

Study of Efficacy of Tramadol as an Adjuvant to Lignocaine in Intravenous Regional Anesthesia at a Tertiary Care Teaching Centre

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ABSTRACT

Introduction: Tramadol is a central analgesic with an opioid agonistic activity with some selectivity for μ -receptors. Several studies showed that tramadol is beneficial as an additive to local anesthetics in different regional nerve blocks including infiltration, caudal block, brachial plexus block and IVRA. However, the existing data on its role as an additive for IVRA are conflicting. Therefore, a prospective, randomized controlled trial was conducted to determine efficacy of Tramadol (100mg) as an intra-operative, post-operative and pre-emptive analgesic as an adjuvant to lignocaine in IVRA.

Materials and Methods: Present study was carried out in 80 patients undergoing upper arm orthopedic surgery at Sharda Hospital, School of Medical Sciences and Research, Sharda University, Greater Noida, Uttar Pradesh, India. All patients selected were planned for forearm surgeries, of ASA Grade I or II, aged 16-60 years. Patients received 0.5% lignocaine 40 ml in one group and we added Tramadol 100 mg in the other group. All the patients were monitored for onset of effect, quality of anesthesia, post op analgesia after deflation of tourniquet, time of first analgesic drug and number of analgesic drug required in first 24 hrs.


Results: Onset of sensory analgesia was significantly earlier in group B (59.7 ± 23.8 sec v/s 196.3 ± 42.7) while onset of motor paralysis was similar in both groups. The post-operative analgesia was significantly longer in group B (304.7 ± 87.9 mins) then group A (12.6 ± 5.1 mins). Accordingly the number of analgesics consumed in post-operative first 24 hours was significantly less in group B (1.2 ± 0.6) then group A (2.9 ± 0.8).

Conclusion: Tramadol has favorable effects as an adjuvant to lignocaine for IVRA. Tramadol substantially shortens the onset of sensory block, improves patient's tolerance of tourniquet, prolongs the duration of analgesia after deflation of tourniquet and reduces the postoperative analgesic consumption.

Key words: Bier's Block, Intra Venous Regional Anesthesia, Tramadol.

INTRODUCTION

Intravenous regional anaesthesia (IVRA) was first described in 1908 for anaesthesia of the hand and forearm by August Karl Gustav Bier.^[1]

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The main advantages of this technique are its simplicity, effectiveness, safety, reliability and ideal for short operative procedures on the extremities. It provides the patients a favorable recovery profile, expedites the post-anesthesia care unit and hospital discharge, thereby, reducing the cost. Its limitations include the slow onset, tourniquet pain and minimal post-operative analgesia. Adjuncts to local anesthetics for IVRA have been proposed to enhance the quality of anesthesia, tourniquet tolerance and postoperative analgesia.^[2,3]

The ideal IVRA solution should have Rapid onset of sensory and motor block with prolonged analgesia after deflation of tourniquet. Different additives have been combined with local anaesthetics (LAs) to improve block quality, prolong post-deflation analgesia and decrease tourniquet pain.^[1,3-5] To achieve this, we evaluated effect of addition of an opioid, Tramadol to lignocaine in IVRA.

Tramadol is a central analgesic with an opioid agonistic activity with some selectivity for μ -receptors.^[6] Also, it inhibits norepinephrine uptake and stimulates serotonin release intrathecally, which are transmitters in the descending pathways which enhance analgesia.^[6,7] Several experimental and clinical studies have shown that tramadol might have a potential peripheral local anesthetic effect.^[8-10] Tsai et al.^[8] demonstrated the blockage of neural conduction by the direct application of tramadol on sciatic nerves of rats. Pang et al.^[9] showed that tramadol significantly reduced propofol injection pain and produces a local anesthetic effect following intradermal injection.^[9,10] Several studies showed that tramadol is beneficial as an additive to local anesthetics in different regional nerve blocks including infiltration, caudal block, brachial plexus block and IVRA.^[11-15] However, the existing data on its role as an additive for IVRA are conflicting.^[14-16] Therefore, we conducted a prospective, randomized controlled trial to determine efficacy of Tramadol (100mg) as an intra-operative, post-operative and pre-emptive analgesic as an adjuvant to lignocaine in IVRA.

MATERIALS AND METHODS

Present study was carried out in 80 patients undergoing upper arm orthopedic surgery at Sharda Hospital, School of Medical Sciences and Research, Sharda University, Greater Noida, Uttar Pradesh, India.

Institutional Ethics Committee approval was taken prior to study. All patients selected were planned for forearm surgeries, of ASA Grade I or II, aged 16-60 years. Patients with known hypersensitivity to local anesthetic agents, Opioids, NSAID drugs or Patients having past or present history of sickle cell disease, peripheral vascular disease, any neurological disease, hemolytic disease or any major systemic disease were excluded from study.

