

Efficacy of Nitroglycerine and Dexamethasone with Lignocaine in Bier's Block for Upper Limb Surgery

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Abstract

This study was done to evaluate the efficacy of nitroglycerine and dexamethasone as adjuncts to lignocaine in the terms of onset, duration, quality and efficacy of IVRA (Bier's block). This study was done on randomly selected 90 adult patients of either sex belonging to ASA grade I & II, aged 20 to 60 years undergoing for upper limb surgery duration lasting not more than 90 mins in three groups. Group 1- Plain lignocaine 2% diluted with saline (40ml), Group 2- lignocaine 2% and nitroglycerine, (40ml) Group 3- lignocaine 2% and dexamethasone (40ml). Patients were premedicated with 0.05mg/kg midazolam 5 minutes prior to surgical procedure. Basal vitals were monitored in all the patients. Two venous cannulae were placed, with all aseptic measures, one in dorsum of the operating hand and the other in the opposite hand for intravenous fluid infusion. Operative hand was exsanguinated with an esmarch bandage to squeeze the circulating blood, a double cuffed pneumatic tourniquet was placed around the upper arm and proximal cuff was inflated to 250mm Hg. Regional anaesthesia was injected slowly. Sensory block was assessed by pin prick cutaneous test. Onset of motor block was noted by asking the subject to flex and extent his/her wrist and fingers. As the sensory and motor block was achieved, distal cuff was inflated and the proximal cuff was released and surgery was started. Tourniquet pain was assessed using Visual Analogue Scale. The mean duration of surgery in group 1 was 44.0±10.5 minutes, in Group2 was 41.2±9.7 minutes and Group3 was 43.3±9 minutes. The addition of 200µgm nitroglycerine improved the speed of onset, quality of anaesthesia, prolonged the sensory and motor block recovery time, increase the duration of post-operative analgesia. The addition of 8mg dexamethasone improved the quality of anaesthesia but did not cause significant difference in time. According to this study, it can be assumed that the addition of nitroglycerine and dexamethasone to lignocaine in Intravenous Regional Analgesia definitely improved the quality of anaesthesia.

Keywords: Intravenous Regional Analgesia; Double Cuff Pneumatic Tourniquet; Esmarch Bandage; Lignocaine; Nitroglycerine; Dexamethasone.

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Introduction

The advent of anaesthesia in 1846 enabled the field of surgery to show tremendous progress and outcome. Anaesthesia word has a vast meaning

which is not only limited to general anaesthesia. To overcome the consequences of general anaesthesia, advances were made in the fields of regional anaesthesia. In 1902, the term "Regional Anaesthesia" was coined by Harvey Cushing. August Gustav Bier (1908) invented intravenous

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regional anaesthesia for forearm and hand. This technique which now bears his name, consisted of occluding the circulation in a segment of arm with the use of two bandages and then injecting a dilute concentration of a local anaesthetic agent in this isolated segment. Prompt analgesia and fast recovery can be achieved in this technique. Feature of prompt analgesia have made this technique suitable for short duration surgeries. This technique never gained much popularity as it was cumbersome, requiring meticulous exsanguination of the part, providing limited operative period, discomfort and risk of toxicity.

The earliest agent injected into the isolated vascular compartment was procaine. This technique again become popular in 1960, when Holmes used lidocaine in place of procaine and introduced several modifications including either a second cuff, or a subcutaneous band of local anaesthetic to control tourniquet pain.

Lidocaine is the least toxic local anaesthetic agent used in IVRA. To achieve early onset and to prolong the operative period, lists of drugs were used as adjuvants, including narcotics, clonidine, nitroglycerine, dexmedetomidine and magnesium in combination with local anaesthetic agents. Nitroglycerine has been used along with many anaesthetic drugs to enhance the onset of analgesia.

Nitroglycerine is metabolized to nitric oxide in the cell. Nitric oxide causes an increase in the intracellular concentration of cyclic guanosine

monophosphate, which produces pain modulation in the central and peripheral nervous system.

Dexamethasone is a potent anti-inflammatory drug. Dexamethasone combined with bupivacaine prolongs the duration of analgesia in nerve blocks.

Aims of Study

The present clinical study was done to evaluate the efficacy of nitroglycerine and dexamethasone in combination with lignocaine in IVRA for upper limb surgeries in terms of onset, duration and post-operative analgesia.

Material and Method

This study was done on 90 patients of ASA grade I and II of age 20–60 years of either sex admitted for forearm or hand surgery which were likely to get completed within 60-90 min and were randomly allocated in 3 groups, consisting of 30 patients each.

