

# Comparative study between epidural bupivacaine with fentanyl versus ropivacaine with fentanyl combination for post operative analgesia in lower abdominal and lower limb surgeries

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## Abstract

**Background:** Adequate analgesia aids to restore normal functions including ventilation, coughing and mobility, thereby facilitating early rehabilitation and shortened hospital stay. Present study was aimed to compare epidural Bupivacaine with fentanyl versus ropivacaine with fentanyl combination for post operative analgesia in lower abdominal and lower limb surgeries at a tertiary hospital. **Material and Methods:** Present study was comparative, interventional study, conducted in patients aged 18–65 years, either gender, American Society of Anesthesiologists (ASA) physical status I–II, posted for elective lower abdominal and lower limb surgeries. This single-blind study comprised a sample size of 30 patients randomly allocated (by computer generates list) into two groups as Group R (0.125% ropivacaine with 1 ug/ml fentanyl) and Group B (0.125% bupivacaine with 1 ug/ml fentanyl). **Results:** We compared various parameters such as Age (years), Weight (kg), BMI (kg/m<sup>2</sup>), Gender, ASA status, Type of surgery, Duration of surgery (min), Intraoperative fentanyl (µg), Catheter insertion level (L1-L2/L2-L3), all parameters were comparable and difference was not significant statistically. Common surgeries considered for study were ovarian debulking surgeries, Wertheim's hysterectomy, orthopaedic lower limb surgeries (THR, TKR) and hemicolectomy. Post-operative analgesia was calculated on basis of VAS scores. We noted in less post-operative VAS scores at 6,12,18 hours in group R and difference was statistically significant. **Conclusion:** Epidural ropivacaine with fentanyl combination seems to be a better alternative to epidural bupivacaine with fentanyl, as it provides comparable stable hemodynamics, early onset and prolonged post-op analgesia, lower consumption of post-op local anaesthetic for epidural analgesia.

**Keywords:** epidural anesthesia, bupivacaine, ropivacaine, fentanyl, lower limb surgery,

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## INTRODUCTION

Effective postoperative pain management is unquestionably a basic human right. Adequate analgesia aids to restore normal functions including ventilation, coughing and mobility, thereby facilitating early rehabilitation and shortened hospital stay.<sup>1</sup> Regional anaesthesia provides effective anaesthesia and analgesia in the perioperative period. Addition of opioids to local anaesthetics has several benefits such as improved dynamic pain relief, limited regression of sensory

blockade, and decreased dose of local anesthetic.<sup>2</sup> Use of lipophilic opioid (fentanyl) is preferred to hydrophilic as it provides rapid onset of action, rapid clearance, and prevents delayed respiratory depression.<sup>3</sup> Epidural combination of opioid and local anaesthetic offers new dimensions in post-operative analgesia. Levo-bupivacaine is the pure S-enantiomer is associated with less toxicity.<sup>4</sup> Ropivacaine, an alternative to bupivacaine and Levobupivacaine is structurally closely related to bupivacaine and supplied as the pure S-enantiomer. It possesses a more favourable toxicity profile than bupivacaine with a higher threshold for cardiac and central nervous system toxicity.<sup>5</sup> Present study was aimed to compare epidural Bupivacaine with fentanyl versus ropivacaine with fentanyl combination for post operative analgesia in lower abdominal and lower limb surgeries at a tertiary hospital.

## MATERIAL AND METHODS

Present study was comparative, interventional study, conducted in Department of Anaesthesia Department, Kamineni Institute of Medical Sciences Sreepuram Narketpally, India. Study duration was of 6 months (January 2021 to June 2021). Study was approved by institutional ethical committee.

**Inclusion criteria:** Patients aged 18–65 years, either gender, American Society of Anesthesiologists (ASA) physical status I–II, posted for elective lower abdominal and lower limb surgeries, willing to participate in study

**Exclusion criteria:** Patient refusal for regional anaesthesia; contraindication to regional anaesthesia (coagulopathy or localized infection); history of allergic reaction to bupivacaine, ropivacaine, or fentanyl; history of opioid or substance abuse; major spine deformity/surgery; or neurological deficit of lower limbs. demyelinating disorder, severely hypovolemic patients, those with raised intracranial pressure, sepsis.

This single-blind study comprised a sample size of 30 patients randomly allocated (by computer generates list) into two groups.

Group R (0.125% ropivacaine with 1 ug/ml fentanyl)

Group B (0.125% bupivacaine with 1 ug/ml fentanyl).

Patients received injection glycopyrrolate (0.004 mg/kg) intravenously as premedication. Thereafter, an epidural catheter was inserted at the lumbar level (L1–L2 or L2–L3) under all aseptic precautions and as per standard operating procedures of department.

