

## Comparison of Sedative and Cardiovascular Effects of Ropivacaine with Dexmedetomidine and Clonidine in Patients Undergoing Lower Limb Surgery: A Hospital Based Prospective Study

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### Abstract

**Background:** Anesthetics are the agents used to induce sedation and analgesia in patients undergoing surgery. Combination of anesthetics plays major role in the major surgery and affect the various systems in the body. The present study aimed to evaluate the sedative and cardiovascular effects of ropivacaine with dexmedetomidine and clonidine in patients undergoing surgery. **Materials and Methods:** A total of 70 patients were included in the study. They were divided into two groups. G-A (Ropivacaine (0.75%/15 ml) + Dexmedetomidine (1 mcg/kg) and G-B Ropivacaine (0.75%/15 ml) + Clonidine (1 mcg/kg) were administered during surgery time. Study procedure was explained to all the patients and informed consent was taken. After administration of anesthetics to respective groups sedative and cardiovascular functions were recorded and analyzed. **Results:** 22 patients had a sedation score of 2 in Group A, whereas 35 patients had a sedation score of 2 in Group-B, 13 in Group A had score 3 at 10 min, No patient had sedation score 3 in Group B at 10 min. No one had sedation score 4 in both the groups, (Table 1). 32 patients, showed sedation score  $\geq 2$  in Group A compared to Group B where only 20 patients had sedation score  $\geq 2$  throughout the surgery. No one had a score of 3 in both the groups at the end of the surgery. Significant difference in heart rate was observed at 50 min and 70 min which got lowered in Group B when compared to Group A. No significant difference was noted in blood pressure monitoring and use of rescue drug for hypotension in both the groups. **Conclusion:** Epidural dexmedetomidine cause better sedation more cardiovascular stability compared to clonidine.

**Keywords:** Anesthesia; Clonidine; Ropivacaine; Dexmedetomidine; Epidural; Sedation; Hypotension.

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### Introduction

Epidural anesthesia is a most common technique used in the lower limb surgery. This technique provides anesthesia along with analgesia in the post operative period. It provides better anesthetic effect and less postoperative complications. It also helps

in fast mobilization with minimal side effects.<sup>1-4</sup> Bupivacaine is the most common anesthetic used in the epidural anesthesia. Recent clinical research results showed that use of ropivacaine is better than bupivacaine to induce the anesthesia. Ropivacaine has similar anesthetic effect but minimal cardiovascular adverse effects.<sup>5</sup> In clinical

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practice various adjuvant drugs used to increase the anesthetic and analgesic effect of local anesthetic agent. Use of combination can increase the effect and also reduce the toxic effects.<sup>6,7</sup> Studies showed that combination use of local anesthetic with alpha-2 agonist increase the quality and duration of analgesia and sedation with lesser cardiovascular effects. Dexmedetomidine and clonidine are alpha-2 agonist increase the effects of local anesthetics in epidural anesthesia.<sup>8</sup> Both drugs acts pre and post synaptic nerves terminals and also have central action which causes decrease the sympathetic flow leading to sedation and hemodynamic effects.<sup>9,10</sup> With this background the present study aimed to compare the sedative and cardiovascular effects of ropivacaine with dexmedetomidine and clonidine in patients undergoing lower limb surgery.

## Materials and Methods

### Study setting and period

This prospective study was conducted for one year in the Department of anesthesiology, SreeMookambika Institute of Medical Sciences, Kulasekharam, Kanyakumri (Dist), Tamil Nadu.

### Inclusion criteria

- Age between 18 and 65 years.
- Both genders.
- Patients fulfill the American Society of Anesthesiology Score 1 and 2.
- Patients undergoing lower limb surgery under epidural anesthesia.
- Patients undergoing lower abdominal elective surgeries under epidural anesthesia.

### Exclusion criteria

- ASA score above 3.
- Patients undergoing spinal anesthesia.
- Alcoholics, drug addicts and on sedative drugs.
- Emergency surgeries.
- Not willing to sign on informed consent.
- Allergic to anesthetics.

