

# Comparison of Onset and Duration of Motor Block and Hemodynamic Stability after Epidural Block using Ropivacaine and Bupivacaine for Lower Limb Surgeries

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## ABSTRACT

**Introduction:** The routine use of parenteral opioids is still inadequate for postoperative pain control and may further aggravate the unpleasant side effects like nausea vomiting, sedation, urinary retention and depressed ventilation. Epidural block is a commonly used alternative for general anaesthesia in case of orthopaedic surgeries. Bupivacaine & Ropivacaine are amide local anaesthetics. The present study is being undertaken to compare the efficacy of conventional Bupivacaine 0.5% with newer Ropivacaine 0.75% via lumbar epidural block for lower limb orthopaedic surgery.

**Material and methods:** The present prospective randomised study was conducted in Department of Anaesthesiology, Gandhi Medical College and associated Hamidia Hospital, Bhopal (M.P.). In this study patients aged between 20-50 years belonging to ASA grade I and II were included in the study. 50 patients who went for elective lower limb surgery were included in the study. Under complete aseptic condition, epidural catheter was inserted in L2-L3 lumbar space. Drug was given epidurally with patient lying in supine position. Continuous monitoring of B.P., HR, R/R, SpO<sub>2</sub> and ECG was taken during intra operative period at regular intervals. Onset of motor blockade was noted in all the patients using Bromage Scale. Postoperative H.R., B.P., R/R, SpO<sub>2</sub> and ECG was observed up to the required of 1<sup>st</sup> rescue analgesic dose. The obtained data was arranged in a tabulated form. SPSS software was used for analysis of the data. Chi square test was applied as the test of significance and p value of less than 0.05 was considered significant.

**Results:** The mean duration of onset of motor block for Group I was 25± 4.4 mins while for Group II it was 26.3±4.8 26.3±4.8 mins. P-value for both group is > 0.05, so there is statistically no difference between two Groups. The mean duration of motor blockade in group I was 264.4± 24 mins, while it was 258.5±28 mins in Group II

**Conclusion:** The duration of motor blockade was shorter with 0.75% Ropivacaine compared to 0.5% Bupivacaine when given via lumbar epidural. The lumbar epidural anaesthesia with 0.75% Ropivacaine provided more hemodynamic stability than 0.5% Bupivacaine.

**Keywords:** Bupivacaine, Epidural, Orthopaedic, Ropivacaine

## INTRODUCTION

The anaesthesia and analgesia during perioperative period can be achieved by either general anaesthesia or regional anaesthesia (spinal and epidural block) in patients undergoing lower limb orthopedic surgeries. As far as general anaesthesia is concerned, it may cause undesirable side effects and also

cannot provide postoperative pain control. The routine use of parenteral opioids is still inadequate for postoperative pain control and may further aggravate the unpleasant side effects like nausea vomiting, sedation, urinary retention and depressed ventilation. In regional anaesthesia, subarachnoid block have disadvantage that it is not suitable for longer lower limb orthopaedic surgeries. Moreover it does not provide post operative analgesia and patient has to be generally put on i.v. or i.m. analgesics which is less effective. So it is the epidural block which has got plus over these disadvantages of subarachnoid block. Epidural anaesthesia provides better control of pain and provides satisfactory analgesia in postoperative period without any respiratory complications. Bupivacaine & Ropivacaine are amide local anaesthetics. Bupivacaine being more cardiotoxic<sup>1,2</sup>, there has been paradigm shift to ropivacaine which is less cardiotoxic<sup>3</sup> and widely used in epidural and spinal anaesthesia to obtain intraoperative and postoperative pain relief with fewer side effects. It has been seen that ropivacaine blocks the sensory fibres more effectively as compared to the motor fibres.<sup>4</sup> However Ropivacaine is relatively a new drug in India, marketed only recently in September 2009. So there is paucity of the literature regarding its use in India. Hence the present study is being undertaken to compare the efficacy of conventional Bupivacaine 0.5% with newer Ropivacaine 0.75% via lumbar epidural block for lower limb orthopaedic surgery.

## MATERIAL AND METHODS

The present prospective randomised study was conducted in Department of Anaesthesiology, Gandhi Medical College and associated Hamidia Hospital, Bhopal (M.P.). In this study patients aged between 20-50 years belonging to ASA grade I and II were included in the study. 50 patients who went for elective lower limb surgery were included in the study. Patients with Coagulopathy or any other bleeding

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disorder, Severe hypovolemia, severe hypotension Increased intra cranial tension, Severe stenotic valvular heart disease or ventricular outflow obstruction, preexisting neurological deficit and De-myelinating lesions were excluded from the study. All the patients were informed about the study and a written informed consent was obtained. The study was approved by the institute’s ethical board.

