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## Original Research Article

# Triple drug intravenous regional anesthesia is safe and equally effective (0.25% lignocaine plus 1 µg/kg fentanyl + 0.5 mg pancuronium) as compared to standard Bier's block (0.5% lignocaine)

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## Abstract

Intravenous regional anesthesia requires a tiny practice to obtain good results and proves economical. We evaluated the efficacy of fentanyl (1 µg/kg) and pancuronium (0.5 mg) in lower doses with 0.25% lignocaine (1.5 mg/kg) for intravenous regional anesthesia for upper limb surgeries for a period not exceeding one hour, additionally we also compared the above study with standard Bier's block i.e. intravenous regional anaesthesia with 0.5% lidocaine (0.5 mg/kg body weight). This study was conducted in a medical college government general hospital, in Andhra Pradesh over the period of 3 years during 2001 to 2004. Fifty patients belonging to ASA grade I and grade II undergoing upper limb surgery were selected. Patients were included if they were undergoing upper limb surgeries for a period not exceeding one hour. These patients were assigned in a randomized, double fashion to two groups: Group A received 0.6 ml/kg of 0.5 % lidocaine (3 mg/kg) and Group B received 0.6 ml/kg of 0.25 % lidocaine (1.5 mg/kg) plus fentanyl (1 µgm/kg) and pancuronium (0.5 mg). The patients were observed for two hours after the release of the tourniquet for any complications like bradycardia, hypotension, and convulsions etc. The present was compared with standard Bier's block, i.e., 0.5%

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lidocaine (3 mg/kg body weight). Data was presented as Mean±SD, actual numbers and percentages and analyzed using SPSS version 16. In this study, 50 patients undergoing various upper limbs, surgeries were given intravenous regional anesthesia which included 38 males and 12 females. The postoperative analgesia was slightly greater in Group B compared to Group A. The onset of sensory and a motor blockade were earlier in Group A patients when compared to Group B patients. Short delay observed with this new method in the onset of sensory and motor blockade should be noted and the start of surgical procedures delayed until 15-20 minutes after tourniquet inflation. There was no difference in the quality of analgesia and muscle relaxation between two groups. The triple combination of lidocaine, fentanyl and pancuronium can be considered as is safe and effective since the dose of lignocaine can be reduced to a non-toxic level with the same quality of anesthesia. However, the limiting factor in this new technique is a short delay in the onset of sensory and motor blockade compared to standard Bier's block.

### **Key words**

Intravenous regional anesthesia, Lignocaine, Fentanyl, Pancuronium.

### **Introduction**

Intravenous regional anesthesia requires a tiny practice to obtain good results and proves economical. The patient remains ambulatory and sensations and functions of the limb return immediately or within a short time after the procedure, which is very useful to the orthopaedic surgeon soon after the tendon transplantation to assess the results of surgery [1, 2]. Although intravenous regional anesthesia using lidocaine is commonly practised, sometimes complications can occur. Plasma concentrations of > 5 micrograms/ml produce peripheral vasodilatation and direct myocardial depression, resulting in hypotension. Slowing of conduction of cardiac impulses may manifest as bradycardia, a prolonged P-R interval and wide QRS complex on the ECG. Central nervous system complications include seizures, apnoea and sometimes cardiac arrest (> 10 micrograms/ml) [3-5]. With the addition of fentanyl (1 µg/kg) and pancuronium (0.5 mg) to the local anaesthetic solution, it is possible to inject only 1.5 mg/kg of lidocaine as 0.25% solution, instead of the usual 0.5% solution, i.e., 3mg/kg body weight. This triple combination produces the same quality of anaesthesia as that of 0.5% lidocaine solution [6, 7]. This modification of the intravenous regional anesthesia technique may be an interesting

approach to reduce the dose and potential toxicity of local anaesthetic. To this purpose, we evaluated the efficacy of fentanyl (1 µg/kg) and pancuronium (0.5 mg) in lower doses with 0.25% lidocaine (1.5 mg/kg) for intravenous regional anesthesia for upper limb surgeries for a period not exceeding one hour, additionally we also compared the above study with standard Bier's block i.e. intravenous regional anaesthesia with 0.5% lidocaine (0.5 mg/kg body weight).

