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Original Research Article

A Study of Effectiveness of Thoracic Intrathecal Isobaric Inj. Levobupivacaine with Inj. Buprenorphine as an Adjuvant in Laparoscopic Appendicectomy

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Conflict of interest: Nil

Abstract:

Background: Subarachnoid blockade amongst regional anesthesia has been most commonly used for performing abdominal and umbilical surgeries. There is persistent search for finding an adjuvant to local anesthetics to prolong its action along with hemodynamic stability. In this study we have used Buprenorphine as an adjuvant to local anaesthetic agent and have assessed its ability to prolong motor and sensory blockade and hemodynamic stability along with adequate postoperative analgesia.

Materials and Methods: This observational study was conducted on 50 patients of ASA grade I/II, undergoing Laparoscopic appendicectomy surgery. Inj. Levobupivacaine isobaric (0.5%) 2ml along with inj. Buprenorphine 60mcg (0.2ml) as an adjuvant was given intrathecally inT8- T9/T9- T10. We have studied following parameters: onset and duration of sensory and motor blockade, hemodynamic changes, duration of analgesia and complications in patients.

Result: Onset of sensory block at T4 level was 2.0±1.0 min and total time of regression of sensory blockade was 180±8.0 min. onset of motor blockade 4.50±0.5 min and total duration of motor blockade 90.0±1.0 min. There were minimal changes in hemodynamic parameters with postoperative analgesia lasting 210±8 minutes.

Conclusion: This study shows that the addition of Buprenorphine to Intrathecal isobaric levobupivacaine is safe as it maintains hemodynamic stability without producing excessive side effects. Buprenorphine as adjuvant prolongs the duration of postoperative analgesia and the request for first rescue analgesics.

Keywords: Isobaric Levobupivacaine, Buprenorphine, Thoracic Spinal Anesthesia, Analgesia.

Introduction

General anaesthesia is a method of choice till now for laparoscopic abdominal surgeries so as to prevent aspiration, shoulder tip pain, respiratory complications, and hypercarbia due to pneumoperitoneum with carbon dioxide. General anaesthesia is disadvantageous in terms of multiple systemic drug side effects, longer recovery time, no post-operative pain coverage, safety, longer duration of hospital stay and cost.[1]

Neuraxial block is advantageous as of having lower post-operative pain, less post-operative nausea vomiting, early ambulation and early recovery as compared to general anaesthesia. Spinal anaesthesia can be given in lumbar as well as thoracic intervertebral space for lower limb and abdominal surgeries.

Thoracic segmental spinal anaesthesia is an emerging technique used for laparoscopic abdominal surgeries making it possible for surgeons to discharge the patient same day as in day care surgeries Intrathecal opioids as additives enhance the blockade of local anesthetics without affecting the sympathetic activity and also provide post-

operative analgesia thereby reducing other drug requirements for pain control. [2]

Levobupivacaine is the S (–) -enantiomer of bupivacaine, an amino-amide local anaesthetic drug. It is strongly bound to plasma proteins with high clearance rate and shorter half-life as compare to enantiomer (R+). Levobupivacaine cause less systemic cardiotoxicity, lower incidence of central nervous system and cardiovascular toxicity. It blocks nerve conduction in sensory and motor nerves mainly by interacting with voltage sensitive sodium channels on the cell membrane.[3]

Although intrathecal levobupivacaine alone offers good sensory blockade, a substantial number of patients experiences some pain and discomfort and may require analgesic supplements intraoperatively. Addition of Opioids not only improves quality of intraoperative anesthesia but it also extends the duration of postoperative period analgesia.

