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CONTINUOUS EPIDURAL INFUSION OF LEVOBUPIVACAINE AND FENTANYL VERSUS CONTINUOUS EPIDURAL INFUSION OF ROPIVACAINE AND FENTANYL FOR POSTOPERATIVE ANALGESIA IN LOWER ABDOMINAL SURGERIES- A COMPARATIVE EVALUATION

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Abstract:

Background and aim: Postoperative pain is a distressing symptom which delays recovery of the patient and increases morbidity. Epidural infusion of local anaesthetic in combination with fentanyl is considered as the gold standard for control of postoperative pain. The present study is aimed at comparing the analgesic efficacy of epidural infusion of 0.125% ropivacaine with fentanyl and 0.125% levobupivacaine with fentanyl in patients undergoing lower abdominal surgeries.

Methodology: 60 patients undergoing elective intra-abdominal surgery were randomly allocated into two groups with 30 patients in each group. Group A received initial bolus dose of 5 ml of 0.125% ropivacaine with fentanyl 1 mcg/ml followed by epidural infusion of 0.125% Ropivacaine and fentanyl 1 mcg/ml at a rate of 8 ml/hr. Group B received initial bolus dose of 5 ml of 0.125% Levobupivacaine with fentanyl 1 mcg/ml followed by epidural infusion of 0.125% Levobupivacaine with fentanyl 1mcg/ml at a rate of 8 ml/hr. Postoperative pain was assessed using visual analogue scale (VAS) score and total volume of local anaesthetic consumed, need

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for rescue bolus doses, incidence of motor blockade and side effects were observed in both the groups.

Results: Postoperative VAS score at 0,1,3,6,12,18 and 24 hrs was comparable in both the groups. Volume of local anaesthetic infusion needed and need for rescue bolus doses was significantly more in ropivacaine group. Incidence of motor blockade, pruritus, nausea, vomiting and hypotension was comparable in both the groups.

Conclusion: Epidural infusion of both 0.125% ropivacaine with fentanyl and 0.125% levobupivacaine with fentanyl are equally effective for control of postoperative pain in patients undergoing elective lower abdominal surgeries.

INTRODUCTION:

Uncontrolled postoperative pain may produce a range of detrimental acute and chronic effects. Postoperative epidural analgesia is an effective and well accepted modality o f pain relief techniques after abdominal or lower extremity surgeries, which improves patient outcome facilitates early mobilization and hastens postoperative recovery. Analgesia delivered through an indwelling epidural catheter is a safe and effective method for the management of acute postoperative pain[1]. Epidural infusion of local anaesthetics alone or combined with opioids may be used for postoperative analgesia.

Ropivacaine, a pure S enantiomer is a newer local anaesthetic with lower cardiac and central nervous system toxicity and produces less motor blockade than bupivacine. Levobupivacaine is a pure S-enantiomer of racemic bupivacaine[2], and has a better safety profile compared to racemic bupivacaine. Opioids are combined with local anaesthetics so that dilute concentration of local anaesthetics can be used, thus decreasing lethal adverse effects they would cause if used individually at a higher concentration.

The present study is to compare postoperative analgesia with an epidural infusion of ropivacaine 0.125% with fentanyl versus levobupivacaine 0.125% with fentanyl in patients undergoing elective lower abdominal surgeries.

OBJECTIVES: To compare the effectiveness of postoperative analgesia with a continuous epidural infusion of ropivacaine 0.125% with 1mcg/ml Fentanyl versus levobupivacaine 0.125% with 1 mcg/ml Fentanyl in patients undergoing lower abdominal surgeries regarding:

- Hemodynamic changes like heart rate and blood pressure.
- Side effects like hypotension, nausea, vomiting, pruritis, urinary retention.
- Any residual motor blockade.

METHODOLOGY: 60 patients undergoing elective intra-abdominal surgery were randomly allocated into two groups with 30 patients in each group. Group A received 0.125% Ropivacaine with Fentanyl 1mcgg/ ml at the rate of 8 ml/ hour infusion for 24 hours epidurally and group B received 0.125% Levobupivacaine with Fentanyl 1 mcg/ml at the rate of 8 ml/ hour for 24 hours epidurally.

