to make a total volume of 40 ml. Both the patient and the anaesthesiologist administering the block and observing the patient were kept blind to the drug solutions, which were prepared by resident anaesthesiologists. Exclusion criteria included history of Raynaud's disease, sickle cell-anaemia or allergy to the study drugs.

Pre-anaesthetic evaluation was done prior to the surgery and all patients were familiarized with Visual Analogue Scale (VAS) for pain. Patients were kept fasting overnight. Tablet ranitidine 150 mg and tablet alprazolam 0.25 mg in the night and 2h prior to the surgery were prescribed as premedicants to all the patients. After arrival in the operation theatre, a multichannel monitor was connected to the patient and baseline Heart Rate (HR), mean arterial pressure (MAP), respiratory rate (RR) and oxygen saturation (SpO_2) recorded. Two intravenous cannulas, one on the dorsal aspect of the hand that would undergo surgery and the other in the opposite hand for intravenous fluid administration were secured. The standard double tourniquet technique for IVRA was used. The onset of sensory block was assessed by pin-prick method with a 23G hypodermic needle over skin of the forearm or hand every 30 seconds after injection of the study drugs. Hemodynamic parameters were continuously observed and recorded at regular intervals. A fall in blood pressure > 25% of the baseline was considered as hypotension and treated with intravenous fluids and injection ephedrine. Heart Rate <50 bpm was taken as bradycardia and treated with injection atropine 0.6 mg intravenously. Intraoperatively, need for supplement analgesia was assessed using VAS. Fentanyl 1mcg/kg was administered when was ≥ 3. The tourniquet was not deflated before 30 min and was kept inflated for a maximum of 60 min after the injection of drug solution. Any adverse effects like nausea, vomiting, shivering and respiratory depression were observed, treated and recorded. In the postoperative period, pain was again assessed using VAS. Injection diclofenac sodium 75 mg was given intramuscularly to the patient when VAS was ≥ 4 and the time noted. Statistical analysis was performed using Chi-Square test and student unpaired t-test. P value <0.05 was considered as significant and <0.001 as highly significant.

Results

Demographic profile of the patients is described in Table 1. All the three groups were comparable. Baseline hemodynamic parameters including HR, MAP, RR and SpO_2 were also comparable. Patients

Table 1: Demographic data

Parameters	Group LT	Group LB	Group L
Age (years)	33.33±9.73	31.73±8.61	31.90±6.66
Gender Male/Female	22/8	25/5	23/7
Weight (kg)	58.80±7.47	57.26±4.27	57.56±4.18
Duration of surgery (min)	55.33±7.18	55.00±7.07	56.66±5.30
ASA (I/II)	20/10	22/8	21/9

Data expressed as mean± Standard deviation; LT-lignocaine + tramadol; LB- lignocaine+butorphanol; L-lignocaine

Table 2: Block Characteristics

Parameters	Group LT	Group LB	Group L
Onset of sensory block (min)	3.35±1.24	3.5±2.4	5.5±1.23
Supplement analgesic required (%age of patients)	10	13.33	16.67
Time to first rescue analgesia(min)	282.5±9.84	184.5±9.25	124±14.68

Data expressed as mean± Standard deviation; LT-lignocaine + tramadol;
LB- lignocaine+ butorphanol; L-lignocaine

in all the three groups remained hemodynamically stable and there was no statistically significant difference in the hemodynamic changes in the three groups throughout the surgery. None of the patients had hypotension or bradycardia.

A significant difference was observed in the time of onset of sensory block among the three groups. Onset of sensory block was significantly earlier in Groups LT and LB as compared to Group L. Requirement for supplement analgesics intraoperatively was comparable in the three groups. The demand for the first rescue analgesic was delayed with the addition of tramadol and butorphanol. On statistical analysis, this difference was highly significant ($P < 0.001$) between Group LT and L and significant ($P < 0.05$) between Group LB and Group L (Table 2). Nausea and vomiting were observed in 3 patients in Group LT and 1 patient in Group LB. They were treated with injection ondansetron 4 mg intravenously.

Discussion

Intravenous regional anaesthesia is an easy, reliable and cost-effective technique of anaesthesia in the modern era of day care surgery [7,8]. It is especially useful for emergency trauma cases which are ill prepared for general anaesthesia. To improve the quality of sensory block and prolong the postoperative analgesia, various adjuncts such as α_2 agonists [9], midazolam [10], dexamethasone [11], diltiazem [12], lornoxicam [13,14], magnesium [15], nitroglycerin [16] and ketamine [17] have been tried in different clinical trials. We compared the effects of addition of tramadol and butorphanol to lignocaine for IVRA.

