Comparison Study of Lignocaine-Bupivacaine with Normal Saline and Lignocaine-Bupivacaine Along with Fentanyl in Supraclavicular Brachial Plexus Block in Mid Arm Surgeries

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Abstract

Background and Objective: brachial plexus block by supraclavicular approach achieve good motor, sensory & sympathetic blocked in mid arm surgeries. Several adjuvants have been added to enhance effect of local anaesthetic agent in peripheral nerve block. We performed a prospective randomized study to compare lignocaine-bupivacaine with normal saline and lignocaine-bupivacaine along with fentanyl for onset, quality & duration of block as well as post-operative analgesia.

Method: Randomized controlled study was carried act among 50 patients of either sex aged 20-50 asa grade 1 & 2 undergoing mid arm surgeries. patient was randomly divided in two groups. Group 1: 20ml of 0.5% bupivacaine + 10ml of 2% lignocaine + 1 ml of normal saline Group 2: 20ml of 0.5% bupivacaine + 10ml of 2% lignocaine + 1 ml of fentanyl (50 mcg)

Time taken for onset of sensory & motor as well as complete duration of block were noted in both groups. Any complication during procedure during surgery as well as post operatively were noted & treated.

Result: Addition of fentanyl (50 mcg) to bupivacaine + lignocaine in peripheral nerve block cause early onset for sensory block.

Mean duration of sensory blockade 440+/-62 in group 1 while 635+/-84 in group 2. mean duration of analgesia 400+/-68 in group1 while 685+/-90 in group 2

It suggests that duration of sensory block and analgesia was prolonged in group 2

Conclusion: The addition of small-dose fentanyl to lignocaine solution in brachial plexus block can increase the success rate and prolong the duration of analgesia, [16]with early onset time of sensory blockade as compared with that achieved by the same doses of local anaesthetics used in combination.

Keywords: *Fentanyl, lignocaine, bupivacaine, brachial plexus, mid arm surgeries.*

Introduction

'Regional anaesthesia' is a term first used by Harvey Cushing in 1901 to describe pain relief by nerve blocks [1]. Regional nerve blocks are based on the concept that pain is conveyed by nerve fibres, which are amenable to interruption anywhere along their pathway2 Local anaesthetic are drugs that produce reversible conduction blockade of impulses along central and peripheral nerve pathways after regional anaesthesia.

The effects of opioids on regional blockade are controversial. The addition of opioids in brachial plexus block is reported to improve success rate and postoperative analgesia, by some authors[1–3] whereas others have found no effect[4,5]

Nowadays brachial plexus block is routinely used for upper extremity surgeries. Addition of fentanyl (1 μg/kg) to local anaesthetic solution is useful to extend the period of analgesia. This study was carried out to study the effect of addition of 1 mL of fentanyl to bupivacaine (0.5%) 20 mL and lignocaine (2%) 10 mL on patients, with following aims and objectives.

Materials and Method

Inclusion criteria: ASA GRADE l and ll patients posted for operations on hand, forearm and elbow; age group of 20-60 years belonging to both sex; weight more than 50 kg; and patients who were ready to give written consent.

Exclusion criteria: patients with neurological disorder, anemia, hypertension, and any cardiac and respiratory disorder were excluded from the study.

Protocol was sent to local ethical committee and approval was obtained. If patients fulfilled inclusion criteria, they were explained about procedure, and written consent was obtained from them. Patients were randomly divided into two groups: group I (control) and group II (study). All the patients were subjected to brachial plexus block with supraclavicular approach with all aseptic precautions with a 24-gauge needle, immediately lateral to subclavian artery. After obtaining paraesthesia, drugs were administered as follows: Group I (control): bupivacaine 0.5% 20 mL + lignocaine 2% 10 mL + NS 1 mL Group II (study): bupivacaine 0.5% 20 mL + lignocaine 2% 10 mL + fentanyl 1 mL (50 microgram).

Time of onset of sensory block, time of onset of motor block, duration of motor block and total duration of sensory block were noted. All side effects were also noted. Intraoperatively, all the patients received adequate intravenous fluids. Pulse rate (PR), blood pressure (BP), respiratory rate (RR) were monitored every 5 minutes till the patients were shifted from operating table. Patients were watched for signs of pneumothorax, like tachypnea and respiratory distress. Intraoperative monitoring was done for nausea, vomiting, itching, dryness of mouth and sweating.

