

A COMPARATIVE STUDY OF PREEMPTIVE USE OF 0.2% ROPIVACAINE AND 0.125% BUPIVACAINE ALONG WITH FENTANYL AND FENTANYL INCREMENTS TO PROVIDE POSTOPERATIVE EPIDURAL ANALGESIA UP TO 24 HOURS

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ABSTRACT

BACKGROUND AND OBJECTIVES

The present study was carried out to compare duration of analgesia, haemodynamic changes (Systolic and Diastolic Blood Pressure, Pulse Rate, Respiratory Rate), total incremental doses of epidural fentanyl required to maintain VAS <3 up to 24 hours and complications and adverse effects in between epidural 0.125% bupivacaine with fentanyl 50 µg and 0.2% ropivacaine with fentanyl 50 µg for postoperative epidural analgesia.

METHOD

The study was conducted in 50 adult (aged 20-65 years) patients of ASA class 1 and 2 patients posted for elective lower abdominal surgeries. Patients were randomly divided into two groups of 25 each. Under strict aseptic precautions, epidural catheter was introduced at L2-L3 space in sitting position and 8 mL of distilled water was injected into catheter to check patency, then patients were placed in supine position and general anaesthesia was given to patient. Patients were reversed and shifted to recovery room and they were injected either 10 mL of 0.2% ropivacaine with fentanyl 50 µg (Group RF) or 10 mL of 0.125% bupivacaine along with fentanyl 50 µg (Group BF). Haemodynamic changes were monitored and noted every 5 minutes up to 30 minutes following administration of either drug. Duration of analgesia and any complications and adverse reactions were compared. Incremental doses of inj. fentanyl 50 µg were injected whenever VAS ≥3 up to 24 hours in each group and total required incremental fentanyl doses were compared between both the groups. Once the data were collected from all the patients, they were compared using, chi-square test, two sample t-test. The p-value was calculated and P <0.05 was considered statistically significant.

RESULTS

The duration of analgesia was more with Group BF (245±17.58 min.) than Group RF (217.6±22.41 min.), thus it is concluded that difference in duration of analgesia was statistically significant between the groups (P<0.05). In this study, it was noticed that patients of Group RF required much more incremental doses of epidural fentanyl (218±31.88 µg) to maintain VAS<3 up to 24 hours than group BF (170±32.27 µg), and difference was statistically significant (P<0.05). Haemodynamic parameters like SBP, DBP, HR and RR were comparable in both the groups. Hypotension and bradycardia were noted in two patients of group BF.

CONCLUSION

Duration of analgesia was longer and comparatively better in group BF and less incremental doses were required to maintain VAS <3 up to 24 hours as compared to group RF, but haemodynamic stability was more in group RF as compared to group BF.

KEYWORDS

Epidural Analgesia, Ropivacaine, Bupivacaine.

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INTRODUCTION: One of the major issues of concern to patients presenting for major surgery is postoperative analgesia. An epidural analgesia is considered by many as gold standard analgesic technique, for postoperative analgesia after abdominal surgeries. Central neuraxial blockade causes certain physiological changes which are mainly variation in heart rate and blood pressure which

results from decreased sympathetic tone and unopposed parasympathetic tone.¹

Pre-emptive analgesia include what is administered before the surgical incision, what prevents the establishment of central sensitisation resulting from incisional injury only (i.e. intraoperative period), what prevents central sensitisation resulting from incisional and inflammatory injury (i.e. intraoperative and postoperative periods).² Even though bupivacaine, the ideal local anaesthetic, is popularly used in epidural space for analgesia, there is fear of inadvertent injection of the drug intravascularly and resultant cardiac arrest which is difficult to resuscitate.

