

Comparison of Dexmedetomidine Versus Fentanyl as an Adjuvant to Epidural Ropivacaine in the Patient Undergoing Lower Limb, Lower Abdomen Surgery

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Abstract

Background: Ropivacaine, the pure S enantiomer of propivacaine, due to its less lipophilicity than bupivacaine does not produce cardiotoxicity or neurotoxicity and causes less motor blockade. Dexmedetomidine the newer selective alpha 2 adrenergic agonist has several advantages when given through epidural route as a neuraxial adjuvant.

Aim: To compare 0.75% Inj. Ropivacaine with Inj. Fentanyl and 0.75% Inj. Ropivacaine with Inj. Dexmedetomidine epidurally for the duration of analgesia, hemodynamic changes, degree of motor blockade and occurrence of side effects.

Materials and Methods: 60 patients undergoing lower limb, lower abdomen surgeries were randomized to two groups. Group RF (n=30) received 0.75% Inj. Ropivacaine 15 ml with Inj. Fentanyl 1 mcg/kg in 2 ml preparation. whereas Group RD (n=30) received 0.75% Inj. Ropivacaine 15 ml with Inj. Dexmedetomidine 1 mcg /kg in 2ml preparation. Quality of sensory block, motor block, pulse rate, blood pressure, pain assessment and any adverse outcome were noted.

Results: Dexmedetomidine fastens the onset of analgesia, prolongs the duration of analgesia thereby reducing the doses of rescue analgesics post operatively, improves the quality of motor blockade without aggravating changes in haemodynamic parameters and has less adverse effects.

Conclusion: We conclude that dexmedetomidine serves as a good neuraxial adjuvant when added to 0.75% ropivacaine in epidural anesthesia given for lower limb, lower abdomen surgery.

Keywords: Ropivacaine; Dexmedetomidine; Fentanyl; Neuraxial adjuvant.

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INTRODUCTION

Epidural anesthesia is the most commonly used technique for providing perioperative surgical anesthesia as well as postoperative analgesia in lower abdominal surgeries and lower limb surgeries. Epidural anesthesia reduces the surgical stress by blocking the nociceptive impulses from the operative site and also reduces the blood loss, improve respiration and bowel function and

decreased incidence of deep vein thrombosis.^{1,2}

Ropivacaine is a long acting local anesthetic agent with lower systemic toxicity. Ropivacaine has lowest potential risk of cardiotoxicity for accidental intravenous injection. Ropivacaine has lesser propensity of motor block during postoperative epidural analgesia.^{3,4}

Opioids like fentanyl have been used traditionally as an adjunct for epidural administration in combination with a lower dose of local anesthetic to achieve the desired anesthetic effect.⁵ Fentanyl, when added to ropivacaine in epidural, confers better analgesia and lesser systemic toxicity. Dexmedetomidine is a class of alpha-2 agonist which decreasing the sympathetic outflow and nor-epinephrin release causing sedative, anti-anxiety, analgesic, sympatholytic and haemodynamic effects.⁶⁻⁸

The purpose and aim of the present study was to compare fentanyl versus dexmedetomidine with 0.75% ropivacaine for epidural in lower limb, lower abdomen surgery.

MATERIALS AND METHODS

After obtaining institutional ethical committee's approval patient were explained about the anesthesia technique and written informed consent was taken. This randomized double blind study was conducted on sixty patient on ASA grade I & II, aged between 18 to 60 year age, who were to be operated for lower limb, lower abdomen surgery, of duration about 1 to 2 hours.

All patients in this study was subjected to thorough checkup. Complete general physical examination, investigation and ASA grading was done. The purpose and procedure was explained to the patients. Visual Analogue Score (VAS) for pain assessment was also explained to the patients. This double blind study was conducted on 60 patients who were randomly divided into 2 groups of 30 patients each:

Group RF (n=30): Patients were administered 15 ml ropivacaine 0.75% plus fentanyl (1mcg/kg) in 2 ml preparation.

Group RD (n=30): Patients were administered 15 ml ropivacaine 0.75% plus dexmedetomidine (1mcg/kg) in 2ml preparation.

