Original Research Article

Study of post-operative analgesia after addition of opioids with intravenous regional anesthesia

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Abstract

Background: Intravenous regional anesthesia was first discovered by August Carl Gustav Bier. In 1908 came the first Bier's paper in "Venous Anesthesia" which was natural outgrowth of his previous work with tourniquet and anesthesia methodology. The technique gained considerable popularity for a time, as evidenced by the flood of articles which appeared. These were all short, case report type studies confirming the feasibility of Bier's method. **Aims and Objective:** To study the post-operative analgesia after intravenous Regional Anaesthesia by using 0.25% lignocaine with fentanyl and pancuronium bromide. **Material and Methods:** For the purpose of study two groups were formed containing 25 patients each. **Group A:** Patients received intravenous regional anesthesia with standard method i.e. 3 mg/kg of 0.5% lignocaine. **Group B:** Patients received intravenous regional anesthesia with 1.5mg/kg of 0.25% lignocaine + Pancuronium 0.5 mg + fentanyl 1 ug/kg. The details of all the patients were entered on a standard proforma. Standard protocol was used for inducing the regional anesthesia. The limb to be operated was kept elevated above the level of the heart for 2 to 4 minutes for gravity drainage. Esmarch's bandage was applied to ensure complete exxsanguination. Both the methods were used for all patients. After exsanguinations, the tourniquet was applied to occlude the vessels by first wrapping the side where the tourniquet was to be applied with cotton roll to reduce the tourniquet discomfort. Then group A patients received Lignocaine 0.5%, 3 mg/kg and group B received, Lignocaine 0.25%, 1.5mg/kg+fetanyl 1 ug/kg+ pancuronium 0.5mg. The drug was injected, the skin usually became mottled and analgesia developed rapidly. The muscle relaxation was profound. As the drug was injected, the forearm was tested for analgesia (loss of sensation for pin prick was elicited). The time of onset of sensory block and motor block was noted. The quality of anesthesia developed was also measured. **Results:** Majority of cases were male in both the groups. The age group in majority of patients undergone surgery were in the age group of 20-30 years. In group A, 20 patients had excellent block, 3 had good quality block and 2 had moderate quality block. Whereas in group B 19 patients had excellent block, 4 had good quality block and 2 had moderate quality block. In group A patients post operative analgesia in 48% of patients remained for 25 to 34 minutes. In 20% cases it remained for 15 to 24 minutes and in 32% of cases it remained for 35 to 44 minutes. In group B patients 12% of the patient had post operative analgesia for 15 to 24 minutes and in 48% cases analgesia remained for 25 to 34 minutes and in 8% cases the post operative analgesia remained for 45 to 54 minutes. And the difference observed was not statically significant. In group A patients one patient had bradycardia and one of the patient had hypotension and other patient had no complication after the release of tourniquet. In group B patient only one patient had giddiness after the release of tourniquet. **Conclusion:** Thus we conclude that the quality of analgesia and duration of post operative anesthesia was almost same in both the groups. But the rate of complication was reduced due less dose of lignocaine in group B.

Keywords: intravenous Regional Anaesthesia, post-operative analgesia, lignocaine, fentanyl and pancuronium bromide.

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Intravenous regional anesthesia was first discovered by August Carl Gustav Bier. In 1908 came the first Bier's paper in "Venous Anesthesia" which was natural outgrowth of his previous work with tourniquet and anesthesia methodology.[1] The technique gained considerable popularity for a time, as evidenced by the flood of articles which appeared. These were all short, case report type studies confirming the feasibility of Bier's method. It was revived in 1963 by Holmes, who used lidocaine which appeared to give more reliable