Group 1: Plain Lignocaine 2% diluted with normal saline to make a volume of 40 ml

Group 2: Lignocaine and nitroglycerine (200µgm)

Group 3: lignocaine and dexamethasone (8mg)

Observations

Patients Characteristics	Group 1	Group 2	Group 3	P
Age (years)	35.4±11.3	43.0±11.0	40.6±12.1	0.088
Weight(kgs)	58.6±8.1	58.5±9.3	60.3±8.5	0.705
Duration of surgery(mins)	43.3±9.0	44.0±10.5	41.2±9.7	0.175
Onset of sensory block(mins)	7.0±1.7	3.5±0.8	5.0±1.7	0.000
Onset of motor block(mins)	7.5±1.8	4.1±0.5	5.2±2.1	0.000
VAS score at 5 min before tourniquet deflation	1.6±1.2	1.1±0.8	1.3±0.9	0.052
VAS score at 10 min before tourniquet deflation	1.5±1.1	1.6±0.8	1.2±1.1	0.106
VAS score at 20 min before tourniquet deflation	2.0±0.9	0.9±1.1	1.5±1.4	0.002
VAS score at 40 min before tourniquet deflation	3.0±0.7	1.9±1.1	2.3±1.1	0.001
VAS score at 60 min before tourniquet deflation	2.2±0.9	2.2±1.1	1.5±1.3	0.000
VAS score at 2 hrs after tourniquet deflation	3.3±0.7	2.5±1.2	2.8±0.9	0.0046
VAS score at 4 hrs after tourniquet deflation	3.6±1.6	2.9±1.0	2.9±1.1	0.033
VAS score at 6 hrs after tourniquet deflation	3.2±0.8	3.1±1.0	2.6±0.9	0.007
VAS score at 12 hrs after tourniquet deflation	1.3±1.2	0.9±0.8	1.0±1.1	0.491
VAS score at 24 hrs after tourniquet deflation	1.0±0.8	1.1±0.9	1.0±0.9	0.782
Sensory block recovery time(mins)	3.3±1.1	6.8±1.8	12.2±4.4	0.000
Motor block recovery time(mins)	3.9±1.4	7.6±1.9	13.0±3.8	0.000
Time of injection of first dose of analgesic(mins)	48.2±31.3	195.7±112.9	55.0±36.5	0.000
Total no. of doses of alagesic required	2.0±0.6	1.3±0.5	1.4±0.6	0.000

Discussion

Bier's block or intravenous regional anaesthesia is simple to administer, reliable and cost effective. It is ideal for short operative procedures of extremities performed on an ambulatory basis. There are various proposed sites of action of IVRA. Raj et al. reported that the action of local anaesthetic is on major nerve trunks, possibly reaching to the nerve trunk via small veinules within the nerve core, whereas Rosenberg provided strong evidence concerning a peripheral site. It is now accepted that both the nerve endings and trunks are affected.

Different anaesthetic agents including procaine, lidocaine, prilocaine, bupivacaine and mepivacaine have been used for intravenous regional anaesthesia since the initial description of this technique by Bier in 1908. Lidocaine is the most commonly used local anaesthetic agent for this technique. Brown et al described that lidocaine is one of the least toxic local anaesthetic used in intravenous regional anaesthesia. Lidocaine 3mg/kg administered as 0.5% solution ensures adequate analgesia and relaxation when used for upper limb surgery.

IVRA has been limited by tourniquet pain and the inability to provide post-operative analgesia as compared with peripheral nerve blocks. It is the high success rate (96-100%) of block in contrast to other methods for obtaining upper limb analgesia where success rate is 75-80%, which makes it popular today.

Numerous attempts to reduce the severity of tourniquet discomfort improve the quality of block and prolong analgesia have been made by adding a wide range of agents to the local anaesthetic for Bier's block.

It was observed in this study, that sensory and motor block onset times were statistically shorter in nitroglycerine group as compared to control group. Intergroup comparison shows that the onset of sensory and motor block was earliest in nitroglycerine group.

This study is comparable with finding of Turan et al. (2005) who observed that the mean time of recovery from sensory and motor block is prolonged in nitroglycerine group.

Demand of first analgesic dose in the post-operative period was longest in nitroglycerine group and shortest in dexamethasone group. Our finding is comparable with Sen et al. (2006) [13] and with Bigat et al. (2006) [5] respectively.

Using nitroglycerine (200µgm) as an adjuvant to lignocaine for IVRA in this study shows the improvement in speed of onset and the quality of anaesthesia. It helps to provide prolonged sensory and motor block and delays the demand of first analgesic dose with minimum adverse effects.

Conclusion

According to the intergroup comparison it was concluded that the onset of sensory and motor block was earliest and the duration of post-operative analgesia was also prolonged in NTG group.

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