After securing a suitable peripheral vein, all patients received injection Ranitidine 50 mg i.v. and inj. Ondansetron 4 mg i.v. preoperatively. All patients were administered 500 ml ringer lactate solution. Baseline pulse rate, blood pressure, respiratory rate, SpO<sub>2</sub> & ECG were recorded. Under complete aseptic condition, epidural catheter was inserted in L2-L3 lumbar space. Drug was given epidurally with patient lying in supine position. Continuous monitoring of B.P., HR, R/R, SpO<sub>2</sub> and ECG was taken during intra operative period at regular intervals. Onset of motor blockade was noted in all the patients using Bromage Scale. Postoperative H.R., B.P., R/R, SpO<sub>2</sub> and ECG was observed up to the required of 1<sup>st</sup> rescue analgesic dose.

**STATISTICAL ANALYSIS**

The obtained data was arranged in a tabulated form. SPSS software was used for analysis of the data. Chi square test was applied as the test of significance and p value of less than 0.05 was considered significant.

**RESULTS**

Table 1 shows the agewise distribution of the patients.

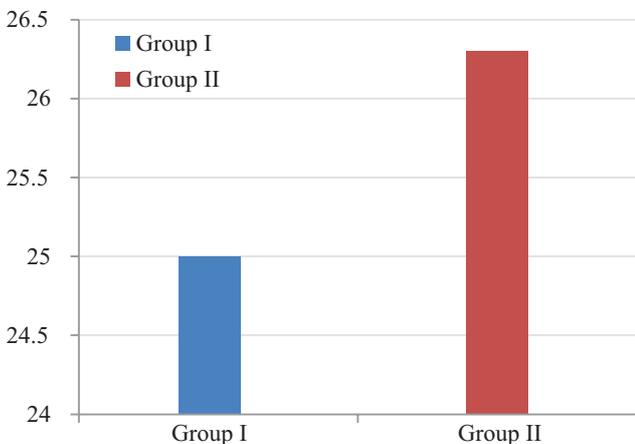


Figure-1: Showing mean duration of onset of motor block in mins

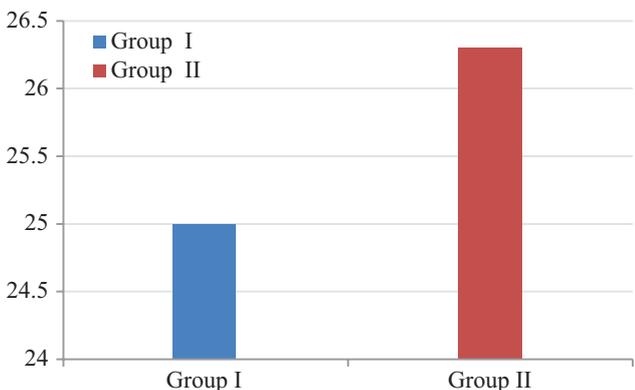


Figure-2: Showing mean duration of onset of motor block in mins

There were total of 50 patients in this study, the age group of the patients varied between 20- 50 years. The mean age distribution of Group I patients was 35.125 ± 7.4 years. The mean age distribution of Group II patients was 34.2± 9.0 years.

From the Figure 1 it is evident that while mean duration of onset of motor block for Group I was 25± 4.4 mins while for Group II it was 26.3±4.8 26.3±4.8 mins. P-value for both group is > 0.05, so there is statistically no difference between two Groups.

Figure 2 shows the mean duration of motor blockade in group I was 264.4± 24 mins, while it was 258.5±28 mins in Group II From the table it can be seen that there is no significant difference between two groups.

It is evident from the table 2 that values of mean pulse rate do not differ significantly between the compared drug groups (p>0.05).

Table 3 shows the hemodynamic stability. It is evident from the above table that larger no. of patients in Group I have developed incidence of hypotension and required treatment than group II.(p<0.05)

Figure 3 shows the respiratory rate at different time interval. It is evident that the values do not differ significantly between the compared drug groups (p>0.05). There was no incidence of respiratory depression (RR<10/min) either intra operatively or postoperatively in either of the groups.

