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Comparative Evaluation of Lignocaine 0.5% and Lignocaine 0.5% with Pethidine for Intravenous Regional Anaesthesia in Upper Limb Surgery

Authors

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Abstract

Introduction: *Intravenous regional anesthesia is particularly useful in the surgery of the extremities, especially in cases with full stomach and as an outpatient technique in orthopedic procedures. The low failure rate, requirement of minimal equipment, minimal hospital stay and expenditure makes IVRA an ideal technique in the hospital setup of a developing country. Several studies using different drugs and their combination have been experimented with. This is to overcome certain limitations of the study like lack of postoperative analgesia and occasional toxic reactions to the drugs used. Among narcotics morphine, fentanyl and pethidine have been used by various researchers as adjuvants. Among these pethidine is known to have peripheral local anesthetic action. Study was undertaken with view to promote IVRA as a safe and cost effective method of anesthesia for extremity procedures, to assess the advantage of adding pethidine to the local anesthetic for IVRA and to assess the incidence of side effects and complications if any related to the above procedure.*

Materials and Methods: *A randomized double blinded study was conducted in which 40 patients were included who were randomly allocated to 2 groups of 20 each to receive either lignocaine alone (Group 1-control group) or lignocaine with pethidine (Group 2- study group) for IVRA. Patients between the ages of 18-50 years scheduled for upper limb surgery were selected.*

Inclusion Criteria: *Only ASA grade 1 and 2 patients were included.*

Exclusion Criteria: *those patients who had high level of anxiety, who had history of allergic response to any drug, hemolytic disease, vascular or neurologic diseases, bleeding disorders, hypertension and diabetes mellites were excluded.*

The grading of analgesia was classified as Grade 1(Excellent-complete loss of sensation to touch, position, pin prick, deep pressure and total paralysis of muscle). Grade 2(Good- mild discomfort but tolerable to patient, deep pressure sensitive, muscle paralysis less than total i.e. Appearing late in procedure). Grade 3(Fair- more discomfort requiring supplements). Grade 4(Poor- requiring conversion to GA for completion of procedure). Tourniquet pain was recorded as present or absent.

The collected data were analyzed using SPSS software. For comparing the differences between the study group and control group student t test was applied. The association between variables were assessed using

Chi squire test. A p value of <0.05 was considered statistically significant.
Results: *The results show that the onset of analgesia was three times quicker in group 2 patients compared to Group 1. Patients in Group 2 had significantly higher quality of anesthesia than Group 1 patients. Patients in Group 2 also had significantly better postoperative analgesia in comparison with Group 1.*
Conclusion: *The addition of pethidine to lignocaine for IVRA significantly improves the quality of block, provides a faster onset of action and prolongs postoperative analgesia effectively.*

Introduction

Intravenous regional anesthesia (IVRA) first used by August Carl Von Bier in 1908 enjoys continuous popularity because of its simplicity, reliability and safety for a variety of procedures in the extremities. It is particularly useful in cases of full stomach and as an outpatient technique in orthopedic procedures. The low failure rate, requirement of minimal equipment, minimal hospital stay and expenditure makes IVRA an ideal technique in the hospital setup of a developing country. Several local anesthetics have been used for IVRA, however because of side effects (eg. Chlorprocaine-venous thrombosis, Prilocaine-methemoglobinaemia, Bupivacaine-cardiotoxicity) Lidocaine is currently the local anaesthetic of choice in a usual concentration of 0.5% with volumes 30-40 ml for upper extremities and 40-50 ml for lower extremities.

To overcome the limitations of IVRA over the years, many drugs including low dose neuromuscular blockers, alpha 2 agonists, narcotics and so forth have been added to the local anaesthetics to improve anaesthesia. Among these, Pethidine is known to have peripheral local anaesthetic action.

In our study we have used a combination of pethidine with lignocaine to produce a balanced effect.

The objectives of our study were to compare the effect of lignocaine 0.5% alone and lignocaine 0.5% with pethidine and to promote IVRA as a safe and low cost-effective method of anaesthesia for upper extremity procedures in our hospital

Methodology

This randomized double blinded study was conducted after obtaining Ethics Committee approval. The study included 40 patients in the age groups of 16-50 years belonging to ASA PS 1&2 scheduled for upper limb surgeries. Patients who had high level of anxiety, drug allergy, hemolytic disease, vascular or neurologic diseases, bleeding disorders, hypertension and diabetes mellites were excluded from the study. These patients were randomized into 2 groups in which, Group I which comprised of 20 patients received lignocaine 0.5% 40 ml and Group 2 which comprised of 20 patients received lignocaine 0.5% 40 ml and 1.5mg/kg pethidine with a total volume of 40 ml respectively.