After completion of surgery, patients were shifted to the recovery room. A person who was unknown to either of the groups observed the patients, till the patient got movements of fingers of blocked hand and/ or the patient complained about pain. All the relevant information was recorded on a pretested, predefined, semi-open pro forma sheet. All analgesics and sedatives were withheld in the postoperative period, unless the patient complained of pain (grade II). PR, BP and RR were recorded every 30 minutes for 24 hours. Side effects like nausea, vomiting, itching and respiratory depression as well as degree of sedation were noted in the postoperative period.

Evaluation of pain and pain relief was done according to McGill pain questionnaire (0- no pain to 5- excruciating pain). When patients complained of discomforting pain (McGill grade II), parenteral analgesic was prescribed, and the total number of doses in the 24-hour period was noted.

Results

The two groups were comparable with regard to mean age, sex and weight of the patients, all belonging to ASA I and II. Surgeries in both the groups were also comparable [Table 1]. Of the 50 patients recruited, 3 were withdrawn because of failure of the block.

Table 1: Effect on sensory and motor block in both groups

	Group 1	Group2
Sex(f/m)	12/11	10/14
Age(y)	45+/-15	48+/-12
Weight(kg)	54+/-12	50+/-4
Duration of surgery(min)	82+/-26	78+/-24

By using a pinprick technique and by measuring the gripping force, Sensory and motor blockades were evaluated respectively. No patient complained of nerve deficit after surgery.

The time to onset of sensory blockade is shown in Figure 1. The addition of fentanyl to brachial plexus block cause early onset of analgesia (P=0.01). [6]

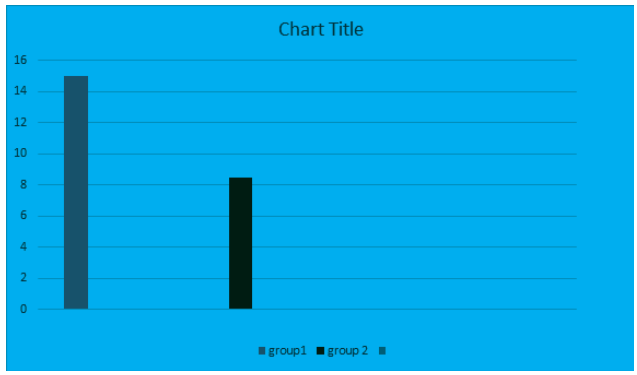

Figure 1: Delayed onset of analgesia in Group 1

The durations of sensory blockade and analgesia in group II (study) were significantly longer (635±84 and 685±90 minutes, respectively) than those in group I (440±62 and 400±68minutes, respectively).

The gripping forces significantly decreased 10 minutes after the injections, and there were no significant differences among the two groups [Table 2].

Table 2: Duration of anaesthesia and changes in gripping force after brachial plexus block

	Group 1	**Group 2**
Duration of sensory blockade(min)	440±62	635±84
Duration of analgesia(min)	400±68min	685±90min
Gripping force (kg)		
before	20+/-12	21+/-13
after	2+/-1	2+/-4

However, onset time of analgesia was prolonged in distribution by adding fentanyl to brachial plexus block. We conclude that the addition of fentanyl to local anaesthetics results in an improved success rate of sensory blockade with an early onset of analgesia.

There was no statistically significant difference in the time required for onset of complete motor block (P>0.05).

Table 3 shows the incidence of various side effects in both the groups. There was no statistically significant difference in the incidence of side effects between the two groups. This study has shown that the mean duration of analgesia is extended if fentanyl is added to the local anaesthetics, without increasing the side effects.

Table 3: Incidence of intraoperative side effects

Side effect	**Number of patients**		**P value**
nausea	02	03	>0.05
vomiting	00	01	>0.05
Dryness of mouth	03	02	>0.05
Itching	00	00	>0.05
Respiratory depression (RR<9 breath/ min)	00	01	>0.05
Hypotension (SBP fall>30mm hg)	02	03	>0.05
Bradycardia (HR<55 Beats/min)	01	02	>0.05

Discussion

This study demonstrated that the addition of 1 ml fentanyl to bupivacaine 0.5% 20mL + lignocaine 2% 10 mL brachial plexus block cause early onset time of block with increased the success rate of sensory blockade and prolonged the duration of blockade.