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anaesthesia than procaine and now is regarded as one of the fundamental techniques of anaesthesia for limb surgery. Intravenous regional anesthesia can provide almost all ideal conditioning for limb surgery, including of skeletal musculature with lack of reflex response. This technique does not affect the cardiovascular and respiratory systems and often surgical maneuvers with protection of the airway especially in an individual with full stomach. Success with intravenous regional anaesthsia depends on placing the needle into the vein and keeping it in position by fixing it during local anaesthsia. In addition to positioning the needle, it is important to appreciate the pharmacology of the drug used along with its pharmacokinetics. It is well established that IVRA is safe and effective. IVRA is commonly preferred for shorter procedures on the distal limb, especially on the forearm, except when the patient was advised against tourniquet use.[2,3,4] related to IVRA depend upon various factors such as type of anesthetic agent, improper equipment, and technical error.[4,5,6] Traditionally, lidocaine is used as 0.5% solution at the dose of 3 mg/kg in IVRA for effective anesthesia during upper limb surgeries[7]. 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 deliberate release 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. In the present study we tried to study the post-operative analgesia after intravenous Regional Anaesthesia by using 0.25% lignocaine with fentanyl and pancuronium bromide.

AIMS AND OBJECTIVE

To study the post-operative analgesia after intravenous Regional Anaesthesia by using 0.25% lignocaine with fentanyl and pancuronium bromide.

MATERIAL AND METHODS

The present study was conducted in the Dr. V.M. Medical College and Shri Chhatrapati Shivaji Maharaj General Hospital, Solapur. For the purpose of study two groups were formed containing 25 patients each.

Group A: Patients received intravenous regional anesthesia with standard method i.e. 3 mg/kg of 0.5% lignocaine.

Group B: Patients received intravenous regional anesthesia with 1.5mg/kg of 0.25% lignocaine + Pancuronium 0.5 mg + fentanyl 1 ug/kg. Following inclusion and exclusion criteria was used to select the study subjects and patients satisfying the below mentioned inclusion criteria were enrolled in the study. He selected patients were randomly divided in group A and B.

Inclusion Criteria

Patients of the age group between 20 and 60 years of both sexes requiring elective surgery of upper extremity below the mid arm were selected.

Exclusion Criteria

- Patients shock or with severe crush injury.
- Hypersensitivity to local anesthesia.
- Highly nervous and uncooperative patients.

After receiving permission from the institution ethical committee and informed written consent from the patents the study was performed. The details of all the patients were entered on a standard proforma. Standard protocol was used for inducing the regional anesthesia. The limb to be operated was kept elevated above the level of the heart for 2 to 4 minutes for gravity drainage. Esmarch's bandage was applied to ensure complete exxsanguination. Both the methods were used for all patients. After exsanguinations, the tourniquet was applied to occlude the vessels by first wrapping the side where the tourniquet was to be applied with cotton roll to reduce the tourniquet discomfort. Then group A patients received Lignocaine 0.5%, 3 mg/kg and group B received, Lignocaine 0.25%, 1.5mg/kg+fetanyl 1 ug/kg+ pancuronium 0.5mg. The drug was injected, the skin usually became mottled and analgesia developed rapidly. The muscle relaxation was profound. As the drug was injected, the forearm was tested for analgesia (loss of sensation for pin prick was elicited). The time of onset of sensory block and motor block was noted. The quality of anesthesia developed was graded according to following scale. Post-operative Analgesia was also measured and was recorded on proforma. Complications occurred due to anesthesia in the two groups were also recorded and were managed accordingly.

Quality of Block

- Excellent : Complete loss of sensation and muscle paralysis.
- Good : Loss of sensation except deep pressure sense and poor muscle
- Moderate : Mild pain or discomfort.
- Poor : Poor analgesia and general anaesthesia was required to complete the surgical procedure.

The collected data was entered in Microsoft excel and Results were expressed as percentage and mean ± SD. The results were analyzed for statistical significance using paired student t-test. Differences were considered to be statistically significant when P value was < 0.05.