In our study, demographic characteristics including age, gender, weight, ASA physical status and duration of surgery were comparable in all the three groups. Hemodynamic parameters were comparable at baseline and after the block. No patient had hypotension or bradycardia. The onset time of sensory block was shorter in the groups that received tramadol or butorphanol as compared to lignocaine alone. The mean time of onset of sensory block was 3.35±1.24 min in Group LT, 3.5±2.4 min in Group LB and 5.5±1.23 min in Group L, which is consistent with various other studies.

Youssef and Elzayyat [18] compared nalbuphine and tramadol in IVRA and observed faster onset of sensory block at 3.7±1.14 min with lignocaine + tramadol and 4.8±1.15 min with lignocaine alone. In their study using tramadol and lignocaine, Subhedar et al [19] reported an average onset time of sensory block at 3.52 min with tramadol + lignocaine and 5.6 min with lignocaine alone. Siddiqui et al [20] found onset of sensory block at 5.20±1.2 min with tramadol + lignocaine and 7.6±1.4 min with lignocaine alone in IVRA. Chakole et al [21] also compared tramadol as an additive to lignocaine for IVRA with control and reported significantly faster onset of sensory block in tramadol group. Bansal et al [22] used butorphanol as an adjunct to lignocaine for IVRA. They found onset of sensory block at 3.88±2.34min with 1mg butorphanol+lignocaine and 5.05±2.10 min with lignocaine alone.

There was no statistically significant difference in the number of patients requiring analgesic supplementation intraoperatively among the three groups. Three patients in Group LT, 4 patients in Group LB and 5patients in Group L were administered fentanyl 1mcg/kg when VAS $\geq$ 3 intraoperatively. Siddiqui et al [20] found enhanced perioperative analgesia and better tourniquet tolerance with the addition of tramadol. Alaryut et al [23] compared tramadol, sufentanil and clonidine in IVRA and observed reduced intraoperative use of analgesic supplements similar to our study.

We found prolongation of postoperative analgesia with the addition of tramadol and butorphanol in our study. The demand to first rescue analgesic was at 282.50±9.84 min in Group LT, 184.50±9.25 in Group LB and 124±14.60 min in Group L. Youssef and Elzayyat [18] also found prolongation of analgesia with the addition of tramadol as compared to control (248 ±9.88 min vs 126.5±13.48 min), similar to our study. Subhedar et al [19] found average time for demand of first rescue analgesia at 5h 28 min with tramadol +lignocaine and 2h 7 min with lignocaine alone. Ramaiah [24] compared butorphanol and parecoxib as adjuncts in IVRA and found prolonged postoperative analgesia with butorphanol as compared to control(129.75±158.70 vs 47.25±52.68). Bansal et al [22] observed mean time to first rescue analgesia at 169.50±99.25 min in butorphanol group as compared to 73.63±61.32 min in the control group. Prolonged postoperative analgesia with the addition of tramadol and butorphanol could be explained to systemic absorption of the drugs after the release of tourniquet and their action on the opioid receptors.

The incidence of adverse effects was comparable in the three groups. Three patients in LT group and 1 patient in LB group had nausea/vomiting postoperatively and were treated with injection

ondansetron 4mg intravenously. Dubey et al [4] compared tramadoland fentanyl for IVRA. They observed nausea/vomiting in 2 patients in the tramadol group, similar to our study.

Conclusion

The addition of tramadol or butorphanol for IVRA significantly enhances the onset of sensory block, improves the quality of block and prolong the postoperative analgesia. Tramadol is comparable to butorphanol in terms of onset of sensory block but provides longer duration of postoperative analgesia as compared to butorphanol.

Key messages

The addition of adjuncts to local anaesthetics improve the quality of intravenous regional anaesthesia.