After comparison, we observed that there is remarkable increase in postoperative analgesia [Table 4]. Opiates have an anti-nociceptive effect at the central and/ or spinal cord level.[7] In animals, the presence

of peripheral opioid receptors has been reported;[8–10] however, it is still unclear whether functional opioid receptors exist in human peripheral tissue. Several studies have attempted to determine whether the addition of opioids to local anaesthetics would improve the efficacy of peripheral nerve blocks. Morphine and buprenorphine are reported to cause profound analgesia for brachial plexus block with or without local anaesthetic.[2,3] Similar findings were observed with the perineural injection of morphine.[11]

Table 4: Mean duration of postoperative analgesia

Observations	Group1	Group2	P value
Mean duration of surgery(min)	72+/-26	74+/-24	>0.05
Mean duration of analgesia(min)	400±68min	685±90min	<0.01

p>0.05 =not significant; <0.01= highly significant

Suvarna et al conclude in their study that addition of fentanyl to local anaesthetics in brachial plexus block significantly prolonged the duration of analgesia without causing any significant side effect, though it had delayed the onset time of both sensory and motor blockade whereas in our study we observed that addition of fentanyl to local anaesthetics in brachial plexus cause early onset of block &prolong the duration of analgesia.

In the study of kinjal et al observed that addition of buprenorphine to local anaesthetic drug provide good post-operative analgesia. Buprenorphine significantly prolong sensory block & lengthen duration of analgesia without prolonging duration of motor block. In our study, also addition of fentanyl in local anaesthetic drug provide good post-operative analgesia.

Mays *et al*. [11] reported that perineural morphine provided longer-lasting pain relief than did either intramuscular (IM) morphine or perineural bupivacaine in patients with chronic pain. Conversely, morphine and fentanyl were reported to have had no additional effect when they were added to axillary brachial plexus block[4,5]

Racz *et al*. [5] observed that the addition of morphine to a local anaesthetic solution (a mixture of plain lidocaine and plain bupivacaine) for axillary block changed neither the onset time nor the quality of postoperative pain relief.

Fletcher *et al*. [4] suggested that the addition of fentanyl to lidocaine with 1:200,000 epinephrine for axillary brachial plexus block produced no clinical benefit except for faster onset in the musculocutaneous nerve trunk. These conflicting results are probably caused by differences in opioids, anaesthetics or techniques for nerve blockade. Most importantly, the lack of comparison between systemic and peripheral opioid administration would cause confusion as to the site of effect of the opioid.

In our study, the addition of fentanyl to local anaesthetics for brachial plexus block improved the success rate of sensory blockade

We postulate two possible mechanisms of action for the improved analgesia produced by the peripheral application of fentanyl.

Firstly, fentanyl may potentiate local anaesthetic action via central opioid receptor–mediated analgesia by peripheral uptake of fentanyl to systemic circulation.

Second, fentanyl may diffuse from the brachial plexus sheath to epidural and subarachnoid spaces and then bind with the opioid receptor of the dorsal horn, but it is unclear from this study whether a sufficient dose of fentanyl diffused to the epidural or subarachnoid spaces to cause adequate analgesia. To clarify this issue, the spinal fluid fentanyl concentrations should be measured.

Third, fentanyl act directly on the peripheral nervous system. Primary afferent tissue (dorsal roots) have been found to contain opioid binding sites [13]. Fentanyl may penetrate the nerve membrane and act at the dorsal horn. This also account for the prolonged analgesia. Fentanyl is also reported to have local anaesthetic action.

However, it is unlikely that the small dose of fentanyl (50 μg) used in our present study could have a local anaesthetic action, because a higher concentration (50 μg/mL) is required *in vitro*.[12]

In our study, the addition of fentanyl to local anaesthetics caused an early onset of analgesia and prolonged the duration of analgesia.

Conclusion

The addition of small-dose fentanyl to lignocaine solution in brachial plexus block can increase the success rate and prolong the duration of analgesia, [14] with early onset time of sensory blockade as compared with that achieved by the same doses of local anaesthetics used in combination.

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Conflict of Interest: Nil

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