### **Materials and methods**

This study was conducted in Kurnool Medical College, Government General Hospital, Kurnool during the period 2001 to 2004. Fifty patients belonging to ASA grade I and grade II undergoing upper limb surgery were selected. Written informed consent was taken. Patients were included if they were undergoing upper limb surgeries for a period not exceeding one hour. These patients were assigned in a randomized, double fashion to two groups: Group A received 0.6 ml/kg of 0.5 % lidocaine (3 mg/kg) and Group B received 0.6 ml/kg of 0.25 % lidocaine (1.5 mg/kg) plus fentanyl (1 µgm/kg) and pancuronium (0.5 mg). All the above patients were premeditated with antiemetic Ondansetron – 4 mg and Ranitidine – 50 mg). An intravenous catheter is usually placed on the dorsum of the hand and a double pneumatic

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tourniquet is placed on the arm. The extremity is elevated and exsanguinated by tightly wrapping an Eschmark elastic bandage from a distal to proximal direction. The upper (proximal) tourniquet inflated, Eschmark bandage is removed, and 40-50 ml of the drug is injected slowly through the catheter, which is removed at the end of the injection. Ten minutes later the lower (distal) tourniquet is inflated and only then the proximal one is deflated. No case should the tourniquet be deflated before the 20<sup>th</sup> or later than the 60<sup>th</sup> minute. Slow deflation may also provide a safety margin.

#### **Time of onset of analgesia**

The time taken between the completion of administration of solution and the loss of pain to pin prick. This was tested on the skin below the tourniquet up to the fingers using a 22G needle, every two minutes.

#### **Time of onset of muscle relaxation**

The motor function was assessed by tactile and visual evaluation by asking the patient to extend his wrist and fingers. The complete motor blockade was noted when all voluntary movements became impossible. The time taken for motor blockade was noted every two minutes.

In this study, the parameter like pulse rate, blood pressure, respiratory rate and the level of consciousness were observed throughout the procedure at intervals of 10 minutes. Time is taken for onset of analgesia and motor blockade, tourniquet time and analgesia time after tourniquet release were noted. The patients were observed for two hours after the release of the tourniquet for any complications like bradycardia, hypotension, and convulsions etc. The present was compared with standard Bier's block, i.e., 0.5% lidocaine (3mg/kg body weight) [8].

#### **Dosage**

- Intubating dose - 0.1 mg/kg body weight
- Supplemental doses

- With nitrous oxide - 0.015 mg/kg body weight
- With volatile anesthetics - 0.007mg/kg body weight

#### **Statistical analysis**

Data was presented as mean± SD, actual numbers and percentages and analysed using SPSS version 16. Comparison of means between groups A&B was done by 'independent sample t-test' and proportions by Chi-square test. A value of p<0.05 was considered statistically significant.

#### **Results**

In this study, 50 patients undergoing various upper limbs, surgeries were given intravenous regional anesthesia which included 38 males and 12 females. Age group of patients ranged between 16 and 50 years. There were no complications in all groups of patients, which ensured safety to the patient. The postoperative analgesia was slightly greater in Group B compared to Group A. The onset of sensory and a motor blockade was earlier in Group A patients when compared to Group B patients. Nevertheless, the short delay observed with this new method in the onset of sensory and motor blockade should be noted and the start of surgical procedures delayed until 15-20 minutes after tourniquet inflation. There was no difference in the quality of analgesia and muscle relaxation between two groups (**Table – 1**).

#### **Discussion**

The results of this study have shown that a small dose of lidocaine combined with fentanyl and pancuronium is efficacious for intravenous regional anesthesia. There are no differences between the two groups after 20 minutes tourniquet time, corresponding on average to the beginning of the surgical procedure. Therefore, it is possible to use 1.5 mg/kg body weight of lidocaine as a 0.25% solution for intravenous regional anesthesia, which corresponds to a nontoxic dose. The mechanisms of the effects of opioids or muscle relaxants in intravenous regional anesthesia remain unclear.

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**Table – 1:** Various parameters according to group.

