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ANALGESIC EFFICACY OF PARACETAMOL WHEN USED AS ADJUVANT IN IVRA

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ABSTRACT

Introduction: Intravenous regional anaesthesia (IVRA) or Bier's block is easy to administer, reliable, and cost-effective for short operative procedures of the extremities performed on an ambulatory basis where a local anaesthetic is injected intravenously using tourniquet. **Objectives:** To compare the effectiveness of i.v paracetamol as add on therapy to lidocaine in Intravenous Regional Anaesthesia with those receiving plain Lidocaine .**Methodology:**66 patients were randomly and blindly divided into 3 groups. All groups received IVRA lidocaine (3 mg/kg) diluted with saline to a total volume of 40 mL. Group 1 - lidocaine plus IV saline, Group - lidocaine and paracetamol (300 mg) admixture plus IV saline, and Group 3 - lidocaine plus IV paracetamol (300 mg).Sensory and motor block onset time, tourniquet pain, and analgesic use were assessed during operation. Visual analog scale (VAS) scores was used to assess pain. **Results:** Onset of motor block was shorter and recovery of motor and sensory block was significantly longer in Group 2 ($P < 0.05$). VAS scores were significantly lower in Group 2 ($P < 0.05$).Preoperative and postoperative analgesic consumption was significantly less in Group 2 ($P < 0.05$). **Conclusion:** The addition of paracetamol during IVRA with lidocaine decreased tourniquet pain, increased anaesthesia quality, and decreased postoperative analgesic consumption.

INTRODUCTION

Bier's block (IVRA) though first used in 1906 by August Bier, got popularity after lignocaine was invented in 60's and since then commonly used in ambulatory patients[1]. The main advantages of this technique are its simplicity and reliability. Disadvantages of IVRA, includes delayed onset of action, poor muscle relaxation, and rapid onset of pain at the operative site after the tourniquet has been deflated[2] (tourniquet pain)

Additives such as opioids, muscle relaxants and various NSAIDS have been studied by various researchers with lidocaine for IVRA. In present study, we evaluated the effects of an IV Paracetamol as adjuvant to Lidocaine in IVRA and its effect for adequacy of block, and also compared it with IV administration of Paracetamol. Intraoperative and Postoperative analgesia and any adverse effects were also studied.

MATERIAL AND METHODS

Study design: Observational, prospective, longitudinal study

Ethical approval: Study have been approved by the Institutional ethical committee. Inform consent was taken from participant. Duration of study was two years. Jan 2013 to Dec 2015.

Inclusion criteria: After approval was carried out in 66 no of patients of both genders ,of age group between 16-65 years and ASA I, II & III grade scheduled for upper limb surgeries were enrolled in the Study. No history of sensitivity to drugs used.

Exclusion criteria: Patients with known allergy to drugs used.[lignocaine, paracetamol]

Patients with Reynauds disease, Sickle cell anaemia.

Grouping: All selected patients were blindly and randomly allocated into 3 groups with 22 patients in each:
GROUP I (control) : 3mg/kg of 0.5% lidocaine as bolus .
GROUP II(adjuvant): 3mg/kg of 0.5% lidocaine plus 300 mg of paracetamol admixture as bolus .
GROUP III(i.v paracetamol):3 mg/kg of 0.5% lidocaine as bolus and on non operative hand 300 mg of i.v paracetamol immediately after injection of IVRA medication.
Dose of paracetamol was taken as in previous study by Huseyin Sen, Yalcin Kulahci et al[16].

Methodology

All patients were premedicated 15minutes before the surgical procedure with I.V. 0.06mg/kg of midazolam . In the operating room, patients were monitored for non invasive blood pressure (NIBP), oxygen saturation (Spo2) and pulse rate (PR).