Buprenorphine is a mixed agonist-antagonist narcotic with high affinity agonist effect in μ opiate receptors and antagonist effect at κ opiate receptors. This opioid with low intrinsic activity can also be administered safely in the subarachnoid space. It has a high molecular weight and lipophilicity which may prevent its cephalad spread. Buprenorphine not only prolongs the duration of anesthesia but also provides adequate postoperative analgesia with minimal side effects.[4]

Materials and Method:

Prospective observational, randomized double blinded study was done for period of 6 months on 50 patients of ASA physical status I and II in age group of 18 to 65 years of either sex in C U Shah medical college and hospital, Surendranagar, Gujarat. After obtaining permission from Institutional ethical committee and written and informed consent was taken from patients scheduled for elective Laparoscopic appendicectomy surgeries under thoracic spinal anesthesia.

Patients who refused from taking part in the study, who had contraindication for subarachnoid block, ASA Grades ≥ III patients, allergy to local anesthetic agents, hemodynamic instabilities, significant cardiovascular, renal, hepatic dysfunction or morbidly obese patients were excluded from study

We hereby report the use of thoracic segmental spinal anesthesia with isobaric Inj. Levobupivacaine (0.5%) 2ml with Inj. Buprenorphine 60mcg (0.2ml) in 50 patients undergoing for Laparoscopic appendicectomy.

All patients were explained about the procedure during pre-anaesthetic checkup. Informed written consent was taken. All were explained about the effect of the procedure and also the possibility of conversion into general anesthesia if they were unsatisfied with spinal anaesthesia at any time during the procedure. The patients was kept nil orally for at least 6hrs prior to the surgery. Inj. ondansetron 4mg i.v and Inj. Glycopyrrolate 0.2mg i.v half an hour before the surgery was administered. On arrival to the operation theatre, following insertion of an 18-G venous cannula, 500mL of Ringer Lactate was infused to the patient before spinal anaesthesia. Standard monitors like ECG, Non-invasive Blood Pressure and SpO2 probe were attached and baseline heart rate, blood pressure, oxygen saturation were recorded. With the patients in sitting position, we performed a dural puncture at T8- T9/T9-T10subarachnoid space through a median approach with a 25 G Quincke needle. Free flow of CSF confirmed the position of the needle into the subarachnoid space. Injection isobaric Levobupivacaine 0.5% 2ml with Buprenorphine 60 mcg(0.2ml) was used for spinal anesthesia. After the spinal injection, the patients were placed in a supine position, The T4 dermatome level (tested by pinprick at 1-minute intervals) was targeted for the spinal block.

Result

In our observational study all patients posted for laparoscopic appendicectomy at C. U. Shah medical college was evaluated. 50 patients who came under the inclusion criteria were selected for segmental spinal anesthesia. Isobaric Inj. Levobupivacaine (0.5%) 2.0 ml + inj. Buprenorphine 60 mcg (0.2 ml) is given in T8-T9/T9-T10 intervertebral space.

Table 1: Demographic and Specific Characteristics

	Mean±SD
Age(yrs.)	29±7.0
Weight(kg)	52.2±3.0
ASA(I/II)	42/8
Sex(F/M)	29/21

It was observed that, the mean age for male and female was 29±7yr. The overall average weight in our study was 52.2±3.0 kg in our study male was 42% and female was 58%. The average duration of surgery was 35 min.

Table 2: Upper and Lower level of sensory blockade

	Level	Number	Percentage (%)
upper level of sensory block	T4	45	90.0%
	T6	5	10.0%
Lower level of sensory block	L2	26	52.0%
	L3	22	44.0%
	L4	2	4.0%

Table 2 show upper level of sensory block T4 & T6 was obtained in 45 & 5 patients, lower level of sensory block L2, L3 & L4 was obtained in 26, 22 & 2 patients. Maximum no. of patients achieved adequate upper level of sensory block -T4 & Lower level of sensory block –L2.The dermatome level of analgesia achieved was satisfactory in all patients0. Onset of sensory block at T4 level was 2.0±1.0 min and total time of regression of sensory blockade was 180±8.0 min.

