ORIGINAL RESEARCH

A comparative study of effects of intrathecal levobupivacaine and bupivacaine with buprenorphine in elective lower abdominal surgeries and lower limb surgeries

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ABSTRACT
Intravenous adjuvant can sedate the patient but if the same is given intrathecally, more benefit is achieved in terms of prolongation of block and effective analgesia along with sedation. Hence they can be used in surgeries of longer durations.The practice of adding adjuvants like opioids started in the 1970's. Morphine was the first opioid used for this purpose. There are numerous studies on the use of opioid as adjuvant with intrathecal local anaesthetic. A prospective randomized controlled study was conducted on 60 patients of physical status ASA I & II, aged 20-60 years of either sex posted for lower abdominal and lower limb surgeries at Hospital. Ethical committee clearance and written informed consent of the patients were obtained before proceeding with the study. There was statistically significant ($p<0.001$)difference between the two groups regarding onset of sensory block (time to reach T10) which is prolonged in Group Y (3.9±0.5477 min) when compared to Group X (3.267±0.4686 min). The mean time taken to attain maximum sensory level is (6.63±0.964 min) in Group X and (6.6±0.932 min) in Group Y. There was no statistically significant ($p> 0.05$) difference between the two groups in relation to time taken to attain maximum sensory level. Time for maximum motor block in Group X was (5.53±1.224 min) and in Group Y was (5.83±0.913 min). There was no significant difference between the two groups in relation to time taken to attain maximum motor block.

Key words: Levobupivacaine, bupivacaine, buprenorphine

INTRODUCTION

Pain is a unique emotional experience, which is associated with actual or potential tissue damage. Postoperative pain management is necessary. The most effective pre-emptive analgesic regimens are those that are capable of limiting sensitization of the nervous system throughout the entire perioperative period. Since no single modality has been proven effective for pain relief, various drug combinations have been explored. Various adjuvants are used in subarachnoid block like opioids (morphine, buprenorphine, fentanyl) and α-agonists (clonidine). They are added to increase the duration of action, reduce the side effects and help in postoperative pain relief. The addition of different adjuvant is attractive as it is a simple and quick technique and has less chances of failure [1, 2].

Intravenous adjuvant can sedate the patient but if the same is given intrathecally, more benefit is achieved in terms of prolongation of block and effective analgesia along with sedation. Hence they can be used in surgeries of longer durations [3].

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Neuraxialtbuprenorphinetwhentusedtalongtwithtlocalt anaestheticsthavetbeentshownttothelptreducetthetrequ irementtoftlocaltanaestheticstwhiletalsothelpingtto prolong analgesia in the immediate postoperative period.Buprenorphine which is a partial μ opioid agonist and Kappa and delta antagonist is one of the most commonly used adjuvants with both bupivacaine and levobupivacaine for spinal anaesthesia [4].
There are several studies tint the past that have TN compared the anesthetic tandt recovery profiles of bupivacaine and levobupivacaine and also analyzed effects of these adjuvants to this agents individually.
Howevertthereti stlacktoftliterarytevidencetintanesthes iatpracticetthatt compares the t addition to ftthe same adjuvant to both these agents simultaneously for intrathecal anaesthesia.
In view of this we conducted a study titled "A comparative study of intrathecal levobupivacaine and bupivacaine with buprenorphine in elective lower abdominal surgeries and lower limb surgeries"with the main objectivet oft this study being the evaluation of effects following the addition of buprenorphine tot 0.5% levobupivacine and 0.5% bupivacine in patients undergoing elective lower abdominal and lower limb surgeries under spinal anaesthesia with respect to sensory blockade, motor blockade and hemodynamic effects.

METHODOLOGY

A prospective randomized controlled study was conducted on 60 patients of physical status ASA I & II, aged 20-60 years of either sex posted for lower abdominal and lower limb surgeries at Hospital.
Ethical committee clearance and written informed consent of the patients were obtained before proceeding with the study.

INCLUSION CRITERIA

1. Between the ages of 20-60 years
2. Patients posted for elective lower limb surgeries
3. ASA class I or II

EXCLUSION CRITERIA

1. Contraindications to intrathecal anaesthesia.
2. Patients with disorders of spine, alcoholic patients, cardiopulmonary diseases, BP >140/90 mmhg.
3. BMI >35 kg/m^2.
4. Height <150 cm or >180 cm.
5. History of drug abuse, collagen vascular diseases, bleeding disorders, space occupying lesions of brain.
6. Known hypersensitivity of local anaesthesia.

