Efficacy of epidural 0.25 ml fentanyl versus 0.5 ml dexmedetomidine with 0.75% ropivacaine in lower abdominal surgeries

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ABSTRACT

Background: Epidural anesthesia alloyed with opioids facilitates a dose sparing effect of local anesthetic and superior analgesia. The drugs such as dexmedetomidine and fentanyl are effective adjuvants to ropivacaine to provide efficient post-operative analgesia. Still, the findings are contradictory.

Aims and Objectives: The aims of the study were to assess the efficacy of 0.75% ropivacaine with 0.25 ml fentanyl and 0.5 ml dexmedetomidine in the patients undergoing lower abdominal surgeries.

Materials and Methods: A total of 80 cases undergoing lower abdominal surgeries above 21 years were recruited. Group RF administered with 18ml of 0.75% ropivacaine + 0.25 ml fentanyl. Group RD administered with 18ml of 0.75% ropivacaine + 0.5 ml dexmedetomidine. During intraoperative period, parameters such as sensory block, motor block by modified Bromage scale, pain score, and hemodynamic parameters were recorded. The sedation score was assessed using Ramsay sedation score.

Results: The mean difference of the events of sensory block and motor block between two study groups was statistically significant (P < 0.05). The mean systolic blood pressure (SBP) was comparatively less in Group RD than Group RF during the entire study period. The mean difference of SBP, heart rate, and mean arterial pressure was statistically significant (P < 0.05). Preoperatively, the diastolic blood pressure was higher in Group RD; later stages, the levels were lesser than Group RF. The mean sedation score was less in Group RD till 15 min, later, it was higher in Group RD than Group RF. Bradycardia was commonly associated post-operative complication in both the study groups followed by nausea and vomiting.

Conclusion: The fentanyl and dexmedetomidine are effective adjuvants to ropivacaine. However, dexmedetomidine has better efficacy in terms of prolonged duration of sensory block, motor block, and post-operative analgesia, minimal requirement of rescue analgesia and with less post-operative complications.

KEY WORDS: 0.75% Ropivacaine; 0.25 ml Fentanyl; 0.5 ml Dexmedetomidine; Lower Abdominal Surgery; Epidural Anesthesia

INTRODUCTION

Epidural anesthesia is an effective method used in abdominal surgeries for prolonged post-operative analgesia with better patient satisfaction.1 Epidural anesthesia alloyed with opioids facilitates a dose-sparing effect of local anesthetic and superior analgesia. To achieve desired perioperative anesthetic effect, higher volumes of local anesthetics are being used, which lead to unfavorable hemodynamic effects.2 A recent local anesthetic drug ropivacaine has minimal cardiovascular and central nervous system toxicity as well as a lesser tendency of motor block during post-operative epidural analgesia.3,4 Dexmedetomidine, a highly selective α2-adrenergic agonist, minimizes the need of opioids and inhalational anesthetics and is preferable choice in the perioperative and critical care settings.4,5
Several reports have been assessed the efficacy of fentanyl and dexmedetomidine as an adjuvant to ropivacaine for epidural anesthesia, still the findings are contradictory. The present study was designed to assess the efficacy of 0.75% ropivacaine with 0.25 ml fentanyl and 0.5 ml dexmedetomidine in the patients undergoing lower abdominal surgeries.

MATERIALS AND METHODS

The present prospective randomized control study was conducted in the Department of Anaesthesiology at SVS Medical College and Hospital, Mahabubnagar, Telangana, from July 2020 to October 2021. A total of 80 cases undergoing lower abdominal surgeries above 21 years were recruited. Cases belong to AS Grades I and II, cases of both genders and willing to participate were included in the study. Cases with contraindication for epidural anesthesia, sensitive to study drugs, cases with systemic and psychiatric complications, and cases not willing to participate were excluded from the study. Informed consent was obtained from all the study cases. The study protocol was approved by the Institutional Ethics Committee (File. No. 2020/IEC/06/29).

The study cases were randomly divided into two study groups. Group RF administered with 18ml of 0.75% ropivacaine + 0.25 ml fentanyl. Group RD administered with 18ml of 0.75% ropivacaine + 0.5 ml dexmedetomidine. All study participants underwent routine laboratory investigations. The baseline vitals were recorded after shifting the participant to the operation theater. During intraoperative period, parameters such as sensory block, motor block estimation by modified Bromage scale, and pain score and hemodynamic parameters such as systolic blood pressure (SBP), diastolic blood pressure (DBP), mean heart rate, mean pulse rate, respiratory rate, and oxygen saturation levels were recorded. The sedation score was assessed using Ramsay sedation score. Post-operative complications were recorded in both the study groups. Descriptive statistics were used to analyze categorical variables and represented as frequency and percentage. The Student’s t-test was used to analyze continuous variables. P < 0.05 was considered as statistically significant. The statistical analysis was performed using Statistical Package for the Social Sciences version 16.0.

RESULTS

The observed findings are summarized in Tables 1-5 and Figures 1-2.