Patients were preoxygenated with 100% O<sub>2</sub> for 3 min. General anaesthesia was given with injection propofol 2

mg/kg mixed with injection xylocard 20 mg intravenously. Suitable relaxant was given to facilitate tracheal intubation Group B patients received 0.25% bupivacaine with 1 ug/ml fentanyl 8 ml bolus after induction of general anaesthesia. After 1 h of bolus, the patient received continuous epidural infusion of 0.25% bupivacaine with 1 ug/ml fentanyl at the rate 6 ml/h intraoperatively. The rate of infusion was adjusted as per the hemodynamic parameters of the patient. Group R patients received ropivacaine instead of bupivacaine.

The pulse rate, blood pressure, central venous pressure, SpO<sub>2</sub>, and EtCO<sub>2</sub> were monitored intraoperatively. Postoperatively, patients were shifted to recovery room and visual analog scale (VAS) score was recorded at 0 h (10 min post-extubation), 1, 6, 12, 18, and 24 h. Patients were not given any other analgesics such as nonsteroidal anti-inflammatory drugs. Group B received continuous epidural infusion of 0.125% bupivacaine with 1 ug/ml fentanyl at the rate 6 ml/h. Group R received 0.125% ropivacaine instead of bupivacaine. The rate of infusion was increased or decreased as per the hemodynamic parameters and VAS score of the patient. Hemodynamic parameters, visual analog scale (0–10), level of sensory block (assessed by pinprick), and were monitored for 24 h postoperatively and need for rescue analgesia, side effects, and interventions if any were noted. Sedation score, respiratory rate and oxygen saturation, and adverse events such as nausea and vomiting, hypotension, shivering, and pruritus were noted. Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Difference of proportions between qualitative variables were tested using chi-square test or Fisher exact test as applicable. P value less than 0.5 was considered as statistically significant.

## RESULTS

In present study, 60 patients randomly allocated into two groups as Group R (n=30) and Group B (n=30). We compared various parameters such as Age (years), Weight (kg), BMI (kg/m<sup>2</sup>), Gender, ASA status, Type of surgery, Duration of surgery (min), Intraoperative fentanyl (µg), Catheter insertion level (L1-L2/L2-L3), all parameters were comparable and difference was not significant statistically. Common surgeries considered for study were ovarian debulking surgeries, Wertheim's hysterectomy, orthopaedic lower limb surgeries (THR, TKR) and hemicolectomy.

**Table 1: Demographic data and other parameters**

Parameter	Group B (n = 30)	Group R (n = 30)	value
Age (years)	51.73 ± 9.25	52.49 ± 8.97	0.057
Weight (kg)	62.13 ± 10.23	63.70 ± 11.46	0.061
BMI (kg/m <sup>2</sup> )			
Gender			0.082
Male	9	10	
Female	21	20	
ASA status			0.23
I	11	12	
II	19	18	
Type of surgery			0.063
Ovarian debulking surgeries	4	5	
Wertheim's hysterectomy	13	11	
Orthopedic lower limb surgeries (THR, TKR)	9	11	
Hemicolectomy	4	3	
Duration of surgery (min)	316.2 ± 41.69	308.8 ± 37.44	0.53
Intraoperative fentanyl (µg)	140.3 ± 35.6	141.6 ± 19.6	0.72
Catheter level			0.082
L1-L2	9	10	
L2-L3	21	20	

Post-operative analgesia was calculated on basis of VAS scores. We noted in less post-operative VAS scores at 6,12,18 hours in group R and difference was statistically significant.

**Table 2: Mean VAS scores at rest**

Time (h) since post-extubation	Group B (Mean ± SD)	Group R (Mean ± SD)	P value
30 min	3.22 ± 1.51	3.00 ± 1.63	0.348
1	3.62 ± 1.32	3.16 ± 1.22	0.079
6	3.03 ± 1.62	2.39 ± 1.01	0.049
12	3.17 ± 0.94	2.57 ± 1.12	0.040
18	2.83 ± 0.88	2.14 ± 0.67	0.038
24	2.54 ± 1.01	2.18 ± 1.08	0.065