S. No.	Age (in years)	Group I (n=25)		Group II (n=25)	
		No.	%	No.	%
1.	20-25	3	12	4	16
2.	25-30	3	12	4	16
3.	30-35	4	16	5	25
4.	35-40	5	20	3	12
5.	40-45	4	16	5	20
6.	45-50	6	25	4	16

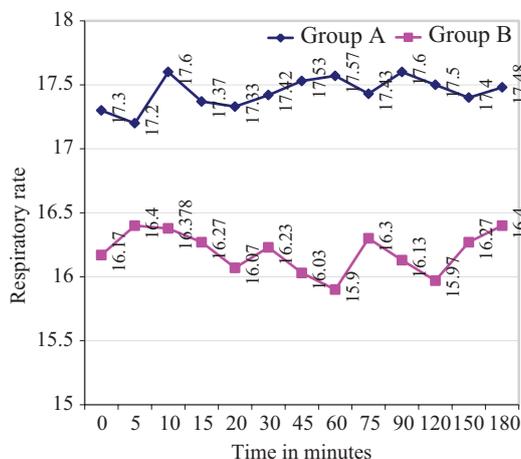
Table-1: Showing age wise distribution of cases

Time (min)	Pulse rate (per min)	
	Group I	Group II
0 (Preop.)	76.34	78.63
5	78.86	75.00
10	82.75	74.52
15	82.63	78.63
20	85.73	76.62
25	86.66	74.82
30	88.83	75.63
45	84.63	85.43
60	87.66	84.73
90	92.48	83.72
120	85.87	85.46
150	83.76	82.54
180	75.32	87.51
240	84.67	81.43
300	78.86	85.47
360	89.75	83.52
420	76.46	81.83

Table-2: Showing pulse rate at different time intervals

	Group I (n=25)	Group II (n=25)
Incidence of hypotension	8	1
Pt. required treatment of hypotension	4	0

**Table-3:** Showing haemodynamic stability



**Figure-3:** Showing respiratory rate at different intervals

## DISCUSSION

The present study was undertaken to compare the efficacy of epidural block using bupivacaine and ropivacaine. In this study 50 patients were randomly allocated into two groups who were aged between 20-50 years of age). Peduto et al<sup>5</sup> conducted their study on adult patients of ASA I & II by taking n=35 patients for Bupivacaine 0.5% and n= 30 patients for Ropivacaine 0.75% group via epidural for lower limb orthopaedic surgeries. Thus our current study groups were comparable in age and number of patients to previous done studies.

The motor blockade was studied as per Bromage scale of motor blockade. In current study, the onset of motor block for Bupivacaine 0.5% group was 25±4.4 min and 26.3± 4.8 mins for Ropivacaine 0.75% group. This was similar for both groups in significant manner (p>0.05). The duration of motor onset in study of Katz JA, Knarr D et al<sup>6</sup> was 47 ±29 mins and 32± 17 mins for Ropivacaine 0.75% and Bupivacaine 0.5% respectively. In study of Bjornstad et al<sup>7</sup>, the mean onset of motor block was 25 mins for Ropivacaine 0.75% (20ml) while 27 mins for Bupivacaine 0.5% (20ml). Wolff et al<sup>8</sup> shown that duration of motor onset was less than 30 mins for both the study groups; while the study conducted by Brown et al<sup>9</sup>, the duration of motor onset was 13± 10.7 mins (mean ± S.D.). the duration of motor block was 264.4± 24 mins for Bupivacaine 0.5%, while it was 254 ±34 mins for Ropivacaine 0.75% which was although longer for Bupivacaine group but clinically not significant. As previous studies have clearly shown that the lower concentrations of Ropivacaine 0.5% have lesser duration of motor block than its 0.75% concentration.

In study conducted by Brown et al<sup>9</sup>, duration of motor block for Bupivacaine 0.5% (20ml) was 276± 52 min while it was 234 min (with range of 186-390 min) in study conducted by Mc Glade et al.<sup>10</sup> In study conducted by Wolff et al<sup>8</sup> the duration

of motor block for Ropivacaine 0.75% & Bupivacaine 0.5% were 186±78 min & 198±84 min respectively (taken as mean ± SD for bromage degree I). in study conducted by Kartz JA, Knarr D et al<sup>6</sup>, duration of motor block was 4.1±0.9 hrs & 4.4±0.9 hrs for Ropivacaine 0.75% & Bupivacaine 0.5% respectively. Peduto et al<sup>5</sup> took lower volumes & mean duration of motor block in their study was 1.6 hrs & 1.8 hrs for Ropivacaine 0.75% & Bupivacaine 0.5% respectively. In the 25 clinical studies conducted over 942 patients, it was shown that as the concentration of Ropivacaine was increased the duration of motor block also increased consequently [ 3 hrs for 0.5% Ropivacaine(20 ml);4 hrs for 0.75% Ropivacaine (20 ml)& 5 hrs for 1% Ropivacaine (20 ml).