References

1. Lillie PE, Glynn CJ, Fenwick DG. Site of action of intravenous regional anesthesia. Anethesiology 1984;61:507-10.
2. Reuben SS, Steinberg RB, Maciolek H, Manikantan P. An evaluation of the analgesic efficacy of intravenous regional anesthesiawith lidocaine and ketorolac using a forearm versus upper arm tourniquet. Anesth Analg 2002;95:457-60.
3. Muhammad A, Muhammad A. To compare the analgesic effect of combination of 0.5% lignocaine plus Ketorolac in IVRA technique with those of lignocaine 0.5% alone to prevent postoperative pain. Professional Med J 2012;19:710-4.
4. Dubey K, Paddalwar S, Chandak A. A comparative double blind study of tramadol and fentanyl as adjuncts to lignocaine for intravenous regional anesthesia for forearm orthopaedic surgeries. Indian J Pain 2014;28:29-35.
5. Hunt CO, Naulty JS, Malinow AM, Datta S, Ostheimer GW. Epidural butorphanol-bupivacaine for analgesia during labor and delivery. Anesth Analg 1989;68:323-7.
6. Kaur J, Bajwa SS. Comparison of epidural butorphanol and fentanyl as adjuvants in the lower abdominal surgery: A randomized clinical study. Saudi J Anaesth 2014;8:167-71.
7. Coleman MM, Peng PW, Regan JM, Chan VW, Hendler AL. Quantitative comparison of leakage under the tourniquet in forearm versus conventional intravenous regional anesthsia. Anesth Analg. 1999;89:1482-6.
8. Chilvers CR, Kinahan A, Vaghadia H, Merrick PM. Pharmaco-economics of intravenous regional anaesthesia vs general anaesthesia for outpatient hand surgery. Can J Anaesth. 1997;44:1152-6.
9. Memis D, Turan A, Karamanlioglu B, Pamukcu Z, Kurt I. Adding dexmedetomidine to lidocaine for intravenous regional anaesthesia. Anesth Analg. 2004; 98(3):835-40.
10. Kashefi P, Montazeri K, Honarmand A, Safavi M, Hosseini HM. The analgesic effect of midazolam when added to lidocaine in intravenous regional anaesthesia. Journal of Research in Medical Sceinces 2011;16(9):1139-48.
11. Bigat Z, Boztug N, Hadimioglu N, Cete N, Coskunfirat N, Ertok E. Does dexamethasone improve the quality of intravenous regional anesthesia and analgesia? A randomized controlled clinical study. Anesth Analg. 2006;102(2):605-9.
12. Khanna P, Mohan VK, Sunder RA. Efficacy of diltiazem as an adjunct to lignocaine in intravenous regional anaesthesia.Saudi J Anaesth 2013;7(3): 305-9.
13. Sen S, Ugur B, Aydin ON, Ogurlu M, Gezer E, Savk O. The analgesic effect of lornoxicam when added to lidocaine for intravenous regional anaesthesia. Br J Anaesth 2006;97(3):408-13.
14. Sertoz N, Kacaoglu N, Ayanoglu HO. Comparison of lornoxicam and fentanyl when added to lidocaine in intravenous regional anaesthesia. Braz J Anesthesiol 2013;63(4):311-6.
15. Turan A, Memis D, Karamanlioglu B, Guler T, Paukcu Z. Intravenous regional anaesthesia using lidocaine and magnesium. Anesth Analg . 2005;100(4):1189-92.
16. Sen S, Ugur B, Aydin ON, Ogurlu M, Gezer E, Savk O. The analgesic effect of nitroglycerin added to lidocaine on intravenous regional anaesthesia. Anesth Analg. 2006;102(3):916-20.
17. Viscomi CM, Friend A, Parker C, Murphy T , Yarnell M. Ketamine as an adjunct to lidocaine intravenous regional anaesthesia: a randomized, double-blind, systemic control trial. Reg Anesth Pain Med 2009;34(2):130-3.
18. Youssef MMI, ElZayyat NS. Lidocaine – nalbuphine versus lidocaine – tramadol for intravenous regional anaesthesia. Ain-Shams J Anesthesiol 2014;07:198-204.
19. Rajesh Subhedar, Sandeep Patel, Vishal V. Ambre, Preeti V. Jadhav, Harshad Zambare. Study of onjection Tramadol as Additive in Intravenous Regional Anethesia. Journal of Evolution of Medical and Dental Sceinces 2015;4(85)14863-68.
20. Siddiqui AK, Mowafi HA, Al- Ghamdi A, Ismail SA, AbuZeid HA. Tramadol as an adjuvant to intravenous regional anaesthesia with lignicaine. Saudi Med J 2008;29:1151-5.
21. Chakole V, Dixit R, Tadwalkar G. Effect of tramadol on postoperative analgesia when added to lidocaine

in IVRA (Biers Block) For Upper Arm Orthopaedic Surgeries. J Evol Med Sci 2012;1:335.

22. Bansal A, Gupta S, Sood d, Kathuria S, Tewati A. Bier's block using lignocaine and butorphanol. J Anaesthesiol Clin Pharmacol. 2011;27(4):465-9.
23. Alaryut S, Memis D, Pamukcu Z. The addition of sufentanil, tramadol or clonidine to lidocaine for intravenous regional anesthesia. Anaesth Intensive Care 2004;32:22-7.
24. Ramaiah VK, Trikha A, Mohan V, Saksena R. Comparison of Parecoxib and Butorphanol as Adjuvannt to Lidocaine in Intravenous Regional Anaesthesia. Anaesthesiology 2006;105:A1129.