After arrival of patient into operation theatre, routine monitoring of non-invasive blood pressure, heart rate, electrocardiogram (ECG), and pulse oximetry was started. An intravenous line was established with 18G cannula to preload the

patient with Ringer lactate solution at rate of 10 ml.kg-1 before the initiation of epidural block. Under all aseptic condition, epidural anesthesia was administered in the sitting position at L 3-4 or L 4-5 interspace with an 18-G Tuohy needle by loss of resistance technique. With the bevel of the Tuohy needle in cephalic direction, an epidural catheter was inserted 5 cm into epidural space and secured. The position of catheter was checked by aspiration for blood or CSF. A test dose of 60 mg lidocaine containing 1:200,000 epinephrine, was administered to detect intrathecal or intravenous injection and patients turned to supine position. After 3 minutes the patients received study solution according to randomization schedule at rate of 3 ml/10 seconds by epidural catheter.

Intra operatively all the vital parameter were recorded at 1, 5, 10, 15, 20, 30, 40, 50, 60, 90, 120 minutes.

In the postoperative room, all the vitals and haemodynamic parameters were recorded at 0, 3, 6, 12, 18, 24 hrs. Postoperative pain was managed by top-up doses of 8 ml of 0.2% ropivacaine through epidural catheter.

The patients were interviewed after 1 day of surgery. The response of the patient to whole procedure was graded using three point scale.

1= Good

2= Fair

3= Poor

Statistical analysis was done using student t test and chi-square test. A p value < 0.05 was considered as significant.

RESULTS

The demographic data were comparable between the two groups (Table 1). The onsets of the sensory block and motor block were significantly earlier in group RD as compared to group RF (p value <0.05) (Table 1).

Table 1: Patients variables

Parameters	Group RD	Group RF
Age (years)	44.76±1 45.93	0.92 ±11.34
Weight (kg)	58.56±6. 32	59.03±6. 34
Sex (M:F)	9 : 21	12 : 18
Onset of sensory block (min)	9.83±1.93	11.36±2.15
Onset of motor block (min)	17.23±3.36	19.66 ±3.8
Duration of motor block (min)	276.56±19.41	189.33.33±16.85
Duration of analgesia (min)	354.6 ±25.3	230.53±26. 49

Values are Mean±SD or number

Onset and peak of sensory & motor blockade was faster in group RD as compare to group RF. Duration of sensory & motor blockade was longer in group RD than in group RF. Prolonged duration of analgesia was observed in group RD than Group

RF. In 24 hr post block period consumption of rescue analgesic was significantly lower in RD group than in group RF. Sedation was higher in group RD than group RF.

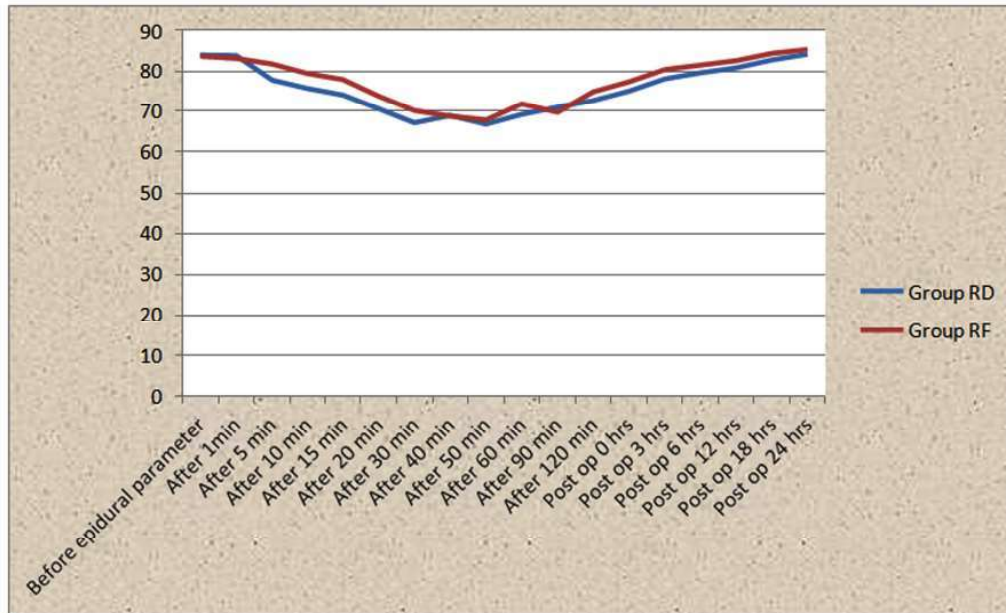


Fig. 1: Pulse rate per min.