All the patients were premedicated with 0.1mg/kg of oral diazepam. After explaining the procedure and obtaining informed consent patients were postioned as per the requirement of surgery. After attaching Standard ASA monitors a vein on the dorsum of the hand to be operated was canulated with a 20 gauge intravenous cannula. The cannula was flushed with normal saline and secured. An intravenous line was started in the opposite side for administering fluids and emergency drugs. Exsanguination was done wherever possible using Esmarch rubber bandage. If the arm was too painful the arm was elevated for a minute with brachial artery compression before inflating the tourniquet. After proper exsanguination, the proximal tourniquet was inflated to 100- 150 mm Hg above the arterial pressure of the patient and absence of radial pulse was ensured. Patients in

group 1 were given lignocaine 0.5% 40 ml and Group 2 patients received lignocaine 0.5% 40 ml and 1.5mg/kg pethidine with a total volume of 40 ml. Drug was taken in a 20 ml syringe and injected through the cannula over 1 minute. After injection the cannula was removed and the puncture site sealed.

Onset of analgesia was tested by loss of sensation to pin prick, the subjective sensation of ascending numbness after injection and reduction of pain at the fracture site. Onset of motor blockade was tested by asking the patient to squeeze an infusion bag. The onset was marked as the time the patient was unable to do so.

Grade of analgesia was classified as Grade 1 (Excellent-complete loss of sensation to touch, position, pin prick, deep pressure and total paralysis of muscle). Grade 2 (Good- mild discomfort but tolerable to patient, deep pressure sensitive, muscle paralysis less than total i.e. Appearing late in procedure). Grade 3 (Fair- more discomfort requiring supplements). Grade 4 (Poor- requiring conversion to GA for completion of procedure). Tourniquet pain was recorded as present or absent. The distal tourniquet was inflated and the proximal deflated when the patient complained of pain.

Maximum tourniquet time was 90 minutes and minimum 30 minutes. In all cases the tourniquet was released with cycling ie. deflated 3 times for 10 seconds with 1 minute re inflation before finally deflating the tourniquet.

The patients were observed in the recovery room for 1 hour. At this time pain was checked every minute for the 1st 10 minutes and then every 5 minutes for the next 15 minutes and every 15 minutes for 1 hour. Thereafter pain was reassessed at 4 hours,8 hours, 12 hours and 24 hours. Duration of analgesia was the time elapsed from the onset of block to the 1st dose of analgesic requirement.

The data collected were entered into a master sheet. Necessary statistical tables were constructed. In order to see whether the differences in the control group and study group were statistically significant, the student ‘t’ test was applied. The association between variables were assessed using ‘Chi square’ test. Diagrams and charts were drawn to give due importance to the most salient findings.

Results

There were no significant difference between the two groups with respect to demographic data, anthropometric data and ASA PS status. (Table 1)

In our study, mean onset of analgesia in group I was 2.5 minutes (SD-2.11),and in group II, mean onset of analgesia was 0.85 minutes(SD-1.46), P value 0.007, which is statistically significant. The results show that the onset of analgesia is significantly quicker in group II.($p< 0.01$), ie nearly 3 times quicker.(Table2}

The mean onset of motor blockade in group I was 10.3 minutes (SD-1.71) and in group II it was 4.1 minutes (SD-1.16), P value 0.0 ,which is statistically significant.(Table 3)

15 out of 20 patients in group II had excellent analgesia throughout the surgery, where as in group I, 5 out of 20 patients had excellent analgesia, p-0.003, which is statistically significant.(Table4)

The mean tourniquet time in group I was 58.75 minutes (SD-22.8) and in group II it was 67 minutes (SD-16), p -0.194, ie there is no significant statistical difference. (Table5)

The mean onset time to post operative pain in group I was 5.1 minutes (SD-3.16) and in group II it was 30.25 minutes (SD-12.7), p -0.0, which is statistically significant. It was found that post operative analgesia was significantly longer in

group II. (Table6)