- Preoperative assessment was done for each patient and written informed consent was taken.
- Basic lab investigations like haemoglobin (Hb) %, fasting blood sugar (FBS) or random blood sugar (RBS), blood urea, serum creatinine and electrocardiogram (ECG) was done routinely in all patients.
- Chest X-ray was done when indicated.
- Written and informed consent was taken prior to scheduled operation. Patients were explained about the procedure of spinal anaesthesia.
- All patients were premedicated with a tablet premedication with tablet Ranitidine 150mg and tablet Diazepam 5mg orally the night before surgery.
- Anaesthesia machine, circuits, emergency drugs and equipments and monitors were checked before starting the case. The monitors used were-electrocardiogram (ECG), pulse oximetry, noninvasive blood pressure (NIBP). Invasive vascular access was secured depending on the need.
- IV line secured using 18 gauge cannula.
- Base line blood pressure, heart rate, respiratory rate and SPO2 noted.
- On arrival in the operating room, patients were preloaded with lactated ringer's solution at 15ml/kg.

The study population was divided into two groups of 30 patients in each group.
Patients were randomized into two groups on the basis of a sealed envelope technique to receive one of the following into the subarachnoid block:

GROUP X: Received 2.7 ml of 0.5% hyperbaric levobupivacaine plus 0.3 ml buprenorphine (90 mcg).

GROUP Y: Received 2.7 ml of 0.5% hyperbaric bupivacaine plus 0.3 ml buprenorphine (90 mcg).

- The patient placed in lateral position. With all aseptic precautions a skin wheal raised in L3-L4 interspace with 2 ml of 2% lignocaine
- Under asepsis, 25 G Quincke Babcock spinal needle was used to enter L3-4 interspace.
- The needle was slowly advanced until it enters the subarachnoid space, which was identified by the loss of resistance.
- Once free flow of CSF was confirmed, pre-loaded drug injections were given over approximately 10 to 15 seconds to each group as specified
- After completion of the block, patients were turned back to supine position.
- Oxygen was administrated through a mask.
- The surgeon and the observing anaesthetist were blinded to the patient groups.

RESULTS

Table 1: Characteristics of sensory and motor block

Characteristics	Group X (n=30)	Group Y (n=30)	p value
Time to T10 (min)	3.267±0.4686	3.9±0.5477	<0.001#
Time for maximum sensory level (min)	6.63±0.964	6.6±0.964	0.892
Two segment sensory regression (min)	102.67±5.208	179.03±10.915	<0.001#
Time for maximum motor block (min)	5.53±1.224	5.83±0.913	0.286

Values are in mean ± SD, *p value < 0.05 is significant, #p value < 0.001 is highly significant

There was statistically significant (*p<0.001*)difference between the two groups regarding onset of sensory block (time to reach T10) which is prolonged in Group Y (3.9±0.5477 min) when compared to Group X (3.267±0.4686 min).

Table 1 also shows that the mean time taken to attain maximum sensory level is (6.63±0.964 min) in Group X and (6.6±0.932 min) in Group Y. There was no statistically significant (*p> 0.05*) difference between the two groups in relation to time taken to attain maximum sensory level.

Time for maximum motor block in Group X was (5.53±1.224 min) and in Group Y was (5.83±0.913 min). There was no significant difference between the two groups in relation to time taken to attain maximum motor block.

The mean time taken for two segment sensory regression is (102.67±5.208 min) in Group X and (179.03±10.915 min) in Group Y. There is a highly statistically significant (*p<0.001*)difference between the groups with faster regression of sensory block in Group X (Graph 3).

Table 2: Maximum level of *sensory* block attained

		Group X (n=30)	Group Y (n=30)
Maximum sensory level	T_6	0	13 (43.3%)
	T_8	20 (66.7%)	17 (56.7%)
	T_{10}	10 (33.3%)	0

Maximum level of sensory block attained between the groups is shown in Table 2 According to results, Group X 66.7% (20/30) and in Group Y 56.7% (17/30)attainedmaximumlevelofsensoryblockatT_8.

Group Y had 13 cases which attained T6 as maximum level of sensory block as compared to nil in levobupivacaine + buprenorphine group.

Table 3: Duration of sensory and motor block

Characteristics	Group X (n=30)	Group Y (n=30)	p value
Time to S2 (min)	199.5±16.679	373.67±13.954	<0.001#
Duration of motor block(min)	172.5±9.537	336.93±6.297	<0.001#

Values are in mean ± SD, *p value < 0.05 is significant, #p value < 0.001 is highly significant

The mean duration of sensory block to reach S2 indicating the duration of analgesia is (199.5±16.679 min) in Group X and (373.67±13.954 min) in Group Y, shows statistically highly significant (*p< 0.001*) difference between the groups regarding the duration of analgesia.

There was statistically significant (*p< 0.001*) difference between the two groups regarding duration of motor block with mean duration of motor block in Group X being (172.5±9.537 min) and (336.93±6.297 min) in Group Y.