Table 3: Characteristics of Motor Blockade

Motor blockade	Min (Mean±SD)
Onset of motor block (min)	4.50±0.5
Time for regression of motor blockade (min)	90.0±1.0
Motor block before surgery (Modified bromage score)	1.40±0.20
Motor block after surgery (Modified bromage score)	0.90±0.20

Table 3 shows onset of motor blockade 4.50±0.5 min and total duration of motor blockade 90.0±1.0 min. Motor block before surgery (by modified bromage scale)1.40±0.20. Motor block after surgery (by modified bromage scale) was 0.90±0.20.

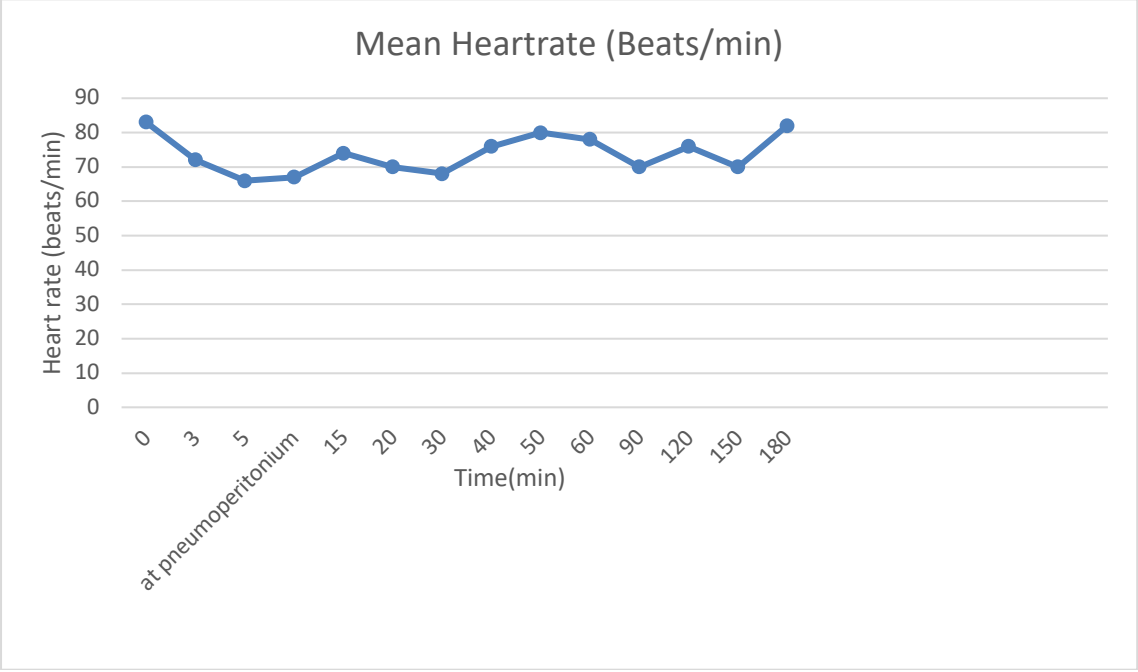

Figure 1:

Figure 1shows intraoperative changes in mean heart rate at different time interval. There is decrease in heart rate 66.2±5.7 (/min) after segmental spinal anaesthesia & 67.0±3.5 (/min) after CO2 insufflations from the mean baseline heart rate of 83.0±7.8 min which was increased again after deflation. There is no significant change in mean heart rate in our study.