After detailed examination and informed consent, patients were randomly assigned in two groups of forty (40) patients each. Preservative free Lignocaine was used.

Group A: Lignocaine 0.5% 40ml.

Group B: Lignocaine 0.5% 40ml + Tramadol 100mg.

Detailed history and thorough physical examination were carried out and routine laboratory investigations were done. Exanguination was done by using Esmarch Bandage after keeping limb elevated for 3- 5 minutes. Intravenous regional anesthesia (IVRA) was given using double tourniquet technique and using any of the one drug combination. First the upper tourniquet was inflated to 100 mm of Hg above the systolic blood pressure and drug was injected through angiocath on operative limb. After 10 mins, the lower cuff was inflated and the upper cuff was deflated. All patients were pre-medicated with inj. Midazolam 0.05 mg/kg. IV. 10 min. prior to inflation of tourniquet for anxiolysis. After completion of surgery, the tourniquet was deflated by intermittent deflation and reinflation method over a period of 2-3min. In no circumstances, tourniquet was released before 20 minutes

after injection of drug. Hemodynamic monitoring was done continuously throughout procedure and stay in Post Anesthesia Care Unit. Thereafter, patients were followed every 4 hourly in ward. Any patient who had inadequate analgesia or lengthened procedure were converted into general anesthesia and excluded from study. Postoperatively for V.A.S. ≥ 5 , Diclofenac Sodium 3 cc. (75 mg.) IV was given as rescue analgesic. Postoperative nausea vomiting was treated with intravenous Ondansetron 4mg intravenously.^[17]

Parameters Studied were as follows:

1. Onset of sensory analgesia: The time taken for onset of loss of pain sensation by pin prick after injection of drug.
2. Onset of motor paralysis: Time from injection of drug to onset of motor paralysis \leq grade II.
3. Intra operative condition:
 - (a) Excellent: Indicated complete loss of touch, position sense, and pain sensation with no sensitivity to pin prick or deep pressure with marked or total paralysis of muscle.
 - (b) Good: Loss of pain, touch and position sense but retained a sensory response to maximum pressure applied to the fingernail.
 - (c) Moderate: anesthesia which was complete in most areas but incomplete in small region (patchy). Mild pain or discomfort during the reduction or during the operative procedure.
 - (d) Poor/Failure: Failure to obtain anesthesia, moderate to marked pain when carrying out the manipulative or surgical procedure or both.
4. Total surgical time
5. Total Tourniquet Time
6. Time to first analgesic: Time between deflation of tourniquet and consumption of first analgesic dose (V.A.S. ≥ 5)
7. Number of analgesics required: Total number of analgesic doses required in first 24 hours after deflation of tourniquet.

RESULTS

Present study was carried out in 80 patients undergoing upper arm orthopedic surgeries. Patients were randomly assigned in two groups of forty (40) patients each.

Group A: Lignocaine 0.5% 40ml.

Group B: Lignocaine 0.5% 40ml + Tramadol 100mg.

Demographically both the groups were comparable. There was no significant difference between duration of surgery and Duration of Tourniquet. Onset of sensory analgesia was significantly earlier in group B (59.7 ± 23.8 sec v/s 196.3 ± 42.7) while onset of motor paralysis was similar in both groups.

The post-operative analgesia was significantly longer in group B (304.7 ± 87.9 mins) then group A (12.6 ± 5.1 mins). Accordingly, the number of analgesics consumed in post-operative first 24 hours was significantly less in group B (1.2 ± 0.6) then group A (2.9 ± 0.8).

Table 1: Observations of present study

Parameters	Group A	Group B
Age in years	37.3	36.5
Sex		
Male	67.5%	77.5%
Female	32.5%	22.5%
Weight in Kg.	56.38	58.24
Duration of Surgery	79.2 ± 17.9	74.8±14.4
Duration of Tourniquet	93.6 ± 16.2	89.4 ± 12.3
Onset of Sensory Analgesia	196.3±42.7	59.7±23.8
Onset of motor paralysis	6.4±4.2	5.8±3.3
Analgesia after deflation of tourniquet	12.6± 5.1	304.7± 87.9
Tourniquet discomfort	3	1
Rash	1	2
PONV	1	1
Analgesics in 24 hrs	2.9±0.8	1.2±0.6

DISCUSSION

In present study, we have tried to determine the efficacy of an opioid, Tramadol to local anesthetic solution of IVRA on the parameters of onset of analgesia, quality of intraoperative analgesia, muscle relaxation, analgesia after deflation of tourniquet and number of analgesics required in first 24 hours.