Two cannulae were placed, one in a vein on the dorsum of the operative hand and the other on the non operative hand for i.v fluids. The operative arm was elevated for 2 min and was then exsanguinated with an Esmarch bandage. A pneumatic "double" tourniquet was then placed around the upper arm, and the proximal cuff was inflated to 100 mm Hg above systolic BP. Circulatory isolation of the arm was verified by inspection, absence of a radial pulse, and a loss of the pulse oximetry tracing in the ipsilateral index fingers

The solutions were prepared by an anesthesiology assistant not involved in any part of the study. The solutions were injected over 90 s by an anaesthesiologist. After 30 to 45 mins of operative procedure (or when patient complaints of tourniquet pain) distal tourniquet was inflated and the proximal was released. During surgery if patient complained of nausea and vomiting, inj. Ondansetron 4mg i.v was administered. If the patient reported pain during operation (VAS 4 or greater) inj. fentanyl 1 µg/kg was given and total amount used was recorded. After injection, sensory block was evaluated with pinprick testing with a 22-gauge needle every 30 s until the start of surgery in the median, ulnar , and radial nerve innervated areas of the hand and forearm[10], motor block was determined according to a modified Lovett rating scale[10]. Sensory and motor block onset time was noted. Sensory block recovery time was determined by pinprick test done every 30 s was noted, Motor block recovery time based on modified Lovett rating scale was noted. BP, HR, Spo2 levels was recorded before and after the application of the tourniquet and during the operation.

Tourniquet Pain was determined by 10cm visual analog scale (VAS).Levels were recorded before the application of the tourniquet, after application of tourniquet /during operation (5, 10, 15, 20, 30, 40, and 50 min) and after operation 1, 2, 4, 6, 12, and 24 hr postoperatively. Tourniquet was deflated by the cyclic deflation technique not before 30 min and not kept inflated for more than 1 h 30 mins.

In the post anaesthesia care unit and later in the ward, patients were observed for any side effects, and if encountered were noted and treated. Postoperatively patients were questioned for pain and if VAS > 4 ,75 mg IM diclofenac was given. Total amount used was recorded.

Statistical analysis: Analysis was performed with SPSS for Windows version 21. According to the distribution of the data, student –t test, chi square tests were performed. Data were mean (sd), number (%). A *P* value of <0.05 was accepted as statistically significant.

RESULTS

All groups were similar with regard to demographical data (age, weight and sex) and duration of tourniquet (Table 1). There was no statistical difference among groups when compared for MAP, HR, or Spo2 at any time either intraoperatively or postoperatively (data not presented).In all patients we were able to complete the study and there were no exclusions in data analysis.

Table 1: Demographic Parameters

	Group I (n =22)	Group II (n =22)	Group III (n =22)
Age (yrs)	35±6	34±5	35±5
Weight (kg)	56±8	58±9	55±8
Sex (male/female)	13/9	14/8	12/10
Tourniquet time (min)	48±9	51±6	50±7

There was no significant difference in onset of sensory block among all three groups,

(*P* >0.05); however, after tourniquet release recovery of sensations was significantly longer in Group 2 (*P* <0.05). Similarly, time for onset of motor block was shorter and recovery of motor block was longer in Group 2 (*P* < 0.05) (Table 2).

Table 2: Onset and Recovery Times of Sensory and Motor Block (min)

	Group I (n =22)	Group II (n =22)	Group III (n =22)	P value
Sensory block onset time (min)	4±6	4±1	5±1	0.1578
Sensory block recovery time (min)	5±2	8±2	5±1	0.0001
Motor block onset time (min)	9±2	7±2	8±2	0.0024
Motor block recovery time (min)	6±2	7±1	6±2	0.0183

Values are mean ±SD

Intraoperative VAS scores 20 and 30mins intraoperatively were significantly lower in Group 2 (*P* < 0.05) (Table 3) compared to other groups. Intraoperative analgesic (fentanyl) requirement was significantly lower in Group 2 (*P* <0.05) (Table 4).

Table 3: Intraoperative and Postoperative Pain (VAS) Scores.