This made us look for other drugs. Ropivacaine, the recently introduced long-acting amide local anaesthetic derived from bupivacaine is claimed to have lesser cardiovascular side effects due to it being an s-enantiomer. It is said to be better in its cardiovascular profile as patient can be revived from cardiovascular side effects much faster and with better outcome than it occurs with bupivacaine, so ropivacaine is a better drug.³

The injection of narcotics in the epidural space provides epidural analgesia by the action of these drugs on opiate receptors in the spinal cord.⁴ Fentanyl is a highly lipid soluble narcotic agonist with faster onset and short duration of action when used intravenously in small doses, it also penetrates dura matter rapidly than any other narcotics and produces faster onset of epidural analgesia when injected in epidural space.⁵

OBJECTIVES: The following study was done to compare the duration of analgesia and haemodynamic changes of preemptive use of 0.2% ropivacaine along with fentanyl 50 µg with that of 0.125% bupivacaine along with fentanyl 50 µg in elective lower abdominal surgeries for postoperative epidural analgesia and also to compare total doses of epidural fentanyl required to maintain VAS <3 up to 24 hours in postoperative period.

METHOD: The study was conducted in 50 adult (Aged 20-65 years) patients of ASA class 1 and 2 patients posted for elective lower abdominal surgeries. After obtaining ethical committee clearance and institutional approval, the written informed consent was obtained from all the patients. Patients were randomly divided into two groups of 25 each.

Group RF: Patients received 10 mL of 0.2% ropivacaine along with fentanyl 50 µg and then increments of fentanyl 50 µg at VAS ≥3 up to 24 hours via epidural catheter.

Group BF: Patients received 10 mL of 0.125 % bupivacaine along with fentanyl 50 µg and then increments of fentanyl 50 µg at VAS ≥3 up to 24 hours via epidural catheter.

Inclusion Criteria:

- Adult patients aged between 20 to 65 years of both sex.
- Patients belonging to ASA class 1 and 2.
- Patients posted for elective lower abdominal surgeries.

Exclusion Criteria:

- Patient with history of bleeding diathesis.
- Patients with ASA class 3 and 4.
- Patient on anticoagulant therapy.
- History of drug abuse.
- Patients having history of hypersensitivity to drugs used during anaesthesia and to any of the study drug.
- Patient's refusal.
- Patients with neuromuscular disease and history of spine surgery.
- Patients with height <5 feet and weight <50 kg.
- Patients with any type of chronic pain disease of spine.

Patients were premedicated with Tablet Ranitidine 150 mg and Tablet Alprax 0.5 mg night prior to surgery. Baseline parameters of patients were recorded. Under strict aseptic precautions, epidural catheter was introduced at L2-L3 space in sitting position and 8 mL of distilled water was injected in to catheter to check patency, then patients were placed in supine position and general anaesthesia was given to patients. Patients were reversed and shifted to recovery room and they were injected either 10 mL of 0.2% ropivacaine with fentanyl 50 µg (Group RF) or 10 mL of 0.125% bupivacaine along with fentanyl 50 µg (Group BF).

Haemodynamic changes were monitored and noted every 5 minutes up to 30 minutes following administration of either drug. Analgesic effect was noted by visual analogue scale at 0-10 numerical scale and inj. fentanyl 50 µg diluted up to 10 cc with distilled water was injected in epidural catheter whenever VAS ≥3 up to 24 hours in each group and total required incremental fentanyl doses were compared between both the groups. For VAS, all the patients were explained in preoperational period, where after injecting the drug, patient was asked to point out score on scale. Any complication like nausea, vomiting, hypotension, bradycardia, etc. was noted and managed accordingly by oxygen, antiemetics, fluid infusion, incremental doses of vasopressor and atropine.

Once the data were collected from all the patients, they were compared using, chi-square test, two sample t-test. The P value was calculated and P <0.05 was considered statistically significant.

RESULTS: The two groups were comparable with respect to the number of participants, age, weight, gender and duration of surgery [Table 1]. Table 1 showing age distribution of the patients in both the groups. The minimum age in group RF (ropivacaine+fentanyl) and group BF (bupivacaine+fentanyl) were 24 and 21 years respectively. The maximum age was 65 years in the both groups. There was no significant difference in the age of patients between the Group RF and Group BF. Both groups were similar with respect to age distribution (p>0.05). There was no significant difference in the sex distribution of the patients between the groups. In both the groups, there was a predominance of female patients. Table 1 is also showing the body weight distribution of patients.

The mean body weight in group RF was 58.28 ± 6.05 kg and group BF was 55.72 ± 6.38 kg. There was no significant difference in the body weight of patients between the groups ($p > 0.05$).