### Study groups

**Group-A:** Ropivacaine (0.75%/15 ml) + Dexmedetomidine (1 mcg/kg) (n=35)

**Group-B:** Ropivacaine (0.75%/15 ml) + Clonidine (1 mcg/kg) (n=35)

### Procedure

This study was started after approval of Institutional Research Committee and Institutional Human Ethics Committee. Study population was selected from patients coming to the anesthesia department. Based on the inclusion and exclusion criteria 70 patients were included in this study. All the selected patients were explained study protocol and procedure in detail. Informed consent was obtained from each patient. The selected patients were divided into 2 groups each of 35. The selected patients were asked to admit to the hospital one day prior to the surgery. They were kept fasting before 6 hr of surgery. On arrival to the operation theater, following insertion of an 18-G venous cannula, 500 mL of Ringer Lactate was infused to the patient before epidural anesthesia. Standard monitors like ECG, Non-invasive blood Pressure and SpO<sub>2</sub> probe was attached and baseline parameters recorded. Patients positioned and 15 ml 0.75% ropivacaine with adjuvant was administered epidural space in L3-L4 interspace through a standard midline approach using an 18-G Tuohy needle. Group-A was given Dexmedetomidine 1 mcg/kg with ropivacaine epidural space, whereas Group-B was given 1 mcg/kg of clonidine with ropivacaine epidural space. All patients were supplemented with oxygen-4L/min via a face mask throughout the procedure after positioning the patient. The level of sedation was assessed 10 minutes after grade 3 motor blockades and at the end of surgery based on the Ramsay sedation scale. Hemodynamic parameters were monitored every 5 minutes for the first 30 minutes, every 10 minutes thereafter till the end of surgery. Patient received inj. Atropine 0.6 mg when the heart rate fell below 20% of baseline (bradycardia) and Inj. Mephentermie in titrated bolus when there was hypotension (fall below 20% of baseline). Any side effects seen after administration of study drug was noted and treated appropriately.

### Statistical analysis

Statistical Package for Social Sciences (16.0) version used for analysis. The data was expressed in number, percentage, mean and standard deviation. Unpaired *t* test applied to find the statistical significant between the groups. *p* value less than 0.05 (*p* < 0.05) consider statistically significant at 95% confidence interval.

**Results**

Total 70 patients were included in the study. They were divided into two groups each of 35 patients. 22 patients had a sedation score of 2 in Group A, whereas 35 patients had a sedation score of 2 in Group B. 13 in Group-A had score 3 at 10 min. No patient had sedation score 3 in Group B. No one had sedation score 4 in both the groups, (Table 1). 32 patients, that is 91% of patients showed sedation score  $\geq 2$  in Group-A compared to Group-B where

only 20 patients, that is 57% had sedation score  $\geq 2$  throughout the surgery. No one had a score of 3 in both the groups at the end of the surgery. 0, 5, 10, 15, 20, 25, 30, 40, 45, 60, 80, 90, 100, 110 and 120 min not showed any significant difference compared heart rate between Group-A with B. Statistical significance in heart rate was observed between Group-A and B at 50 and 70 min ( $p < 0.05$ ) (Table 3 and Graph 1). No significant difference was noted in blood pressure monitoring and subsequent use of injmephentermine for hypotension in both the groups.

**Table 1:** Comparison of Sedation Score at 10 min between the Group-A and Group-B

Sedation score	Group-A		Group-B	
	Number	Percentage (%)	Number	Percentage (%)
2	22	62.88*	35	100*
3	13	37.14*	0	0
4	0	0.0	0	0

(\* $p < 0.05$  significant compared Group-A with Group-B)

**Table 2:** Comparison of Sedation Score at the end of Surgery between the Group-A and Group-B

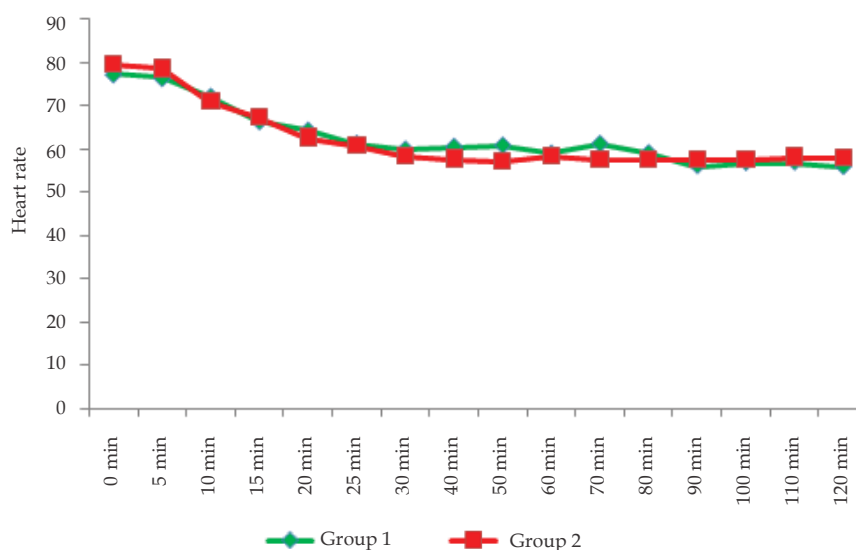
Sedation score	Group-A		Group-B	
	Number	Percentage (%)	Number	Percentage (%)
2	32	91.4*	20	57.14*
3	0	0	0	0
4	0	0	0	0