RESULTS

Observation

Table 1: Age and sex distribution of patients in the study

Age in years		Male	female	Total
Group A	20-30	07	04	12 (48%)
	30-40	06	00	06 (24%)
	40-50	03	03	06 (24%)
	50-60	00	01	01 (04%)
Group B	20-30	08	04	12 (48%)
	30-40	05	01	06 (24%)
	40-50	02	05	07 (28%)
	50-60	00	00	00 (00%)

It was observed that majority of cases were male in both the groups. The age group in majority of patients undergone surgery were in the age group of 20-30 years.

Table 2: Distribution according to the surgical procedure performed

Sr. No.	Surgical procedure peformed	No. of cases (%)
1	Open reduction and sq.nal	07 (14%)
2	Open reduction and fixation with 'k'wire	10 (20%)
3	Open reduction and fixation with 'L'wire	04 (08%)
4	Implant removal	04 (08%)
5	Radial head excision	05 (10%)
6	Both bone nailing	08 (16%)
7	Plating of radius and ulna	06 (12%)
8	Tension band wiring of olecrenon	01 (02%)
9	Open reduction with internal fixation	05 (10%)
Total	50 (100%)	

It was seen that most common surgical procedure performed in the study patients was open reduction and fixation with 'k' wire and only one patient undergone the procedure of tension band wiring for olecrenon.

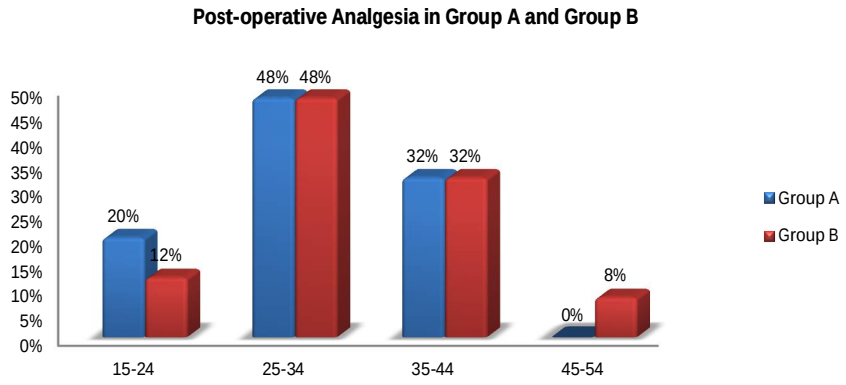
Table 3: Quality of block in Group A and Group B patients

	Group A		Group B	
	No. of cases	Percentage	No. of cases	Percentage
Excellent	20	80%	19	76%
Good	03	12%	04	16%
Moderate	02	08%	02	08%
Poor	00	00%	00	00%

It was seen that in group A, 20 patients had excellent block, 3 had good quality block and 2 had moderate quality block. Whereas in group B 19 patients had excellent block, 4 had good quality block and 2 had moderate quality block.

Table 4: Post-operative Analgesia in Group A and Group B

Post-operative Analgesia (min)	Group A		Group B		P value
	No. of cases	Percentage	No. of cases	Percentage	
15-24	05	20%	03	12%	>0.05
25-34	12	48%	12	48%	
35-44	08	32%	08	32%	
45-54	00	00%	02	08%	



In group A patients post operative analgesia in 48% of patients remained for 25 to 34 minutes. In 20% cases it remained for 15 to 24 minutes and in 32% of cases it remained for 35 to 44 minutes. In group B patients 12% of the patient had post operative analgesia for 15 to 24 minutes and in 48% cases analgesia remained for 25 to 34 minutes and in 8% cases the post operative analgesia remained for 45 to 54 minutes. And the difference observed was not statically significant.

Table 5: Incidence of complication in Group A and Group B

Complication	Group A	Group B
Bradycardia	01 (04%)	00 (00%)
Hypotension	01 (04%)	00 (00%)
Giddiness	00 (00%)	01 (00%)
Nausea and Vomiting	00 (00%)	00 (00%)
Itching	00 (00%)	00 (00%)

In group A patients one patient had bradycardia and one of the patient had hypotension and other patient had no complication after the release of tourniquet. In group B patient only one patient had giddiness after the release of tourniquet.