Category	Group RF (Mean $\pm$ S.D.)	Group BF (Mean $\pm$ S.D.)
Number (n)	25	25
Age (years)	46.1 ± 12.6	45.7 ± 12
Weight (Kg)	58.28 ± 6.05	55.72 ± 6.38
Sex (Male/Female)	10/15	11/14

Table 1: Demographic Data and Duration of Surgery

There was no statistically significant difference in heart rate, respiratory rate, systolic blood pressure and diastolic blood pressure within 30 minutes of study drug injection between two groups [Figure 1-4]. Two patients of group BF developed hypotension and bradycardia and they were treated symptomatically.

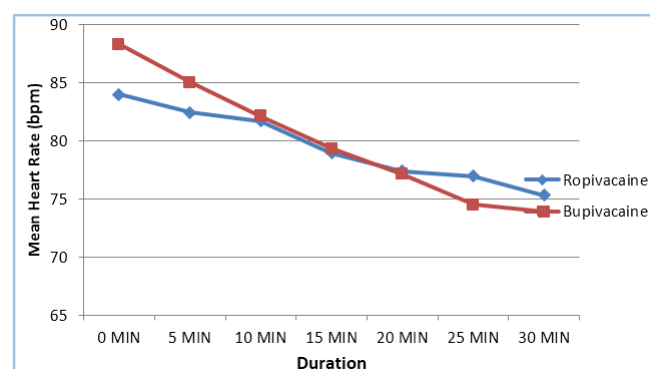


Fig. 1: Mean Heart Rate (bpm)

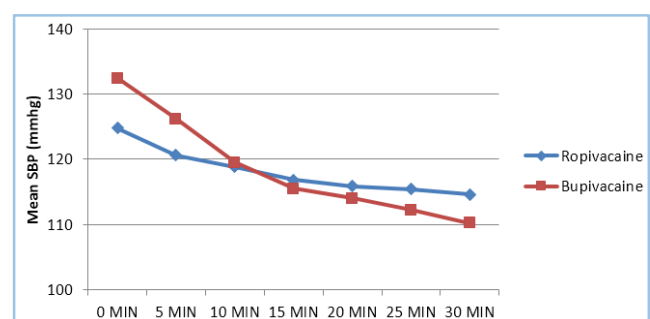


Fig. 2: Mean Systolic Blood Pressure (mmHg)

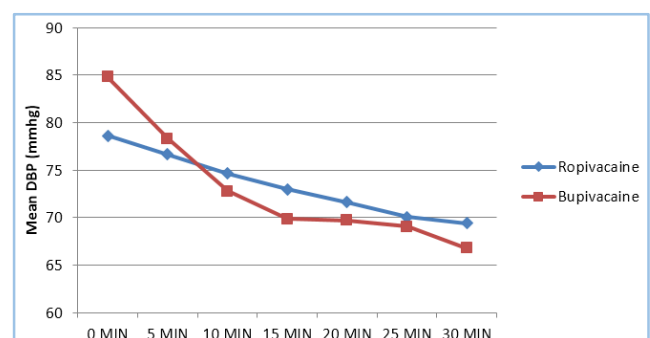


Fig. 3: Mean Diastolic Blood Pressure (mmHg)

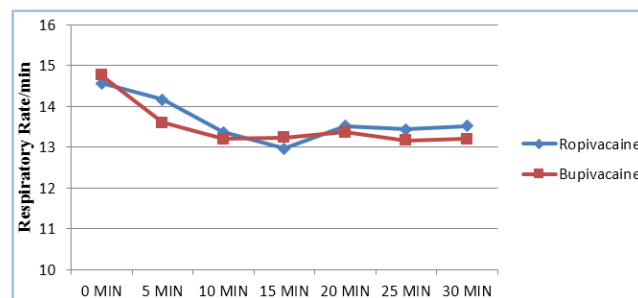


Fig. 4: Mean Respiratory Rate (bpm)

The mean duration of analgesia was 217.6 ± 22.41 mins. in group RF and 245.2 ± 17.58 mins. in group BF [Table 2]. There was statistically significant difference in duration of analgesia between the groups ($p < 0.05$). Group RF required more incremental doses of epidural fentanyl (218 ± 31.88 μ g) to maintain VAS <3 up to 24 hours than group BF (170 ± 32.27 μ g) ($p < 0.05$) [Table 2].