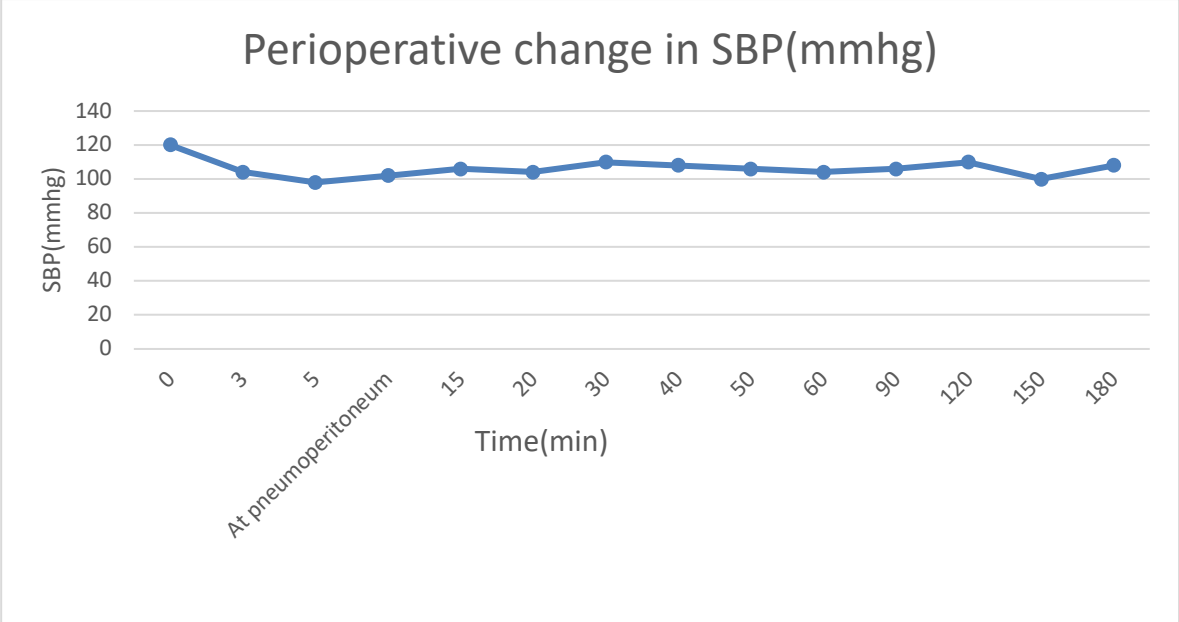

Figure 2:

Figure 2 shows Perioperative changes in mean SBP±SD (mm hg). Intra operative systolic pressure shows a decline to 98.8±2.8 mmhg from baseline 120.7±8.5 mm hg after segmental spinal anesthesia & after co2 insufflations 102.9±5.1mmhg. There is no significant change in systolic blood pressure in our study.