it is evident that there was 1 patients in group receiving Ropivacaine 0.75% who had incidence of hypotension in first 30 mins out of which no patients required treatment of hypotension. But as far as group receiving Bupivacaine 0.5% was concerned, 8 patients had episodes of hypotension(B.P. fall greater than 20% of the base line) in first 30 mins, out of which 4 patients required vasopressors treatment (mephentermine 6-12 mg). This was clinically significant (p<0.05) and it was evident from the data that Ropivacaine 0.75% provided more hemodynamic stability than Bupivacaine 0.5%. In study conducted by Wolff et al<sup>8</sup>, he concluded that concentration of Ropivacaine up to 1% provide a longer duration of sensory and motor block & superior quality of anaesthesia compared with Bupivacaine 0.5%,without any increase in cardiovascular side effects or any other adverse events.

## CONCLUSION

Epidural block acts as an effective alternative to general anesthesia with lesser complications. The duration of motor blockade was shorter with 0.75% Ropivacaine compared to 0.5% Bupivacaine when given via lumbar epidural. The lumbar epidural anaesthesia with 0.75% Ropivacaine provided more hemodynamic stability than 0.5% Bupivacaine.

## REFERENCES

1. Leone S, Di Cianni S, Casati A, Fanelli G. Pharmacology, toxicology, and clinical use of new long acting local anesthetics, ropivacaine and levobupivacaine. Acta Biomed. 2008;79:92-105.
2. Whiteside JB, Wildsmith JA. Developments in local anaesthetic drugs. Br J Anaesth. 2001;87:27-35.
3. Nancarrow C, Rutten AJ, Runciman WB, Mather LE, Carapetis RJ, McLean CF, et al. Myocardial and cerebral drug concentrations and the mechanisms of death after fatal intravenous doses of lidocaine, bupivacaine, and ropivacaine in the sheep. Anesth Analg. 1989;69:276-83.
4. Zaric D, Nydahl PA, Philipson L, Samuelsson L, Heierson A, Axelsson K. The effect of continuous lumbar epidural infusion of ropivacaine (0.1%, 0.2%, and 0.3%) and 0.25% bupivacaine on sensory and motor block in volunteers: A double-blind study. Reg Anesth. 1996;21:14-25.
5. Peduto VA, Baroncini S, Montanini S, Proietti R,

- Rosignoli L, Tufano R, et al. A prospective, randomized, double-blind comparison of epidural levobupivacaine 0.5% with epidural ropivacaine 0.75% for lower limb procedures. *Eur J Anaesthesiol.* 2003;20:979–83.
6. Katz JA, Bridenbaugh PO, Knarr DC, Helton SH, Denson DD. Pharmacodynamics and pharmacokinetics of epidural ropivacaine in humans. *Anesthesia & Analgesia.* 1990;70:16-21.
  7. Bjornestad E, Smedvig JP, Bjerkreim T, et al. epidural ropivacaine 7.5 mg/ml for elective caesarean section: A double blind comparisons of efficacy and tolerability with bupivacaine 5 mg/ml. *Acta Anaesthesiol scand.* 1999; 43:603–608.
  8. Wolff AP, Hasselstom L, Kerkamp IE, et al. Extradural ropivacaine and bupivacaine in hip surgeries. *British Journal of Anaesthesia.* 1995;74:458-460.
  9. Brown DL, Carpenter RL, Thompson GE. Comparison of 0.5% Ropivacaine and 0.5% Bupivacaine for epidural anaesthesia in patients undergoing lower extremity surgery. *Anesthesiology.* 1990;72:633-636.
  10. Mc Glade DP, Kalpokas MV, Mooney PH, et al. A comparison of Bupivacaine 0.55 & Ropivacaine 0.5% in lumbar epidural anaesthesia for lower limb orthopedic surgeries. *Anaesthesia Intensive Care.* 1997;25:263-285.

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