## DISCUSSION

Adequate analgesia is important to ease patient suffering, improve wellbeing and to prevent cardiovascular and respiratory complications. Epidural anesthesia is the most commonly used technique for providing not only peri-operative surgical anaesthesia but post-op analgesia in lower abdominal and limb surgeries. Studies have confirmed that equal volumes and concentrations of ropivacaine and bupivacaine produce a similar pattern of sensory block, but motor block is slower in onset, less intense, and of shorter duration with ropivacaine.<sup>6,7</sup> Epidural local anaesthetic drugs administered alone have never become widely used for routine postoperative analgesia because of the significant failure rate resulting from regression of the sensory block and the unacceptable incidence of motor blockade and hypotension.<sup>8</sup> In a similar study Kulkarni A *et al.*<sup>9</sup>, noted that visual analog scale (VAS) score at rest and on coughing were higher in Group BF as compared to Group RF. Group RF had less drug consumption, required fewer patient-controlled epidural analgesia (PCEA) boluses, and had minimal motor blockade as compared to Group BF. Good analgesic efficacy with lower drug consumption makes Group RF

well suited for postoperative PCEA with hemodynamic stability and minimal motor blockade. Misiran KB<sup>10</sup> studied 70 patients, randomly allocated to receive either ropivacaine 0.165% (Group A) or levobupivacaine 0.125% (Group B) both added with fentanyl 2.0µg/ml via epidural route. Total volume of drug used was significantly higher in Group A (163.31±29.01ml) than Group B (142.69±30.93ml) (p<0.01). The mean dose of Group A for the first 48 hours after surgery was 251.43±70.02mg and was significantly greater than the mean dose of Group B (178.91±42.33mg) (p<0.01). The numbers of PCEA boluses delivered (D) and PCEA attempts (A) were higher in the Group A (22.37±7.32 and 27.66±9.12) in contrast to Group B (17.63±7.71 and 24.40±11.51) but the differences were not statistically significant. The VAS pain score was similar for both groups. They noted that both PCEA using ropivacaine 0.165% with fentanyl 2.0µg/ml and levobupivacaine 0.125% with fentanyl 2.0µg/ml provided effective postoperative analgesia within the first 48 hours of major lower limb orthopaedic surgery despite clinically significant dose difference. B. Sankara *et al.*,<sup>11</sup> noted that, onset of action was significantly quick with ropivacaine i.e. 5.53 min compared to 6.96 min for bupivacaine; but

there was no significant difference when time and duration of peak action was studied. Modified Bromage scale was used for measuring motor blockade and it was found that motor blockade was significantly less with ropivacaine group compared to the bupivacaine group. The study by Li Y *et al.*,<sup>12</sup> compares the effectiveness of bupivacaine and fentanyl (BUPIFEN) and ropivacaine and fentanyl (ROPIEFN) in epidural analgesia for labor pain through a meta-analysis of relevant randomized clinical trials. It was concluded that in combination with fentanyl, bupivacaine and ropivacaine exhibit comparable efficacy and safety. However, BUP-FEN analgesia led to a shortened second-stage labor and ROPI-FEN resulted in a significantly lower incidence of motor block. Krishan YS *et al.*,<sup>13</sup> conducted study between various drug combinations for postoperative pain relief in lower limb surgeries between Group I (0.2% Ropivacaine), Group II (0.1% Ropivacaine + 2µg/ml Fentanyl), Group III (0.2% Bupivacaine), Group IV (0.1% Bupivacaine + 2µg/ml Fentanyl) at the rate of 6 ml/hour. and noted that Group I patients had significantly lower VAS scores, mean total epidural consumption, supplemental epidural bolus requirement and rescue analgesic requirement among all groups. Thus epidural analgesia using Ropivacaine 0.2% infusion is more effective than other study groups when used for postoperative pain relief in lower limb surgeries. In study by Patil SS *et al.*,<sup>14</sup> postoperatively, patients received 0.125% bupivacaine with 1 µg/ml fentanyl (Group B) or 0.125% ropivacaine with 1 µg/ml fentanyl (Group R) at the rate 6 ml/h. Hemodynamic parameters and VAS scores were comparable in the two groups. The level of sensory block was higher in bupivacaine group. There were more patients with higher Bromage score in the (23.3%) bupivacaine group than in (6.7%) ropivacaine group though the difference was not statistically significant. Both ropivacaine and bupivacaine in the concentration of 0.125% with fentanyl 1 µg/ml are equally safe, with minimal motor block and are effective in providing postoperative analgesia. these findings are contradictory with present study findings, Ropivacaine is less lipophilic than bupivacaine and is less likely to penetrate large myelinated motor fibers. Therefore, it is more selective for pain transmitting nerves than motor function fibers.<sup>14,15</sup> Limitations of present study were small sample size, single hospital based and elective cases, larger, multicentric studies are required to confirm present study findings.

## CONCLUSION

Epidural ropivacaine with fentanyl combination seems to be a better alternative to epidural bupivacaine with fentanyl, as it provides comparable stable hemodynamics, early onset and prolonged post-op analgesia, lower consumption of post-op local anaesthetic for epidural

analgesia. Use of Epidural ropivacaine with fentanyl combination is recommended for post operative analgesia in lower abdominal and lower limb surgeries.

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