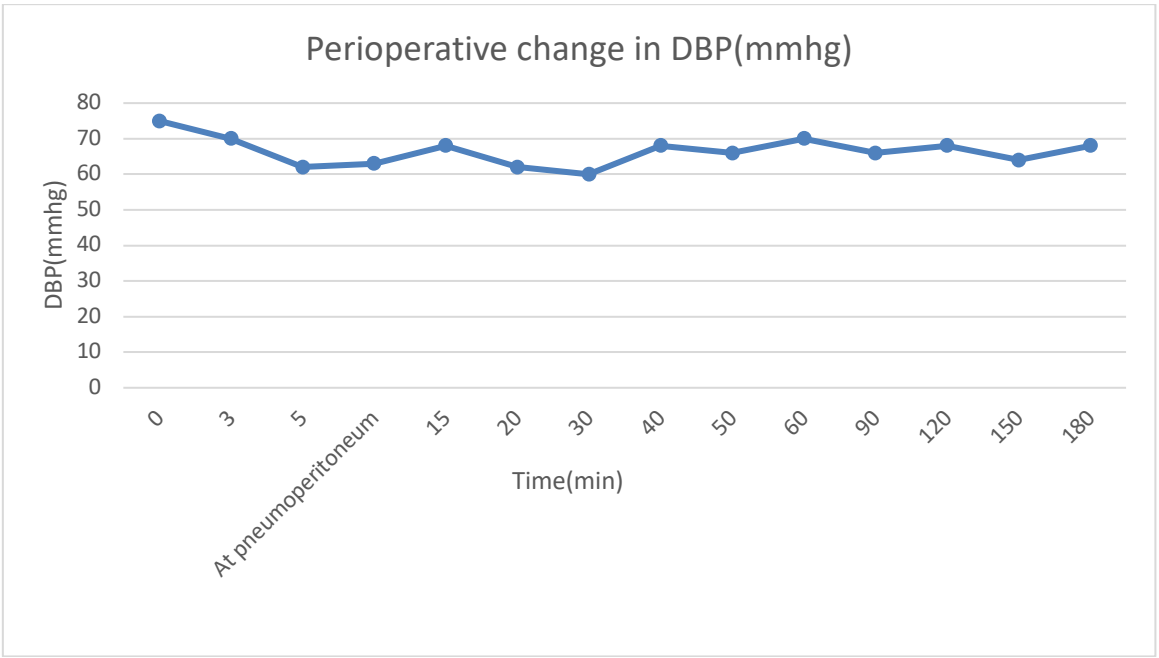

Figure 3:

Figure 3 shows the intra operative mean diastolic pressure changes. The baseline diastolic blood pressure was 75.7±5.5 mmHg which was decreased after segmental Spinal anesthesia to 62.3±4.6 mmHg and persisted afterCO2 insufflation at a level of 63.8±4.0 mmHg. There is no significant change in diastolic blood pressure in our study

Table 4: Peri-Operative & Post-Operative Complications

Complications	Number
Bradycardia	4
Hypotension	9
Shoulder tip pain	3

Nausea /vomiting	3
Respiratory depression	2
Inadequate block converted to General Anesthesia	1

In our study 9 patients had hypotension and were treated with inj. Mephentermine 6 mg and of 4 of patients had bradycardia and were treated with inj. Atropine 0.6 mg IV. 3 of patients had shoulder tip pain and were treated with Inj. Dexmedetomidine (0.5 mcg/kg/hr. -maintenance dose) with or without ketamine (0.5 mg/kg) was administered intravenously. 3 patients with nausea and vomiting were treated with Inj metoclopramide 10 mg, 2 patients with fall of oxygen saturation below 90% were given oxygen supplementation at 4L/min and one patient had to be supplemented with general anesthesia. Rest of them did not have any complaints.

Postoperative pain score was 1.30±0.4 at 1st hr after surgery, 2.32±0.7 at 2hr, 3.06±0.8 at 4hr and 3.6±0.6 at 6hr after surgery.

Discussion:

There is greater risk of injuring the spinal cord if spinal is given above L1. The anatomy of the thoracic spinal canal with magnetic resonance imaging (MRI) in 50 patients were studied and concluded that there is low incidence of neurologic complications during thoracic anaesthesia segmental neuraxial [5].The depth of the posterior subarachnoid space at the mid-thoracic levels is greater than the depth at lumbar and upper thoracic levels.

This indicates that we can give anaesthetic drug intrathecally avoiding spinal cord contact in the thoracic region. Some hemodynamic changes occur even in thoracic segmental spinal anaesthesia but these changes are comparatively less than lumbar spinal anaesthesia because here we used small amount of drug and due to which dilution concentration of drug decreases and therefore chances of hemodynamic changes are less. [6,7]

There are certain high risk cases where the chance of morbidity mortality are high and the need for postoperative ventilator support. In such cases this technique can be used safely. This technique has many advantages like Post-operative analgesia, which reduces the use of opioid for post-operative pain reducing their side effects, maintain spontaneous breathing, and the advantage of remaining conscious throughout the procedure decreases the postoperative cognitive dysfunction.

There is earlier recovery of gastric motility and better postoperative pain cooperative pain control. As there is no need for post-operative ventilator for patient the duration of hospital stay can be decrease, unnecessary sedation or paralysis for ventilator, and burden of cost to patient is decreased.[8,9].Neuraxial anaesthesia has the advantage of inhibiting the neuro endocrine stress response and since there is no pain postoperatively the need for opioid analgesia is decreased.