For present study, we used 40 ml of 0.5% lignocaine solution for both the groups. The choice of lignocaine as the local anesthetic agent and its dose has been suggested by many studies done before to be 3 mg/kg or 30-40 ml of Lignocaine 0.5% solution.^[18,19] In 1983, the American Food and Drug Administration (FDA) specifically contraindicated use of bupivacaine for IVRA following unfortunate incidents of cardiac toxicity followed by use of bupivacaine in IVRA.

Tourniquet-related pain is a main factor limiting the extensive use of IVRA techniques in surgical procedures involving the extremities.^[20] This distress may be caused via multiple factors including neuropathic pain produced by nerve compression stimulation of the nerve endings in the cutaneous tissue, skeletal muscle ischemia and local metabolic changes.^[21-23] Tramadol may be effective in the management of tourniquet pain since it has been successfully used in the treatment of neuropathic pain. In addition, it has been found that it is more effective than morphine in relieving severe ischemic pain in an experimental study on rats.^[24,25] We used double balloon tourniquet, applied on upper 2/3 rd arm. The lower tourniquet was inflated after obtaining the analgesia below the upper tourniquet and then upper tourniquet deflated. The technique of using double balloon tourniquet is very effective in reducing pain due to tourniquet.

Mean time for onset of sensory analgesia for group B to be 59.7±23.8 seconds, while in group A it is significantly more at 196.3±42.7 seconds ($P<0.001$). The mean time for onset of muscle relaxation in group A was 6.4±4.2 minutes while in Group B 5.8±3.3 minutes. There is no significant difference in onset of muscle relaxation in between two groups as is mentioned by other studies in past also.^[26,27]

One of the major limiting factors has been the minimal or no residual post-operative analgesia following IVRA.^[28-30] Many adjuvants have been tried to counter this limitation. Vivek Chakole et al.^[17] used Lignocaine + Tramadol, Sunita Goel et al.^[18] (2002) Lignocaine + Tramadol or

Ketorolac, Reuben et al (1995) Lignocaine with ketorolac^[27], Kulkarni et al^[31] (1993) used Lignocaine + Ketamine + Gallamine and Acalovschi et al^[32] Lignocaine + tramadol. An opioid was considered to be a more acceptable choice because of its good analgesic efficiency. Tramadol is a synthetic opioid analgesic with a unique dual mechanism of action. It exerts agonist properties at opiate receptors and also interferes with neurotransmitter reuptake. We used Tramadol in dose of 100 mg as adjuvant to local anesthetic solution.

No significant post-operative analgesia was found after deflation of tourniquet when only local anesthetic solution was used. Various findings have been noted when different adjuvant were added to IVRA solution.

Sunita Goel et al^[18] (2002) demonstrated that Tramadol assured significantly longer pain free interval of 16.8 ± 9.07 hours ($p<0.05$) while Ketorolac had 12.9 ± 8.48 hours. We found analgesia after deflation of tourniquet significantly longer in group B (304.7 ± 87.9 min.) than group A (12.6 ± 5.1 min.) ($P<0.00001$) Thus, it can be stated that addition of Tramadol to Lignocaine solution for IVRA definitely prolongs duration of analgesia after deflation of tourniquet. Another way to evaluate the post-operative analgesia is total number of analgesics required in first 24 hours after the procedure. In our study the consumption of analgesic was significantly high in group A (2.9 ± 0.8) than group B (1.2 ± 0.6) in first 24 hours. ($P<0.005$) It shows that tramadol has postoperative analgesic effect and also has a property of preemptive analgesia.

Altunkaya et al.^[11] concluded that tramadol 5% has a local anesthetic effect similar to prilocaine 2% when used intradermally for excision of cutaneous lesions. Explanations for the local anesthetic action of tramadol remain unclear. Mert et al.^[33] compared the nerve conduction blockade by tramadol and a local anesthetic and concluded that tramadol has a local anesthetic activity similar to lignocaine.

This technique is less suitable for the lower limb due to the difficulty in venepuncture, especially in the affected limb, difficulty in retaining the tourniquet and higher dose of anesthetic agent required.^[34,35] We selected all orthopedic patients undergoing surgeries in upper limb.

Our results agree with Alayurt et al.^[15] reported that tramadol 100mg added to lidocaine for IVRA shortened the onset of sensory block, enhanced the tourniquet tolerance and extended the intraoperative analgesia similar to sufentanil and clonidine. Also, Acalovschi et al.^[14] found that tramadol 100mg added to lidocaine for IVRA in volunteers resulted in a faster onset time of sensory block.

CONCLUSION

From present study, it can be concluded that tramadol has favorable effects as an adjuvant to lignocaine for IVRA. Tramadol substantially shortens the onset of sensory block, improves patient's tolerance of tourniquet, prolongs the duration of analgesia after deflation of tourniquet and reduces the postoperative analgesic consumption.

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