COMPARISON BETWEEN USING LIDOCAINE IN DIFFERENT VOLUMES AND CONCENTRATIONS FOR INTRAVENOUS REGIONAL ANAESTHESIA

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ABSTRACT

Biers block is used to provide regional anaesthesia for more than one hundred years ago worldwide with high degree of safety .This study designed to compare the efficacy of Xylocaine when used in different volumes and concentrations. Prospective randomized study, single blinded, done after taking patient consent and approval from hospital ethical committee done on 28 patients, 30-40 years old, 17 female and 11 male undergoing elective soft tissue surgery on the upper limb as trigger finger, cut tendon, carpel tunnel syndrome and ganglion. 40 ml of (0.5 %) lidocaine given to group A and 20 ml of (1%) lidocaine given two group B. Lidocaine used is preservative free. All injected done by usng 20 ml syringe size and given through 22 gauge cannula in the dorsum of the hand and the injection done over 90 seconds after inflating the proximal tourniquet. The patients classified randomly into two groups Group A receive 40 ml of (0.5%) lidocaine to do biers block and in Group B 20 ml of 1% lidocaine. Intraoperative and postoperative, assessment of the pain, and patient satisfaction in group A and B determine it is nearly similar, VAS ($P<0.05$). by using the T test. 40 ml of lidocaine (0.5%) is equal in efficacy to 20 ml lidocaine at (1%) in performing the intravenous regional anaesthesia of upper limb.

KEY WARDS: Visual analogue scale (VAS), Lidocaine, Intravenous regional anaesthesia (IVRA or Biers block).

INTRODUCTION

IVRA is a technically simple and reliable technique, with success rates between (94%) and (98%)[1,2]. However, the local anesthetic most often used is lidocaine (0.5%) in volume of 40 ml with total dose of 200 mg. Despite vast clinical experience and success with IVRA , the site and mode of action of the local anesthetic agents remains controversial[3]. Some tried to modify it by adding other drugs[4-9] .Others change the site of the tourniquet and decreased the dose[10].

We hypothesize that adequate IVRA can be achieved with the same local anesthetic dose but with (50%) less volume.

Preparation of 40ml (0.5%) lidocaine consumes time as the commercially available concentrations of lidocaine from manufacturer are in concentrations of (1%) and (2%). Theoretically it is beneficial to have volume of 40 ml 0.5% lidocaine to do efficient biers block[11] but adult patients are different in body size this means depending on the volume of the local anaesthetic to do efficient block not rational.

In this study we compare the efficiency of 20 ml of (1%) lidocaine from 40 ml of (0.5%) lidocaine (the same total dose of 200 mg) in performing the IVRA.

PATIENTS AND METHODS

The study was approved by the Misurata Central Hospital scientific committee and written informed consent was obtained from the patient. Twenty eight unpremedicated healthy patient coming for elective minor forearm and hand surgery, ASA physical status I participate in this prospective randomized study (age 30-40 yr; seventeen female and, eleven male), comparing 40 ml of (0.5%) lidocaine preservative free diluted in N/S and 20 ml of (1%) lidocaine commercially prepared. Patients with liver disorders, hypertension, diabetes, obesity, history of allergic reaction to local anaesthetics, those not wishing the IVRA technique, or whom venipuncture was difficult were excluded. Patients were allocated to one of two groups according to a table of random numbers. Patients in one group(A) (n=14) including 8 females and 6 males received 40 ml of (0.5%) lidocaine, Eleven operation were done on the forearms and three on the hands . Whereas those in the other group (B) (n=14) including 9 females and 5 males received 20ml (1%) lidocaine, Ten operation were done on the forearms and four on the hands A 22-gauge catheter was introduced into a vein on the dorsum of the hand to be operated upon and another 20-gauge catheter was inserted into a veins of the arm not requiring surgery for maintenance fluid infusion. The operative arm was exanguinated by elevating it and wrapping it with a rubber Esmarch bandage. The proximal cuff of a double tourniquet was then inflated minimally 100 mm Hg above systolic pressure until the pulse trace disappear on the pulse oximeter and lidocaine was injected over 90 seconds.Then we inflate the second tourniquiet after fifteen minute. Boluses of fentanyl were provided whenever there was a (20%) increase in baseline values of arterial pressure and/or heart rate or when analgesia was graded as poor by the patient. All patients received entonox intraoperatively (N_2O and O_2 mixture 50:50). Patient's vital signs (arterial pressure, ventilatory frequency, ECG, pulse oximeter), analgesic request, and presence of adverse events related to unexpected deflation of the tourniquet were assessed intraoperatively .The surgeon allowed to start five minute after the tourniquet inflation after absence of pin brick sensation. Adequate intraoperative analgesia was determined by the

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need for supplementary medication intraoperatively and by the visual analogue scale taken five minute after the surgeon start, then postoperatively three minute after the tourniquet release the visual analogue scale reported and. Symptoms of dizziness, nystagmus, tinnitus, facial dysaesthesia, convulsions, depression of the central nervous system, bradypnoea (ventilatory frequency ≤10 breaths min^{-1}), bradycardia (heart rate ≤50 beats min^{-1}), and cardiovascular depression (≤25% decrease in baseline arterial pressure) were noted, if present.