Inclusion criteria: Patients belonging to ASA grade 1 & 2, between the age 18 and 60 years posted for elective intra-abdominal surgeries.

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Exclusion criteria: Patient refusal, patients belonging to ASA grade 3 and 4, infection at the site of injection, patients with coagulation abnormalities, hypersensitivity to local anaesthetics, neurological or neuromuscular diseases.

All patients received tab. Ranitidine 150 mg and tab. Alprazolam 0.5 mg at bed time the day before surgery. On the day of surgery, written informed consent was obtained from the patient. Inj. Ondansetron 0.08 mg/kg IV and inj. Pantoprazole 40 mg IV was administered as premedication. ASA standard monitors were connected to the patient and fluid preloading was done with 500 ml of Ringer's lactate. Under all aseptic and antiseptic precautions, epidural space was located at L2-L3 interspace using 18G Tuohy needle and 18G epidural catheter was inserted and secured. Subarachnoid block was achieved by injecting 3.25 ml of 0.5% hyperbaric bupivacaine hydrochloride into L3-L4 interspace. Surgery was performed under spinal anaesthesia. Postoperatively, after regression of motor block to Bromage score of 0, patients were randomly allocated using computer generated random numbers into one of two study groups,

Group A received initial bolus dose of 5 ml of 0.125% ropivacaine with fentanyl 1 mcg/ml followed by epidural infusion of 0.125% Ropivacaine and fentanyl 1 mcg/ml at a rate of 8 ml/hr

Group B received initial bolus dose of 5 ml of 0.125% Levobupivacaine with fentanyl 1 mcg/ml followed by epidural infusion of 0.125% Levobupivacaine with fentanyl 1mcg/ml at a rate of 8 ml/hr

Post-operatively, the patient's vital signs were monitored continuously, analgesia was assessed every hour using the visual analogue scale (VAS) (0-no pain to 10-maximum pain). Epidural top-up of 5 ml of study solution was administered as required for breakthrough pain. VAS scores were recorded at the initiation of infusion, one hour, 3 hours, 6hours, 12hours, 18hours, and 24hours.

STATISTICAL ANALYSIS:

Data was entered in Microsoft Excel sheet and analysis was done using IBM SPSS statistics software version 21.0. Continuous data were expressed as mean ± SD and association between two groups were tested using Student t-test (two-tailed, independent). Qualitative data was tested using Fisher's exact test. Significance assessed at a probability of a 5% level. If the probability value is less than 5% ($p<0.05$), there is evidence to reject the null hypothesis, the two means are significantly different at the significance level reported by the p-value, and if the probability value is more than 5% ($p>0.05$), null hypothesis will be accepted to say two means are not different.

OBSERVATIONS AND RESULTS:

Demographic data and duration of surgery was comparable in both the groups with (table 1).

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Table 1: Demographic data and duration of surgery:

	Group A (n = 30)	Group B (n = 30)	P value
Age (in years)	37.5±6.9	39.1±7.2	0.383
Sex (M/F)	21/9	23/7	0.771
Body mass index (BMI)	24.9±3.8	25.8±3.6	0.35
Duration of surgery (in minutes)	95.6±10.6	98.6±9.8	0.259

The type of surgeries in which the study was carried out are depicted in table 2.

Table 2: Types of surgeries

Type of surgeries	Group A	Group B
Open appendectomy	18	17
Incisional hernia repair	12	13

Baseline VAS score and VAS score after 1 hr,3 hrs, 6 hrs, 12 hrs, 18 hrs and 24 hrs of infusion was comparable in both the groups (table 2). Following initiation of epidural bolus and infusion of the study drug, VAS score decreased in both the groups.

Table 3: VAS scores at different time intervals in the two groups

Time	Mean VAS score		p-value
	Group A	Group B	
0 hour	7.27±0.44	7.17±0.37	0.345
1 hour	3.03±0.91	2.93±0.63	0.622
3 hours	1.83±0.86	1.7±0.74	0.532
6 hours	1.37±0.44	1.34±0.60	0.826
12 hours	1.4±0.66	1.3±0.58	0.535
18 hours	1.37±0.55	1.23±0.49	0.302
24 hours	1.9±0.63	1.8±0.52	0.505

Changes in mean arterial pressure (MAP) and heart rate were comparable in both the groups (table 4).