Table 4: Comparison of VAS between two groups

Time (min x 10)	Group X (n=30)	Group Y (n=30)	p value
7	2	2.03±0.183	0.326
9	2.23±0.43	2.1±0.305	0.172
11	2.23±0.43	2.4±0.498	0.171
13	2.37±0.49	2.63±0.49	0.039*
15	2.6±0.498	2.7±0.466	0.425
17	2.83±0.592	2.77±0.43	0.62
19	2.63±0.765	2.07±0.254	<0.001#
21	2.67±0.758	2.07±0.254	<0.001#
24	2.4±0.621	2.07±0.254	0.01#
27	2.23±0.43	2.07±0.258	0.08
30	2.23±0.43	2.07±0.254	0.074
42	2.7±0.651	2.83±0.791	0.479

66	2.43±0.504	2.67±0.661	0.131
90	2.37±0.49	2.47±0.681	0.517
114	2.2±0.407	2.3±0.466	0.38
138	2.2±0.407	2.23±0.43	0.759
144	2.2±0.407	2.17±0.379	0.744

Values are in mean ± SD, *p value < 0.05 is significant, #p value < 0.001 is highly significant

The highest VAS value in Group X (2.83±0.592) was seen at 170 min and in group Y (2.83±0.791) on 420 min. There was statistically significant (*p<0.05*)difference in VAS between two groups at following time intervals-130 min, 190 min, 210 min and 240 min. Highly significant (*p<0.001*)difference was noted at 190 min and 210 min intervals wherein Group X showed higher VAS than Group Y. Overall Group X had higher VAS value as compared to Group Y.

Table 5: Adverse effects

Adverse effects	Group X	Group Y
Nausea	5 (45.5%)	4 (40.0%)
Shivering	6 (54.5%)	6 (60.0%)

DISCUSSION

This prospective, double blinded study has shown that addition of 90 mcg (0.3 ml) of buprenorphine to 2.7 ml of 0.5% levobupivacaine and 0.5% bupivacaine is an effective regimen for lower abdominal and lower limb surgeries under subarachnoid block. The duration of analgesia was significantly ($p<0.05$) better in the levobupivacaine with buprenorphine group, with similar hemodynamic effects and without significant adverse effects when compared to the bupivacaine with buprenorphine group.

Demographic data with respect to age distribution, ASA status and duratiojn of surgery were similar in both the groups and was not statistically significant.

Karaca *et al.* [5], conducted a study on 60 patients undergoing caesarean section under subarachnoid block and evaluated the addition of 20mcg fentanyl to 0.5% levobupivacaine and 0.5% bupivacaine and found that the motor blockade disappeared earlier in the group that received levobupivacaine with fentanyl and this ensured early mobilization. In our study also, the levobupivacaine with buprenorphine group had good motor blockade and prolonged analgesia. However it was found to be statistically significant ($p<0.001$).

In another study by Glasser *et al.*[6] the onset time of sensory block was found to be 11±6 minutes in the 3.5 ml of 0.5% isobaric levobupivacaine group and 13±8 minutes in the 3.5 ml of isobaric 0.5% bupivacaine group, and they reported that there was no statistically significant difference between them.

Lee *et al.* [7] measured the time to reach T10 as 10±6 minutes for levobupivacaine, and 8±4 minutes for bupivacaine in urologic surgeries using 2.6 ml of isobaric levobupivacaine and bupivacaine with fentanyl, and reported that there was no statistically significant difference between them. In our study, it was found that there was statistically significant (*p<0.001*)difference between the two groups regarding onset of sensory block (time to reach T10) which is prolonged in Group levobupivacaine with buprenorphine (3.9±0.5477 min) when compared to Group bupivacaine with buprenorphine (3.267± 0.4686 min).

In the present study, time for maximum motor block in Group bupivacine with buprenorphine was (5.53±1.224 min) and in Group levobupivacine with buprenorphine was (5.83±0.913 min). There was no significant difference between the two groups in relation to time taken to attain maximum motor block. This was compared with Camorcia *et al.* [8] in their randomized controlled study did not find any difference in the motor levels between levobupivacaine, bupivacaine and ropivacaine.

A study conducted by Akan *et al.* [9] in patients undergoing TURP under intrathecal anaesthesia with low dose of levobupivacaine with fentanyl and sufentanil demonstrated a faster onset of sensory block, reduced duration of motor blockade with prolonged sesnsory analgesia in the postoperative period. Similar findings were noted in our study but there was prolonged motor blockade [10].

CONCLUSION

Based on the study, we conclude that both levobupivacaine with buprenorphine and bupivacaine with buprenorphine regimes were effective in providing surgical anaesthesia, but levobupivacine with buprenorphine group offered an advantage of improved degree of motor block and prolonged duration of sensory block, with less side effects.

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