Onset and duration of sensory Blockage:

In our study, we gave isobaric inj. Levobupivacaine (0.5%) 2 mL with inj. Buprenorphine 60 mcg intrathecal at T8-T9 T9-T10 level. In our study onset of sensory blockade at T4 level was 2.0 ±1.0 min. I Time to regression of sensory blockade was 180±8 min.

Khan et al study regarding Comparison of intrathecal fentanyl and buprenorphine in urological surgeries showed that the mean time for the sensory block to reach T10 dermatomal level was 3.2 ± 2 minutes in fentanyl-bupivacaine group versus 4.3 ± 1 in buprenorphine-bupivacaine and 4.5±2 bupivacaine alone group. The duration of sensory block was significantly longer in buprenorphine-bupivacaine group.[10]

Onset and Duration of Motor Blockage:

In our study onset of motor blockade at L2 level was 4.5 ±0.5 min. Modified bromage score before surgery was 1.4±0.2. Time to regression of motor blockade was 90 ± 1.0 min. Modified bromage score after surgery was 0.9±0.2.

Dr. Deepa T el at (2018) found in her study that onset of motor blockade with buprenorphine as an adjuvant to Levobupivacaine was 3-5 min that was almost similar to our study. [11] Pal et al study on Intrathecal Buprenorphine, Clonidine and Fentanyl as Adjuvants to 0.5% Hyperbaric Bupivacaine in Lower Abdominal and Lower Limb Surgeries showed that Buprenorphine is another opioid which increases sensory block without affecting motor block and haemodynamics.[12]

Duration of Analgesia:

In our study, mean duration of analgesia was 210±8 min. Rescue analgesia was given when VAS Score more than 4. Safiya et al showed in the study of 0.5% bupivacaine with buprenorphine showed that 1 μg/kg Buprenorphine to a maximum of 50 μg when added to 15 mg of 0.5% heavy Bupivacaine intrathecally provides analgesia for 476.6±93.7 minutes [13]

Hemodynamics changes:

There is minimal change in systolic blood pressure in our study. The baseline diastolic blood pressure was 75.7±5.5 mmHg which decreased after segmental Spinal anesthesia to 62.3±4.6mmHg and persisted after CO2 insufflation at a level of

63.8±4.0 mmHg. There is minimal change in diastolic blood pressure in our study. The baseline mean blood pressure was 90.4±5.6 mmHg which decreased after segmental spinal anesthesia to 75.1±5.1mmHg.

Capogna et al study on Spinal buprenorphine showed that heart rate and arterial blood pressure remained within the physiological range during the observation time and there were no significant differences in either base excess or mean oxygen tension and oxygen saturation among the groups [14] Khan et al study regarding Comparison of intrathecal fentanyl and buprenorphine in urological surgeries showed that Vasopressor was not required intra or in immediate postoperative period in any patient.

Atropine was not needed for treatment of bradycardia. No episode of desaturation (SaO2 falling below 92%) was seen.[11]

Side effects:

In our Study Bradycardia, Hypotension, Shoulder tip pain, Nausea and vomiting, Respiratory Depression and Inadequate block were observed in 4,9,3,3,2,1 patients respectively Thus complications were not much significant hence proving good efficacy of buprenorphine intra operatively as well as post operatively.

Capogna et al study on Spinal buprenorphine for postoperative analgesia after caesarean section showed that the mean respiratory rate in all three groups during the first 12 hours after surgery did not differ significantly and remained within the physiological range; it transiently decreased below 10 breaths/minute in one patient in group C but required no treatment. No further problems were encountered postoperatively [14]

Conclusion:

This study shows that the addition of Buprenorphine to Intrathecal isobaric levobupivacaine is effective and it maintains hemodynamic stability without producing excessive side effects.

Buprenorphine as adjuvant prolongs the duration of postoperative analgesia and the request for first rescue analgesics. The patient's well-being was satisfactory. Further studies to validate our findings recruiting larger patient population is considered essential**.**

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