Original Article

Indian Journal of Anaesthesia and Analgesia
2017, 4 (3, Part-I), 669-672
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.4317.20

Comparative Clinical Study of 0.5% Lignocaine Alone and Combination of 0.25% Lignocaine Withpentazocine and Pancuronium In Intravenous Regional Anaesthesia for Upper Limb Orthopaedic Surgeries

Raghavendra Babu T.[1], Malathi C.N.[2], Gurudatt C.L.[3]

[1]Assistant Professor, [2]Professor, [3]Head of Dept., Department of Anaesthesiology, JSS Medical College and Hospital, Mysuru, Karnataka 570015, India.

Abstract

Background and Objective: Intravenous regional anaesthesia with conventional large dose of local anaestheticis associated with serious systemic toxicity when the tourniquet deflates unexpectedly during the procedure or when it is deflated intentionally at end of surgery. Therefore modifications in IVRA have been done with the use of low dose of local anaesthetic to decrease systemic toxicity and addition of muscle relaxant and opioid to local anaesthetic to get same quality analgesia as high dose local anaesthetic. Hence the present study is carried out to compare the sensory and motor characteristics, cardiovascular and respiratory parameters and side-effects during intra-operative and post-operative period between the patients who received 0.5% lignocaine alone and those who received combination of 40 ml of 0.25% lignocaine with 30 mg pentazocineand 0.5 mg pancuronium in intravenous regional anaesthesia for upper limb orthopaedic surgeries. *Materials and Methods*: Sixty unpremedicated ASA class 1 and 2 patients scheduled for elective upper limb orthopaedic surgeries were randomly allocated to receive IVRA either with 40ml of 0.5% lignocaine alone (Group A, n = 30) or combination of 40 ml of 0.25% lignocaine with 30 mg pentazocineand 0.5 mg pancuronium (Group B, n = 30). The sensory and motor characteristics, cardiovascular & respiratory parameters and side effects were studied during the intra-operative and post-operative period. *Conclusion*: The study indicated that the triple combination of 40 ml of 0.25% lignocaine,30 mg pentazocineand 0.5mg pancuronium produces the same quality of analgesia as 40ml of 0.5% lignocaine in IVRA. But the short delay that was observed in the onset and attainment of complete sensory and motor block in the former group will delay the start of surgery by 10-15 minutes after application of tourniquet. Thus, this modified technique of intravenous regional anaesthesia allows the reduction in the dose of local anaesthetic agent and hence the potential toxicity of the local anaesthetic agent.

Keywords: Intravenous Regionalanaesthesia; Tourniquet; Lignocaine; Pentazocine; Pancuronium.

Introduction

In this fast moving world, the number of road traffic accidentsincreases and so does the number of patients with upper limb trauma coming for various orthopedic surgical procedures. These patients often present a full stomach and, in addition, may have co-existing diseases, which make general anesthesia hazardous. The brachial plexus block can be employed for such upper limb orthopedic surgeries, but it requires technical skill. Furthermore, complications like pneumothorax, inadvertent intravascular injection or injury to nerves may occur. The technique has other problems like time consumption, delayed onset of analgesia and a chance of incomplete analgesia. Thus, a simple and effective technique like intravenous regional anesthesia (IVRA) or Bier's block can be an alternative for upper limb surgeries .

Traditionally, lidocaine is used as 0.5% solution

Corresponding Author: Raghavendra Babu T., 401, Manasa enclave, GSSV Road, Lakshmipuram, Mysuru-570004, Karnataka, India.
E-mail: dr.babu77@gmail.com

Received on 10.04.2017, **Accepted on** 25.04.2017

at the dose of 3 mg.kg-1 in IVRA for effective anesthesia during upper limb surgeries 2. However, at this high dose, life threatening side effects such as convulsions, coma, cardio-respiratory depression and even cardiac arrest can occur due to accidental release of tourniquet during the procedure or deliberaterelease of tourniquet at the end of the procedure. In order to avoid these potential life threatening side effects, many modified techniques of IVRA have been attempted by using a low dose of lidocaine, muscle relaxant and opioid.

Given this background, the present study was carried out to evaluate the usefulness of addition of pentazocine 30mg and pancuronium (0.5 mg) to 0.25% lignocaine and to compare it with 0.5% lignocaine alone in intravenous regional anaesthesia for upper limb orthopaedic surgeries.

Methods

The institutional ethical committee approved the studyand researchers obtained written informed consent from all patients. This study was a randomized, prospective, comparative study. The study population consisted of sixty patients aged between 18 and 60 years belonging to ASA Class 1 and 2 scheduled for elective upper limb orthopedic surgeries. Patients with history of allergy to local anesthetics, highly nervous and uncooperative patients, patients with crush injury, open wounds, infection and cellulitis of the operative limb, patients with history of epilepsy, peripheral arterial disease, sickle cell disease, arteriovenous malformation and pregnancy were excluded from this study. Patients were randomly allocated into two groups of thirty each.