Table 1. Demographic Data

	Group B (n=20)	Group F (n =20)	P Value
Age (years) Mean +/-S.D	34.5 +/-7.5	32.6 +/-6.8	0.409
Sex Male/Female	6/14	6/14	0.634
Weight(Kg) Mean+/-S.D	55.8 +/ -7.5	55.6 +/-6.3	0.946
ASAPS I/II	16/4	17/3	0.500

Table 2. Onset of analgesia

Group	Onset of analgesia (Mts)		t value	p value
	Mean	SD		
I	2.5	2.11	2.871	0.007
II	0.85	1.46		P < 0.01 (s)

Table 3 Onset of motor blockade

Group	Onset of motor blockade (Mts)		t value	p value
	Mean	SD		
I	10.3	1.71	13.347	0.0
II	4.1	1.16		P < 0.01

Table 4 Grade of analgesia

Group	Grade of analgesia							
	I		II		III		IV	
	No	%	No	%	No	%	No	%
I	5	25	12	60	3	15	0	0
II	15	75	4	20	1	5	0	0

Table 5 Tourniquet time.

Group	Tq (Mts)		t value	p value
	Mean	SD		
I	58.75	22.8	-1.324	0.194
II	67.00	16.00		P < 0.05 (NS)

Table 6 Post op analgesia

Group	Post op analgesia (Mts)		t value	p value
	Mean	SD		
I	5.1	3.16	-8.582	0.0
II	30.25	12.7		P < 0.01 (S)

Discussion

In 1908 August Bier described IVRA. The drug he used for the procedure was Procaine. Later on, the drug was replaced by safer amide local anaesthetics. Several studies were conducted using adjuvants to local anaesthetics eg. Tremadol, Ketamine, Ketorolac, Neostigmine and opioids.

Armstrong , Power and Wildsmith added Fentanyl to Prilocaine (0.1mg + 40 ml 0.5%) and found that there was no effect.

In 1992, Pitkanen et al reported using 0.2 mg Fentanyl with Prilocaine producing better analgesia but he didn't recommend this method due to higher incidence of side effects.

Acalovschi and Cristea used Pethedine 100 mg alone for IVRA . The conclusion was Pethedine had local anaesthetic action on the peripheral nerves in vivo, but that its single use for IVRA should be a second choice for patients allergic to local anaesthetics because of the significant side effects associated

The present study was attempted to establish that conventional IVRA may be improved to achieve satisfactory anaesthesia. The two groups were found to be comparable in terms of demographics.

The onset of analgesia and motor blockade was found to be significantly quicker in the Lignocaine + Pethidine group. In group I (Lignocaine), the onset time varied from 0 to 7 minutes (Mean 2.5 ± 1.46(SD)). Similarly onset of motor blockade was also quicker in the Lignocaine + Pethedine group . Thus in group one the mean time to motor blockade was 10.3 ± 1.71 (SD) and group II it was 4.1 ± 1.16 (SD). The quality of analgesia was found to be excellent in 15 out of the 20 patients in group II. Whereas in group I, only 5 among the 20 patients had excellent analgesia. Statistical examination revealed a significant difference between the two groups. These findings can be explained only on the basis of local anaesthetic action by Pethedine on peripheral nerve endings. In vitro studies with Pethedine have shown that the drug is capable of blocking unsheathed A and C fibres (Power I, Brown DT, Wildsmith Jaw 1991). Another possibility is that Pethedine exerted a vasodilatory effect leading to an earlier spread of the group II drug solution.

Postoperative analgesia did not exist in group I whereas in group II the postoperative analgesia was prolonged. The figures were 5.1 ± 3.1 in group I and 30.25 ± 12.7 in group II. The results were found to be stastically significant.

Conclusion

Intravenous Regional Anaesthesia was administered to 40 patients of ASA garde I and II undergoing surgery in the upper extremities in the age group 18 – 50 years, using Lignocaine 0.5% 40 ml or Lignocaine 0.5%40ml + Pethedine 1.5 mg /kg. The results of the study were analysed statistically and it was found that Lignocine + Pethedine group showed faster onset of analgesia, motor blockade and a better quality of analgesia compared to the Lignocaine group. Thus, the conclusion of the study is that addition of Pethedine to Lignocaine for IVRA significantly improves the quality of the block.

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