Parameters	A	B (Triple drug)	P value
Age (years)	27.16 ± 7.83	32.72 ± 12.73	P>0.05
Weight (Kg)	53.88 ± 9.26	53.64 ± 6.94	
Male	21 (84%)	17 (68%)	P>0.05
Female	4 (16%)	8 (32%)	
Onset of analgesia (min.)	8.75 ± 3.36	14.64 ± 3.25	P<0.05
Onset of muscle relaxation (min.)	12.08 ± 1.78	18.48 ± 2.90	P<0.05
Mean duration of postoperative analgesia (min.)	36.60 ± 5.02	50.20 ± 5.30	P<0.05

Elhakim and Sadek have shown that the addition of muscle relaxant such as atracurium to lidocaine for intravenous regional anesthesia improved muscle relaxation and operative conditions [9]. Me Glone, et al. [10] also reported that the addition of atracurium to the local anesthetic facilitated the reduction of wrist fractures and increased the quality of analgesia.

Abdulla and Fadhil [11] in their study obtained successful analgesia in 100% of the cases with combination of lidocaine (100 mg) plus fentanyl (50 micrograms) plus pancuronium (0.5 mg) in comparison with only 13% with lidocaine (100 mg) alone and 27% with the combination of lidocaine (100 mg) plus fentanyl (50 micrograms). The safety of this combination was confirmed by the absence of toxic signs after the release of a tourniquet. Sztark, et al. [12] studied the efficacy of fentanyl and pancuronium combine with dilute lidocaine solution for intravenous regional anesthesia. Forty adult patients undergoing upper limb surgery were randomly allocated to receive either 0.6 ml/kg body weight of 0.5% lidocaine (3 mg/kg body weight) or 0.6 ml/kg body weight of 0.25% lidocaine (1.5 mg/kg body weight) with one microgram/kg body weight of fentanyl and 0.5mg of pancuronium. The onset of sensory and motor blockade was significantly shorter in the 0.5% lidocaine group. However, no difference in analgesia or motor blockade was found between the two groups at 20 minutes-tourniquet time. Post-operative analgesia time was similar in the two groups. They concluded that the addition of fentanyl plus pancuronium to the lidocaine

solution reduced the dose of the local anaesthetic and possible systemic toxicity.

In the present study, the onset of sensory blockade and motor blockade is significantly different between the two groups. The results of the present study show that the same quality of muscle relaxation can be obtained with reduced dose of local anaesthetic and with the addition of muscle relaxant, i.e., pancuronium, compared to standard Bier's block.

S M Tan, et al. [13] conducted a study to assess the efficacy of intravenous regional anaesthesia by adding 50 mg of tramadol to 30 ml of 0.5% lidocaine solution. Fifty-four adult patients undergoing upper limb surgery were randomly allocated to receive either 30 ml of 0.5% lidocaine and 1 ml normal saline (Group A) or 30ml of 0.5% lidocaine and 50mg of tramadol (Group B). They were then assessed for the onset of sensory and motor block and the VAS score for tourniquet pain. Although more patients in Group B had a faster onset of sensory and motor block, this was not significantly different. Patients in Group B had a significantly lower VAS score 30 after tourniquet inflation and after the change over to the distal tourniquet. There were no complaints of postoperative nausea and vomiting. Thus, they concluded that there was a positive trend that tramadol might improve the quality of intravenous regional anesthesia.

Kurt N, et al. [14] conducted a study by adding alfentanil and atracurium to lidocaine for intravenous regional anesthesia and they concluded that there were no clinical benefits of

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adding alfentanil or atracurium to lidocaine solution for intravenous regional anesthesia.

The results of the present study showed that the same quality of analgesia as that of the standard Bier's blocks (0.5% lidocaine) can be achieved with decreased concentration of local anesthetic, i.e., 0.25% lidocaine and with an addition of an opioid analgesic.

The vital signs such as pulse rate and blood pressure were stable in all patients except for a slight variation during intra-operative and post-operative period. There were no complications during and after the release of the tourniquet in all groups of patients. Our study results were also similar to study conducted by A Puttappa and G Patkar [15].

## Conclusion

The triple combination of lidocaine, fentanyl and pancuronium can be considered as is safe and effective since the dose of lignocaine can be reduced to a non-toxic level with the same quality of anesthesia. However, the limiting factor in this new technique is a short delay in the onset of sensory and motor blockade compared to standard Bier's block.

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