DISCUSSION

In the present study two groups were formed. In Group A patients received 0.5% lignocaine with a dose of 3 mg/kg whereas Group B patients received 0.25% lignocaine, 1.5mg/kg +fentanyI 1ug/kg+pancuronium 0.5 mg. It was seen that majority of cases were male in both groups and majority being in age group of 20-30 years. The age and sex distribution of the patients in Group A and B was nearly same and thus both the groups were comparable as far as age and sex distribution was concerned. While studying the quality of anesthesia it was seen that in group A, 20 patients had excellent block, 3 had good quality block and 2 had moderate quality block. Whereas in group B 19 patients had excellent block, 4 had good quality block and 2 had moderate quality block. There was not a single case of poor block in both the groups. No patients in our study required general anesthesia for the completion of the procedure, thus the results showed that IVRA block with dose lignocaine 1.5 mg/kg, 0.25%+fentany1 1ug/kg +pancuronium 0.5 mg was effective. The results of quality of block were comparable with standard technique of IVRA with 0.5% lignocaine alone. By reducing the dose of lignocaine 50% we can reduce the chances of toxicity. Similar findings were also reported by Abdullah and Fadhi[8] and Asrmstrong P. *et al*[9] in their study. We also studied the duration of post-operative analgesia in group A and group B patients. In 25% of patients remained for 15 to 24 minutes in group A whereas in group B there were 12% of patients in which analgesia remained for 15 to 24 minutes. In both the groups there were 32% of patients in whom post-operative analgesia remained for 35 to 44 minutes, there was no patient in group a where the analgesia remained for 45 to 54 minutes but in group B there were 8% patients in which analgesia remained for 45 to 54 minutes. While studying the incidence of complications in both the groups it was observed that in group A patients one patient was having bradycardia which responded to injection atropine 0.6 mg IV within two minutes. In one patient systolic blood pressure decreases by 20 mm Hg after the release of tourniquet and it returned to normal within 5 minutes without any treatment. In group B patients no patients had braycardia of hypotension after the release of tourniquet. But one patient complained of giddiness. No other patients complained of any other symptoms, no severe reaction and no delayed effects were observed in any patient 60 minutes after the completion of procedure. The toxic reaction appears to be more common when injection of drug to tourniquet release time interval is less than 25 minutes as observed by Bier 1908, who advocated interval of 30 minutes. Homes's series[9] had mild symptoms referable to central nervous system in 8 to 30 cases, in which he used 200 to 400 mg of lignocaine and surgery lasted for 15 to 75 minutes with 30 mg/kg body weight dose. In the present study of cases in group A and B who has injection of drug to release of tourniquet interval of more than 25 minutes. Guay J[10] conducted a systematic review and search was done in the American National Library of Medicine's PUBMED, EMBASE (1980-2007, wk 11), and Medline (from 1950) in March 2007. All complications associated with IVRA were reviewed. It was seen that the lowest dose of local anesthetic associated with a seizure was 1.4 mg/kg for lidocaine; 4 mg/kg for prilocaine, and 1.3 mg/kg for bupivacaine. Cardiac arrests and deaths were reported with lidocaine and bupivacaine only. The lowest dose associated with a cardiac arrest was 2.5 mg/kg for lidocaine and 1.6 mg/kg for bupivacaine. Local anesthetic toxicity occurring during tourniquet inflation has been reported, with tourniquet pressure exceeding initial systolic arterial blood pressure by 150 mmHg. Seizures occurring after tourniquet deflation have been reported with a tourniquet time as long as 60 minutes. Ten cases of compartment syndrome are reported. The rate of complication was much lower as compared to the results observed by Guay J.

CONCLUSION

Thus we conclude that the quality of analgesia and duration of post operative anesthesia was almost same in both the groups. But the rate of complication was reduced due less dose of lignocaine in group B.

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