(\* $p < 0.05$  significant compared Group-A with Group-B)

**Table 3:** Comparison of Heart Rate between the Group-A and Group-B

Heart rate	Group-A		Group-B		t	p
	Mean	SD	Mean	SD		
0 min	77.40	8.222	79.49	10.472	-.927	.357
5 min	76.57	9.319	78.49	10.752	-.796	.429
10 min	72.34	9.152	70.89	9.380	.658	.513
15 min	66.46	13.611	67.29	8.191	-.309	.759
20 min	64.43	6.984	62.57	7.072	1.105	.273
25 min	61.37	7.166	60.86	6.779	.308	.759
30 min	60.03	6.506	58.23	7.581	1.066	.290
40 min	60.60	6.779	57.66	6.633	1.836	.071
50 min	60.91	7.164	57.14	6.731	2.270	.026*
60 min	59.06	5.810	58.23	6.695	.553	.582
70 min	61.31	8.025	57.43	5.468	2.367	.021*
80 min	59.17	5.591	57.57	5.164	1.244	.218
90 min	56.20	7.136	57.60	4.894	-.957	.342
100 min	56.94	6.145	57.54	6.075	-.411	.683
110 min	57.03	7.115	58.09	5.564	-.692	.491
120 min	56.03	6.066	57.80	4.378	-1.401	.166

(\* $p < 0.05$  significant compared Group-A with Group-B)



Graph 1: Comparison of heart rate between the Group-A and Group-B

## Discussion

In this study, we found better sedation in the patients who received dexmedetomidine than those who received clonidine at both 10 minutes and at the end of surgery. This apparent change was also found to be statistically significant ( $p = 0.000$ ). The similar study conducted by Oriol-Lopez *et al.*,<sup>11</sup> assessing the anxiolytic and sedative property of epidural dexmedetomidine in patients undergoing abdominal surgeries, dexmedetomidine was given at a dose of 1 mcg/kg. Following the injection, Ramsay sedation score was used for assessment of sedation. They found that 90% of the patients receiving dexmedetomidine were sedated to a score of 3 to 4 for 90 minutes after drug administration. The findings of Bajwa *et al.*,<sup>12</sup> also showed a significantly higher level of sedation in the patients who received dexmedetomidine in comparison to clonidine. These findings from the studies mentioned above concur with the findings from our study, showing that dexmedetomidine causes significantly higher sedation than clonidine when given epidurally. We found that heart rate significantly fell in both the groups by 20 in 30 to 50 minutes after the epidural injection. Blood pressure decreased by 25% in 30 to 50 minutes following epidural injection. However, this change was not statistically significant ( $p > 0.05$ ). Similar observations were observed by Bajwa *et al.* and Schnaider *et al.*<sup>13</sup> where a 15% fall of heart rate % blood pressure from the baseline which was not statistically significant.

We observed similar hemodynamic changes in both the study groups. We found no significant difference in the atropine and mephentermine requirement as rescue in both the groups. Findings were similar to studies done by Bagatini *et al.*, who also found no significant difference in terms of hypotension and bradycardia between the patients receiving dexmedetomidine or clonidine.<sup>14</sup> Nausea, vomiting and shivering was not observed in both the groups. We had two patients in Group R and one patient in Group RD who had dry mouth. The study conducted by Bajwa *et al.* showed a higher incidence of nausea, dry mouth during the postoperative period.

The limitations of our study was that as different surgeries were taken up in this study, therefore onset of pain at surgical incisional site may not give an accurate duration of analgesia. There is also need for larger studies, using different concentrations of both drugs to find equivalent doses of epidural dexmedetomidine and clonidine. There is a further requirement to assess the long-term safety and effects of epidural dexmedetomidine as most studies only determine the short-term effects.

## Conclusion

The study results conclude that epidural dexmedetomidine induce better sedation compared to clonidine. Combination of dexmedetomidine with other local anesthetic produces the better sedation effect with less cardiovascular effects.

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