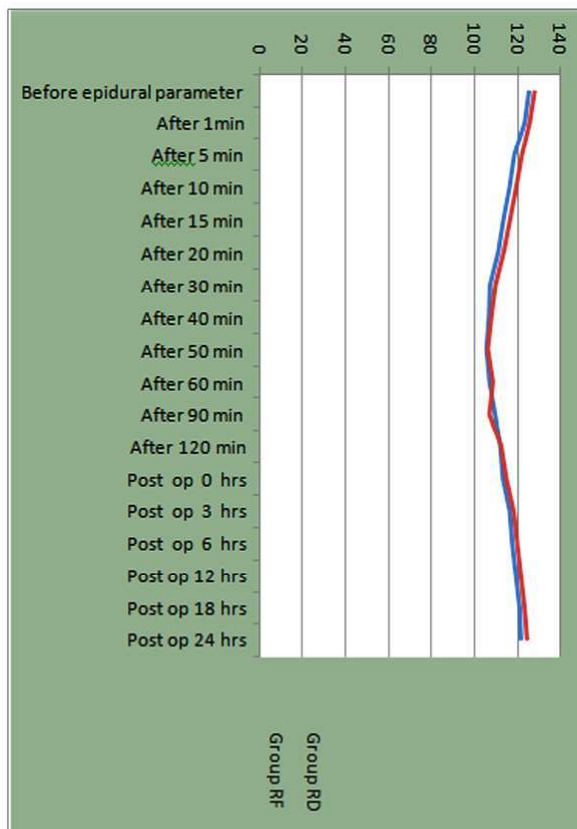


Fig. 2: Intra and post-operative mean Systolic blood pressure (mmHg).

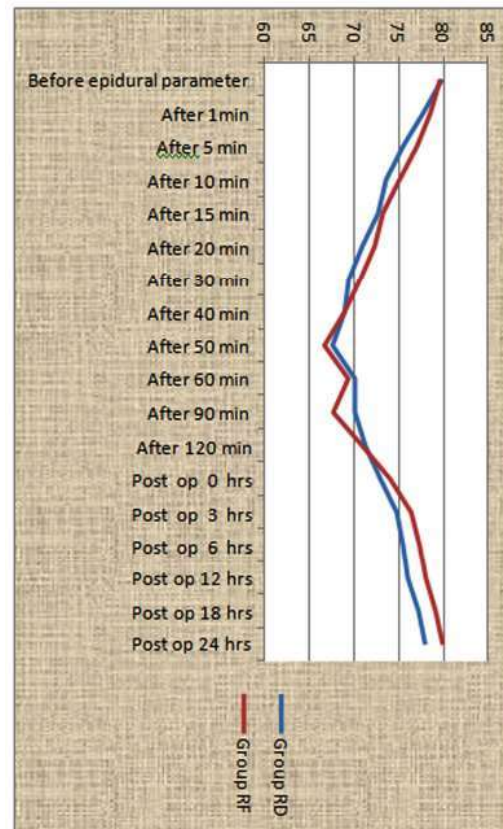


Fig. 3: Intra and post-operative mean Diastolic blood pressure (mmHg).

The VAS score was more decreased and remained significantly at low level in group RD as compared to group RF after the block & difference was statistically significance ($P < 0.05$), fall in pulse rate, SBP, DBP was much more in RD group than RF group and remained significantly low ($P < 0.05$). Hemodynamical stability was seen in both groups but patients in group RD were more stable than group RF. No significant side effects or complications were seen in both groups.