Group A (n =30): received 40 ml of 0.5% lignocaine alone.

Group B (n =30): received combination 40 ml of 0.25% lignocaine with 30 mg pentazocineand 0.5mg pancuronium.

A thorough preoperative evaluation was done and the patients were kept nil per oral overnight. We explained the procedure to ensure good cooperation. To the extent possible, we chose cases where the surgery was expected to be over before the maximum tourniquet time of the upper limb (lower than 90 minutes). None of the patients in this study received any premedication.

The patients were placed in supine position with due comforts on a tilt able operative table. The intravenous line was secured on the non-operating upper limb with 20 gauge intravenous cannula for infusion of intravenous fluids. The patients were connected to standard monitors that included continuous E.C.G, pulse oximetry, non-invasive blood pressure monitor. The baseline values were recorded. All the necessary equipments and emergency drugs were kept ready for resuscitation, in order to cope with any toxic and untoward reactions occurring during the procedure.

The venipuncture was done with 20-gauge intravenous cannula in the operative limb. After venipuncture, we performed exsanguination of the operative limb by elevating the limb above the body for two to three minutes and applied an Esmarch's bandage starting from the tip of the fingers till the upper arm, where we applied the tourniquet, with due care for the intravenous cannula. We achieved vascular occlusion by application of double pneumatic tourniquet. We noted the time of inflation of proximal tourniquet. Before inflating distal tourniquet, we injected the local anesthetic drug into the operative limb through the 20-gauge intravenous cannula. The drug was injected slowly over 45 seconds to prevent leakage of the drug beyond the tourniquet. We inflated the distal tourniquet 2-3 minutes after the injection of the drug. After the inflation of distal tourniquet, the proximal tourniquet was deflated. We assessed sensory and motor characteristics during the intra-operative and post tourniquet deflation period based on the following scale:

A. *Sensory Loss*: We used a 0-2 scale to assess the sensory loss.

0 = Sharp

1 = Touch only (cannot appreciate pinprick)

2 = Cannot feel touch

B. *Motor Loss:* We used a 0-3 scale to assess motor block.

0 = Ability to move the wrist against resistance

1 = Inability to move the wrist against resistance

2 = Inability to move the wrist and elbow against resistance

3 = Inability to move the arm

The sensory and the motor characteristics were recorded at 1st, 3rd, 5th, 10th, 20th, 30th, 45th and 60th minute after the injection of drug and thereafter till the end of the surgery.

The time at which the patients were unable to appreciate pinprick (that is, sensory loss score scale

1) after the injection of drug was considered as the time of onset of sensory loss and the time at which the patients were unable to appreciate touch (that is, sensory loss score scale 2)after the injection of drug was considered as the time of complete loss of sensation.

The time at which the patients were unable to move the wrist against resistance (that is, motor loss score scale 1) after the injection of drug was considered as the time of onset of motor loss and the time at which the patients were unable to move the arm (that is, motor loss score scale 3)after the injection of drug was considered as the time of complete loss of motor power.

Tourniquet was released, after surgery was over and if surgery was completed within 20 minutes after the injection of drug, the tourniquet was kept for a minimum period of 20 minutes. Before releasing the tourniquet, duration of surgery and tourniquet timewere noted. The duration of surgery was the time noted from the time surgeons started preparing for surgery (that is, painting of the surgical site) to completion of the surgery. The tourniquet time was considered as the time between application of first tourniquet to the release of second tourniquet at the end of surgery. The tourniquet was released slowly.

The sensory and motor characteristics were studied in the post-operative period. The time of return of full sensation (period of post-operative analgesia) and full motor power were noted. The time from the release of second tourniquet to the appearance of a sharp pain at the surgical site was considered as the time of return of full sensation (period of post-operative analgesia). The time from the release of second tourniquet to the time at which patients were able to move the arm against resistance (that is, motor loss score scale 0)13 was considered as the time of return of full motor power.

The patients were observed for changes in pulse rate, blood pressure (systolic and diastolic), respiratory rate, oxygen saturation, E.C.G and any side effects for 30 minutes after release of second tourniquet (that is at 1st, 3rd, 5th, 10th, 20th, 30th minute).

The results of the present study were analyzed for statistical significance using the 'P' value obtained by student 't' test. Differences were considered to be statisticallysignifi cant when P value was < 0.05.

Results

Both groups were statistically comparable with respect to demographic variables like age, sex and weight (Table 1).