Table 4: Changes in MAP in both the groups

Mean Arterial Pressure in mmHg				Herat rate – beats/minute		
Time	Group A	Group B	P value	Group A	Group B	P value
0 hour	84.1±7.10	83.2±7.66	0.638	89.8±6.42	91.5±5.93	0.291
1 hour	76.8±8.59	75.6±7.45	0.565	86.2±6.23	87.5±5.93	0.411

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3 hours	74.7±8.27	75.1±6.09	0.832	84±6.28	85.2±5.97	0.451
6 hours	77.4±7.18	76.6±8.21	0.689	79.6±6.21	81.1±5.86	0.340
12 hours	75.4±10.4	74.3±7.66	0.642	76.8±6.42	78.5±5.93	0.291
18 hours	76±9.80	74.8±8.72	0.618	74.8±6.42	76.5±5.93	0.291
24 hours	76.7±8.8	75.8±9.2	0.7	78.9±6.8	77.8±7.4	

Motor Blockade: In group A, none of the patients experienced a motor blockade, but in group B 6.7% experienced mild motor weakness of lower limb. The difference in the number of patients who experienced motor blockade between the groups is not significant statistically after testing with Fischer exact test. ($p>0.05$)

Complications observed: Complications after the block in group A were nausea and vomiting (6.67%), hypotension (3.33%), and urinary retention (3.33%), and in group B were nausea and vomiting (3.33%), hypotension (6.67%) and urinary retention (6.67%). On comparing the two groups with chi-square tests with Yates correction, two groups were not showing any significant difference in causing any of the complications mentioned. ($p>0.05$)

Table 5: Motor block and Postoperative complications:

Complications		Group A	Group B	p-value
Motor block	Present	0 (0%)	2 (6.7%)	0.491
	Absent	30 (100%)	28 (93.3%)	
Nausea & Vomiting		2 (6.67%)	1 (3.33%)	1
Hypotension		1 (3.33%)	2 (6.67%)	1
Pruritus		0 (0%)	0 (0%)	-----
Urinary retention		1 (3.33%)	2 (6.67%)	1

Amount of local anesthesia consumed: In group A, a total amount of 218.7 ± 36.8 ml of local anesthesia was given. In group B, a total amount of 186.7 ± 33.0 ml of local anesthesia was given. Group A required a significantly higher amount of local anesthesia than group B.

($P = 0.0007$).

Total number of boluses required: In group A, a total of 2.17 ± 0.78 boluses were required, and in group B, a total of 1.3 ± 0.46 boluses were required. Group A required a significantly higher number of boluses than group B. ($p<0.0001$)

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Table 6: Total volume of local anaesthetic consumed and no,of rescue bolus doses administered

	Group A	Group B	P value
Volume of local anaesthetic consumed (in ml)	218.7 ± 36.8	186.7 ± 33.0	0.0007
Number of boluses required	2.17 ± 0.78	1.3 ± 0.46	<0.0001

DISCUSSION

Epidural analgesia with local anaesthetics is one of the most effective techniques used for postoperative pain relief and may improve patient outcome. Although the combination of epidural opioid with local anaesthetic is known to provide superior analgesia in the postoperative period, very few studies have evaluated epidural 0.125% ropivacaine in combination with fentanyl for postoperative analgesia

R Whiteside et al [3] conducted a study on the effect of volume and concentration of epidural ropivacaine with fentanyl in treating post-operative pain following gynaecological oncology surgery. They found that low concentration ropivacaine 0.1% with low dose fentanyl 1mcg/ml appears satisfactory in providing postoperative analgesia. So, we have used 0.125% ropivacaine with fentanyl 1 mcg/ml in the present study.

Levobupivacaine, the pure S enantiomer of bupivacaine possess similar local anaesthetic potency to the racemic parent bupivacaine, but with reduced cardiac and central nervous system toxicity.[4,5]. Epidural infusion of levobupivacaine provides excellent anaesthesia and analgesia in clinical practice.[6,7] Continuous epidural infusion of levobupivacaine with or without morphine has been shown to provide adequate postoperative analgesia in patients undergoing major abdominal surgery[8]. However, continuous epidural infusion of 0.25% levobupivacaine could result in a higher incidence of untoward effects, particularly motor block than 0.125% or 0.0625% levobupivacaine[9].