	Group RF (Mean $\pm$ S.D.)	Group BF (Mean $\pm$ S.D.)
Duration of analgesia (min)	217.6 ± 22.41	245.2 ± 17.58
Incremental doses of fentanyl (μ g)	218 ± 31.88	170 ± 32.27

Table 2: Comparison of Duration of Analgesia and Incremental Doses of Fentanyl

DISCUSSION: In our study, the minimum age in Group RF and Group BF were 24 and 21 years respectively. The maximum age in both the groups was 65 years. The mean age in Group RF was 46.1 ± 12.6 years and mean age in Group BF was 45.7 ± 12 years. There was no significant difference in the age of patients between the Group RF and Group BF ($P > 0.05$). Both groups were comparable in sex distribution and there was predominance of female patients in both groups. There was even distribution of weight in both groups. The mean body weight in Group RF was 58.28 ± 6.05 kg and in Group BF was 55.72 ± 6.38 kg. This study coincides with the study of Brockway MS, Bnister J, McClure JH et al (1999).⁶ Brodner G, Mertes N, Aken HV et al (1999).⁷ They also studied adults with the similar age, sex and weight range.

In this study, it was noticed that mean duration of surgery in group RF was 68.80 ± 20.11 (min) and in group BF was 72.40 ± 21.75 (min). The difference in mean duration of surgery was not statistically significant ($P > 0.05$). Bupivacaine is a longer acting amide group which has been used as a prime agent in epidural anaesthesia and also to provide postoperative pain relief. In this study, it was noticed that bupivacaine was and still is an ideal drug for epidural analgesia. In this study, it was noticed that when bupivacaine was used pre-emptively along with fentanyl gave satisfactory analgesia than ropivacaine along with fentanyl, just as mentioned in study conducted by Pouzerat Y, Brunat G, Boccara G et al⁸ where it was stated that when bupivacaine was used in combination with an opioid analgesic was more effective than ropivacaine.

Duration of analgesia was compared between Group RF and Group BF. The duration of analgesia was more with Group BF (245 ± 17.58 min.) than Group RF (217.6 ± 22.41 min.), thus it is concluded that difference in duration of analgesia was statistically significant between the groups ($P < 0.05$). This study coincides with study conducted by Brown DL, Carpenter RL, Thomson GE et al.⁹ A study conducted by Tuttle A, Katz JA, Bridenbaugh PO et al.¹⁰ also concluded that same concentration of bupivacaine and ropivacaine provided adequate surgical anesthesia for lower abdominal surgery when administered epidurally. However, lower extremity motor block with ropivacaine was significantly shorter and sensory block was also shorter at these concentrations.

Ropivacaine is a newer amide longer acting used nowadays as a prime agent due to its fewer side effects and better haemodynamic stability. Bupivacaine because of its structure is said to be more cardiotoxic. Haemodynamic stability was checked in this study and noted that Group BF patients had a more fall in both SBP and DBP as compared to Group RF, but there was no statistically significant difference between Group RF and BF ($P > 0.05$). Two patients in Group BF develop hypotension and bradycardia.

As stated by Knudsen K, Beckman M, Bloomberg S et al,¹¹ bupivacaine reduced both left ventricular systolic and diastolic function compared with ropivacaine and there was a fall in both the systolic and diastolic blood pressures with bupivacaine as compared to ropivacaine.

In this study, it was noticed that patients of Group RF required much more incremental doses of epidural fentanyl (218 ± 31.88 μ g) to maintain VAS < 3 up to 24 hours than group BF (170 ± 32.27 μ g), and difference was statistically significant ($P < 0.05$).

CONCLUSION: Thus, based on our study results, it can be concluded that preemptive use of 0.125% bupivacaine along with fentanyl provides better and longer duration of postoperative epidural analgesia and required lesser amount of incremental doses of epidural fentanyl than 0.2% ropivacaine along with fentanyl to maintain VAS < 3 up to 24 hours, whereas haemodynamic stability was more with ropivacaine than bupivacaine.

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