Table 2: Intra-operative sedation scores

Sedation scale point	Group RD		Group RF	
	No. of Patients	Percentage	No. of Patients	Percentage
1	3	10	22	73.33333
2	12	40	5	16.66667
3	13	43.33333	3	10
4	2	6.66667	0	0
5	0	0	0	0
Total	30	100	30	100

Sedation score 3 was observed in 43.33% of patients in group RD in comparison of 10% of patients in group RF. Sedation score 1, was observed in 73.33% of patients in group RF in comparison of 10% of patients in group RD. The difference was significant statistically ($p < 0.05$).

DISCUSSION

Epidural anesthesia is a central neuraxial block technique can be used as an anesthetic, as an analgesic adjuvant to general anesthesia and for post-operative analgesia involving the lower limbs, perineum, pelvis, abdomen and thorax.

Epidural administration of Alpha-2 adrenergic agonists is associated with sedation, analgesia, anxiolysis, hypnosis and sympatholysis. The faster onset of action of local anesthetics, rapid establishment of both sensory and motor blockade, prolonged duration of analgesia into the post-operative period, dose sparing action of local anesthetics and stable cardiovascular parameters makes these agents a very effective adjuvant in regional anesthesia.

All patients selected in the study belonged to age between 18 and 60 years. No statistically significant difference between the groups with regard to age ($P = 0.67$)

There was even distribution of weight in the two groups no statistically significant difference between the groups with regard to weight ($P = 0.77$)

In our study 30% were male and 70% female in

group-RD. There were 40% males and 60% females in group-RF.

Our study showed onset of sensory loss (T10) was faster in group RD than in group RF. The difference was statistically significant ($P < 0.05$). These results coincide with the studies done by Gill RS et al (2016).⁹

In our study onset of complete motor blockage dexmedetomidine to ropivacaine result early onset of motor block as compared with fentanyl and the difference was statistically significant ($P < 0.05$).

Duration of analgesia longer in group RD as compared to group RF ($P < 0.001$). The result of our study coincides with Shah PJ et al (2017)¹⁰ and Gill RS et al (2016)⁹ and Korat R et al (2017).¹¹

Total duration of analgesia was longer in group RD (354.6 ± 25.3) as compared to group RF (230.56 ± 26.49). There was less requirement of dose of ropivacaine used over 24 hrs. In group RD as compared to group RF.

Mean duration of motor block in group RD was 276.56 ± 19.41 min and in group RF 189.33 ± 16.85 min. The difference was highly statistically significant ($P < 0.001$). The results of our study were in accordance with study done by Bajwa SS et al (2011)¹² who compared ropivacaine + dexmedetomidine and ropivacaine + fentanyl administered epidurally also coincide with studies of Shah PJ et al (2017).¹⁰

The results of our study clearly indicate the effectiveness of epidural dexmedetomidine as mean sedation scores were significantly higher as it produced profound sedation in 43.33% of patients. our study coincides with Bajwa SS et al (2011).¹² They found mean sedation scores in dexmedetomidine group much higher and statistically highly significant as compared with fentanyl group.

Fall in BP and PR was significantly higher in group RD in comparison to group RF and difference was statistically significant ($P < 0.05$) up to 30 min. Vasopressor received by 6 patients in group RD and 1 patient in group RF due to hypotension.

The results of our study were in accordance with study done by Bajwa SS et al (2011)¹² who compared ropivacaine + dexmedetomidine and ropivacaine + fentanyl administered epidurally and found that both additives causes fall in blood pressure and heart rate but do not make patients haemodynamically unstable.

Results also coincide with studies of Gill RS et al (2016).⁹ They found that maximum decrease of heart rate and MAP from base line at 30-35 min

after the epidural injection of the drugs. Shah PJ et al (2017)¹⁰, found that the fall in HR and mean SBP from baseline was significant at 5 min and 10 min interval after injecting epidural drug in both the Groups ($p < 0.0001$).

Quality of analgesia was much better in patients who had dexmedetomidine as an adjuvant to ropivacaine as evident by early onset and prolonged duration of effective analgesia along with less requirements of rescue analgesics.

CONCLUSION

To conclude dexmedetomidine epidurally with ropivacaine significantly prolongs duration of sensory and motor blockade and duration of analgesia. Dexmedetomidine is a better adjuvant than fentanyl in epidural anesthesia as far as patient comfort, stable cardio-respiratory parameters, intra-operative and post-operative analgesia is concerned.

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