Decreasing the concentration of levobupivacaine can reduce the incidence of side effects[9]. However, decreasing the concentration of levobupivacaine might also decrease the efficacy of analgesia and increase the consumption of narcotic agents for postoperative pain management. The ideal combination of levobupivacaine and narcotic agent should balance these two extremes and provide satisfactory analgesia with few sides effects[10]. In the present study, we chose 0.125% levobupivacaine because due to less incidence of motor blockade[11].

DA Scott et al[12] conducted a study of comparison of epidural ropivacaine infusion alone and in combination with 1, 2, and 4 mg/mL Fentanyl for 72 hours of postoperative analgesia after major abdominal surgery. They reported that opioid-related side effects were predictably more common with 2 µg/ml and 4 µg/ml group patients with pruritus and nausea being most frequently reported[13]. In the present study, we chose 1µg/ml Fentanyl, and the incidence of pruritus was low in our study. In the present study, we compared between 0.125% ropivacaine

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and 0.125% levobupivacaine with Fentanyl as a continuous epidural infusion for postoperative analgesia in the lower abdominal surgeries.

In the present study, VAS scoring was matched and was similar among the two groups before the start of 24 hours of epidural infusion. It was found that 0.125% ropivacaine provided equal analgesia compared with 0.1% levobupivacaine.

Lee WK et al[14] conducted a randomized, double-blinded comparison between Ropivacaine 0.1% with and without Fentanyl for post-operative epidural analgesia. They observed that visual analogue scale score for pain relief with an epidural infusion of 0.1% ropivacaine was higher compared to 0.1% ropivacaine with fentanyl.

Changes in heart rate were similar in both the groups, and no statistically significant difference was found. This may be due to the sub anaesthetic concentration of local anaesthetics and low dose fentanyl used in the present study. Ansari et al[15] found no statistically significant difference in heart rate similar to our study.

In the present study, we found no significant difference in systolic and diastolic blood pressure during the 24-hour infusion of ropivacaine with fentanyl and levobupivacaine with fentanyl. Ansari et al[15] found no significant difference in systolic and diastolic blood pressures during infusion of ropivacaine and levobupivacaine.

In the present study no motor block was seen in group A, and two patients in group B had mild motor weakness and the difference was not statistically significant. Senard et al[16] observed no patient had a motor block in levobupivacaine with morphine group. E. Sitsen et al [17] found no motor block in 0.125% levobupivacaine with fentanyl group Decosmo et al[18] found no motor block in levobupivacaine with fentanyl group.

In the present study, volume of local anaesthetic with fentanyl consumption was significantly higher in ropivacaine group. Similar results were reported by Smeti et al[7] who observed 25% higher consumption of local anaesthetic in those receiving ropivacaine than levobupivacaine. The higher amount of ropivacaine used probably reflects the potency difference between the two local anaesthetics.

In the present study, hypotension was noted in one patient in group A and two patients in group B, which was statistically insignificant.

Senard et al [16] conducted a study comparing epidural Levobupivacaine 0.1% or Ropivacaine 0.1% combined with morphine and observed that the incidence of hypotension was infrequent and similar among 0.1% levobupivacaine with morphine and 0.1% ropivacaine with morphine.

Lee WK et al [14] reported that the incidence of side effects is more in ropivacaine with fentanyl group, but the difference is statistically not significant.

LIMITATIONS: One limitation of our study is that the time of giving rescue bolus doses was not fixed so it could have affected the VAS score. Also, further studies with large sample size are warranted to evaluate the motor sporing effect of ropivacaine.

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CONCLUSION

From the present study, it can be concluded that, quality of analgesia is equally effective with both epidural 0.125% levobupivacaine and fentanyl and 0.125% ropivacaine and fentanyl in patients undergoing elective lower abdominal surgeries. The amount of local anaesthetic consumption and need for rescue bolus doses required is more with ropivacaine.

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