The mean tourniquet time was comparable in Groups A and B (54 ± 4 min and 55 ± 3 min, respectively) (Table 2). The mean time of onset of sensory loss in Group B (6.14 ± 0.78 minutes) was significantly longer than in Group A (2.22 ± 0.75 minutes); mean time of complete loss of sensation was significantly longer in Group B (12.25 ± 0.92 minutes) than in Group A (7.12 ± 0.75 minutes) (Table 2). The mean time of onset of motor block in Group B (8.35 ± 1.16 minutes) was longer than in Group A (4.17 ± 0.74 minutes); mean time of complete motor block in Group B (15.65 ± 0.94 minutes) was longer than in Group A (10.57 ± 0.81 minutes) (Table 2). There was no statistically signifi cant difference between two groups with regards to the time of return of full motor power and the time of return of full sensation after deflation of distal tourniquet (Table 2). No side effect

Table 1: Demographic variables

Variables	Group A	Group B	p value
Age (years	35.37	34.7	NS
Male: Female(n)	22:8	23:7	NS
Weight (Kg)	67.67	68.83	NS

n: Number, NS: Not significant.

Table 2: Sensory and motor characteristics

Variables	Group A	Group B	p value
Time of onset of sensory loss (min)	4.21±0.75	8.14± 0.78	<0.05
Time of complete loss of sensation (min)	8.11± 0.83	14.25± 0.99	<0.05
Time of onset of motor block (min)	4.16 ±0.78	11.36 ±1.26	<0.05
Time of complete motor block (min)	14.56± 0.80	24.65± 0.93	<0.05
Time of return of full motor power after release of tourniquet (min)	7.64± 0.82	7.50± 0.80	>0.05 NS
Time of return of full sensation after release of tourniquet (min)	11.93± 1.03	12.23± 0.81	>0.05 NS
Mean duration of surgery (minutes)	43.90± 4.77	43.00± 4.94	>0.05 NS
Mean tourniquet time (minutes)	52.7 ±4.74	52.0± 4.89	>0.05 NS

Values are given as mean ±SD, NS: Not significant.

was reported in the intra-operative period in either of the groups except that tourniquet pain was reported in two patients in Group A and none in Group B, but it was not statistically significant.

There were no significant changes in cardio-respiratory parameters in either group and no significant differences in the incidence of side effects during the intra-op and post-operative periods.

Discussion

In this study, the difference between the two groups regarding the mean time of onset and complete sensory and motor block was statistically significant ($P < 0.05$). However, within fifteen minutes of anesthetic solution injection, there was complete sensory and motor block in both groups. Thus, the quality of anesthesia was comparable in both groups at fifteen minutes after injection of anesthetic solution. This roughly coincides with the usual time of start of surgery, after anesthetizing the patient. A similar study conducted by Sztark et al. where fentanyl was used instead of pentazocine had also shown significant difference in the time of onset and complete sensory and motor block between two groups but there was no difference between the two groups twenty minutes after the injection of anesthetic solution. Abdulla and Fadhil had conducted a study comparing lidocaine (100 mg) alone with a combination of lidocaine (100 mg), fentanyl (50 μg) and combination of lidocaine (100 mg), fentanyl (50 μg) and pancuronium (0.5 mg) in IVRA. They obtained successful analgesia in 100% of the cases with the combination of lidocaine, fentanyl and pancuronium incomparison with only 27% with the combination of lidocaine, fentanyl and only 13% with lidocaine alone 3. In our study, we compared the combination ofpentazocine (30 mg), pancuronium (0.5 mg) and 0.25% lidocaine (100 mg) with the 0.5% lidocaine (200 mg) and noted 100% successful anesthesia in both the groups. This triple combination ofpentazocine (30 mg), 0.5 mg pancuronium and 40 ml of 0.25% lignocaine produces the same quality of analgesia as 40 ml of 0.5% lignocaine alone in IVRA. But the short delay was observed in the onset and attainment of complete sensory and motor block with 0.25% lignocaine, pentazocineand pancuronium group when compared to 0.5% lignocaine group and hence the start of surgery should be delayed for 10-15 minutes after application of tourniquet. Thus, this modified technique of intravenous regional anaesthesia is a simple, better and safe when compared to 0.5% lignocaine alone as an approach to reduce the dose and hence the potential toxicity of the local anaesthetic in IVRA and thereby also fulfilling the criteria of a near ideal IVRA solution

References

1. Bier A-Uebereniennеuenweglokalanasthesie an den gliedmassenzuErzueugen. VerhDtschGesChir. 1908;37: 204-214.
2. Sztark F, Thicoipe M, Favarel-Garrigues JF, Lassie P, Petitjean ME, Dabadie P - The use of 0.25% lidocaine with fentanyl and pancuronium for intravenous regional anesthesia. AnesthAnalg. 1997;84:777-779.
3. Abdulla WY, Fadhil NM - A new approach to intravenous regional anesthesia. AnesthAnalg. 1992;75:597-601.
4. McGlone R, Heyes F, Harris P - The use of a muscle relaxant to supplement local anaesthetics for Bier's blocks. Arch Emerg Med. 1988;5:79-85.
5. Elhakim M, Sadek RA - Addition of atracurium to lidocaine for intravenous regional anaesthesia. ActaAnaesthesiol Scand. 1994;38:542-544.