	Group I (n =22)	Group II (n =22)	Group III (n =22)
Before tourniquet	1.02±0.8	1.18±0.46	1.08±0.48
After tourniquet inflation	0.8±0.37	0.89±0.56	0.76±0.54
5 min	0.62±0.52	0.49±0.54	0.53±0.56
10 min	0.46±0.54	0.4±0.59	0.49±0.39
15 min	0.3±0.47	0.26±0.45	0.34±0.45
20 min€	1.69±0.64	0.81±0.57	1.55±0.57
30 min£	2.82±0.67	1.43±0.51	2.57±0.6
40 min	3.0±0.61	2.76±0.53	2.8±0.73
50 min	1.68±0.62	1.59±0.5	1.76±0.65
1 hr	3.6±0.80	3.4±0.78	3.61±0.83
2 hr	3.22±0.85	3.14±0.76	3.24±0.86
4 hr	2.84±0.32	2.68±0.38	2.84±0.45
6 hr	1.81±0.54	1.68±0.45	1.68±0.48
12 hr	1.4±0.89	1.31±0.96	1.31±0.57
24 hr	1.01±0.68	1.04±0.56	1.02±0.67

Values are mean ±SD ;Group 2 compared with Groups 1 and 3.

€,£,¥ are statistically significant as P< 0.05.Rest were insignificant

€ P value=0.0001,£ P value=0.0011

Postoperative VAS scores and time of initial analgesic requirement time were similar in all groups; however, the

total amount of analgesic (diclophenac) used was less in Group 2 ($P < 0.05$) (Tables 3 and 4). Only postoperative side effect that occurred were nausea in 2 patients in Group 1 and in 3 patients each in Groups 2 and 3.

Values are mean ±SD. There were no significant differences among groups

Table 4: Intraoperative and Postoperative analgesics consumption amount

	Group I (n =22)	Group II (n =22)	Group III (n =22)	P value
Intraoperative fentanyl consumption (µg)	51±11	41±15	47±14	0.0205
Postoperative Total Diclofenac Used (mg)	248±50	193±33	229±43	0.0001

DISCUSSION

Adding adjuvants to improve the efficacy of particular technique is helping anaesthesiologists in getting better results in intensity and prolongation of analgesic effects. Opioids, muscle relaxants[3]various NSAIDS ketorolac[4] ,tenoxicam[5] , aspirin[6],prilocaine and neostigmine[11] have been used as adjuvants by various researchers. improve upon the disadvantages of *IVRA*. Sen, Kulahci[16] used paracetamol as adjuvant to lidocaine for IVRA and shown that it improves efficacy of block but doesn't prolong postoperative analgesia after tourniquet release, although reduces overall dose of analgesics postoperatively.

In our study, we used paracetamol as adjuvant to lidocaine in dose of 300mg .Dose was decided as like previous study but there are no clear guidelines regarding effective dose. Hence further studies are needed to decide effective dose for pronged post operative analgesia. As shown by various studies Paracetamol is generally considered to be a weak inhibitor of the synthesis of prostaglandins. However *in vivo* effects of paracetamol are similar to those of the selective cyclooxygenase-2 inhibitors but, unlike the selective cyclooxygenase-2 inhibitors, paracetamol does not suppress inflammation.[12,13]

Several studies have suggested different mechanisms for the antinociceptive action of paracetamol[8,9], including *N*-methyl-d-aspartate [7] and the effect on cannabinoid receptors.[9,14] The analgesic effect of paracetamol was found to be prevented by cannabinoid receptor (CB1) antagonists, suggesting the endocannabinoid system to be the long-sought mechanism of action of paracetamol.[9,15]

Our study showed improved analgesia, better control of tourniquet pain, and better analgesia in early postoperative period. Study also showed that paracetamol used as adjuvant has better analgesic efficacy as compared to same dose administered parenterally. Limitations of study: Was regarding dose of Paracetamol used , which was as in previous study. More studies with Different doses of Paracetamol will help in knowing adequate dose for best clinical and post-Operative analgesia.

CONCLUSION

Paracetamol as an adjuvant is beneficial as it reduced tourniquet pain improved intraoperative analgesic efficacy, increased patients comfort in early postoperative period and reduces overall drug requirement of analgesic in first 24 hrs postoperatively.

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Conflicts of Interest: Nil

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