RESULTS

Patients characteristics and data of the operation site in both of the study groups are shown in (table 1) There were no statistically significant differences in relation to age, weight, height, gender, duration of operation, and site of surgical procedure.

(Table 1) Demographic features

	Group A	Group B
Number	14	14
Age (Year)	34 (+-2,8)	36 (+-3.2)
Sex (M / F)	8/6	9/5
Weight (kg)	79 (+-4.2)	76 (+-6.1)
Height (cm)	165 (+-9.7)	162 (+-12.3)
Operative site(forearm/arm)	11/3	10/4
Operative duration (min)	27.1 (+-4.7min)	25.4 (+-6.2min)

The visual analogue scale in group A intraoperatively and postoperatively are shown in (table 2) .The mean of the intraoperative VAS 1.24(+-0.52). However, postoperative one 2,66 (+-0.93)

(Table 2)

Group A	Intraoperative VAS	Postoperative VAS
1	1.3	2.1
2	0.8	1.3
3	0.9	1.5
4	1.7	3.7
5	2.3	4.3
6	1.2	2.8
7	1.6	3.2
8	0.6	2.1
9	1.3	3.4
10	0.9	2.7
11	2.1	3.5
12	0.9	2.4
13	1.1	2.9
14	0.7	1.3

However, the visual analogue scale in group B intraoperatively and postoperatively are shown in (table 3). The mean of the intraoperative VAS 1.31(+-0.52) and the postoperative one 2.63(+-0.84)

In all patients involved there were no need for supplementary analgesia .postoperatively with regard to adverse event as dizziness, nystagmus, tinnitus, facial dysaesthesia , convulsions, depression of the central nervous system, bradypnoea (ventilatory frequency ≤10 breaths min^{-1}), bradycardia (heart rate ≤50 beats min^{-1}), and cardiovascular depression (≤25% decrease in baseline arterial pressure) on release of the tourniquet which were not present in the study group. Statistical comparison of VAS intraoperatively and postoperatively in groups A and B showed no statistically significance difference ($P < 0.0001$) according to the analysis by using the T test to compare both groups.

(Table 3)

Group B	Intraoperative VAS	Postoperative VAS
1	1.8	2.7
2	0.7	1.2
3	0.9	1.6
4	1.4	2.4
5	0.6	2.2
6	1.4	3.6
7	2.1	3.9
8	1.5	2.8
9	2.3	4.1
10	0.9	2.6
11	1.6	3.1
12	1.2	2.7
13	0.8	2.1
14	1.1	1.8

DISCUSSION

In this study, we demonstrated that, during the period of tourniquet inflation, IVRA with 20 ml 1 % lidocaine provides anesthesia of similar efficacy as IVRA with 40 ml 0.5% lidocaine. Patients intraoperatively do not ask for analgesic drugs this may be because all of them received entonox which have good analgesic affect[12].

The rapid return of normal sensation three minutes after tourniquet release may be the cause behind increasing in VAS postoperatively in our study. This is consistent with the report that, within three minutes of tourniquet release, 58% of a compound similar to lidocaine (0.1 mg of HIDA labeled with 100 mCi of 99 mTc in 40 mL of saline) was eliminated from the arm[13].

Some study have reported complications as seizures promptly related to postdeflation time[14]. However this is rare as lidocaine has to high uptake by the lung[15] and extraction by the liver[16]. In our study there is no reported postoperative complications may be because the total dose of lidocaine 200mg which is equal to 2.6 mg per one kilogram body weight as the average weight of the patients involved in this study was 77.5 Kg indicating the safety of such dose. Postoperative VAS is the similar in both groups without significant difference ($P < 0.05$)

CONCLUSION

This study indicates that 20 ml 1% lidocaine was equal in efficacy to 40 ml 0.5% lidocaine. This indicate the effectiveness is related to total dose not to the volume of the local anaesthetic Dilution of lidocaine in multiple syringes is time consuming and not necessary. In addition, smaller volumes are easier to

inject and simpler to prepare and safer than mixing and dilution.

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