DISCUSSION

The majority participants in the both study groups were between the age group of 31–40 and 41–50 years. In both study groups, male participants were more common than female participants. The body mass index was 26.57 in Group RF and 26.84 in Group RD. In Group RF, 55% of cases were belonging to ASA Grade I and 45% of cases were ASA Grade II. While in Group RD, 62.5% of cases belonging to ASA Grade I and 37.5% of cases were in ASA Grade II [Table 1]. The mean duration for onset of sensory block at T10 dermatome was 13.01 min in Group RF and 10.56 min in Group RD. The duration to reach maximum level of sensory block was 18.80 min in Group RF and 16.24 min in Group RD. The mean duration for onset of pain was 322.14 min and 385.10 min in Group RF and RD, respectively. Duration of complete motor block was 28.98 min in Group RF and 22.45 min in Group RD. The mean difference of events of sensory block and motor block between two study groups was statistically significant (P < 0.05) [Table 2]. The mean SBP was comparatively less in Group RD than Group RF during the entire study period. This difference was statistically significant (P < 0.05). Preoperatively, the mean DBP was higher in Group RD; later stages, the levels were lesser than Group RF. The mean difference was statistically significant from 20 min onwards [Table 3]. The mean heart rate was comparable between two study groups and the

<table>
<thead>
<tr>
<th>Table 1: Demographic data of study participants (n=80)</th>
</tr>
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<tbody>
<tr>
<td>Demographic data</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>21–30</td>
</tr>
<tr>
<td>31–40</td>
</tr>
<tr>
<td>41–50</td>
</tr>
<tr>
<td>51–60</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>BMI</td>
</tr>
<tr>
<td>ASA grade</td>
</tr>
<tr>
<td>Grade I</td>
</tr>
<tr>
<td>Grade II</td>
</tr>
</tbody>
</table>

BMI: Body mass index

<table>
<thead>
<tr>
<th>Table 2: Comparison of sensory block and motor block between two study groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration (In min)</td>
</tr>
<tr>
<td>Group RF Mean±SD</td>
</tr>
<tr>
<td>Onset to T10 level</td>
</tr>
<tr>
<td>Maximum level of sensory block</td>
</tr>
<tr>
<td>Onset of pain</td>
</tr>
<tr>
<td>Requirement of rescue analgesia</td>
</tr>
<tr>
<td>Duration of complete motor block</td>
</tr>
</tbody>
</table>

SD: Standard deviation
### Table 3: Comparison of mean systolic blood pressure and diastolic blood pressure between study groups

<table>
<thead>
<tr>
<th>Duration (in min)</th>
<th>Systolic blood pressure</th>
<th>P-value</th>
<th>Diastolic blood pressure</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group RF Mean±SD</td>
<td>Group RD Mean±SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At beginning</td>
<td>120.2±12.82</td>
<td>126.44±7.56</td>
<td>0.025</td>
<td></td>
</tr>
<tr>
<td>5 min</td>
<td>124.27±13.22</td>
<td>118.31±6.23</td>
<td>0.028</td>
<td></td>
</tr>
<tr>
<td>10 min</td>
<td>118.54±12.27</td>
<td>110.12±8.54</td>
<td>0.041</td>
<td></td>
</tr>
<tr>
<td>15 min</td>
<td>114.32±14.23</td>
<td>105.74±8.87</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>20 min</td>
<td>108.02±12.98</td>
<td>101.86±8.63</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>30 min</td>
<td>102.56±15.20</td>
<td>99.55±6.28</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>45 min</td>
<td>97.42±15.62</td>
<td>96.28±5.34</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>60 min</td>
<td>99.48±14.38</td>
<td>92.63±6.03</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>90 min</td>
<td>104.92±13.65</td>
<td>89.28±7.35</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>120 min</td>
<td>109.24±12.52</td>
<td>94.66±8.86</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>180 min</td>
<td>114.68±12.08</td>
<td>99.92±7.55</td>
<td>0.027</td>
<td></td>
</tr>
<tr>
<td>240 min</td>
<td>119.78±13.05</td>
<td>108.36±8.78</td>
<td>0.048</td>
<td></td>
</tr>
</tbody>
</table>

SD: Standard deviation

### Table 4: Comparison of mean sedation score between two study groups

<table>
<thead>
<tr>
<th>Duration (In min)</th>
<th>Mean sedation score</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group RF Mean±SD</td>
<td>Group RD Mean±SD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At beginning</td>
<td>1.98±0.86</td>
<td>1.91±0.44</td>
</tr>
<tr>
<td>15 min</td>
<td>2.12±0.37</td>
<td>2.04±0.89</td>
</tr>
<tr>
<td>30 min</td>
<td>2.25±0.88</td>
<td>2.31±1.12</td>
</tr>
<tr>
<td>45 min</td>
<td>2.46±0.94</td>
<td>2.63±0.85</td>
</tr>
<tr>
<td>60 min</td>
<td>2.23±1.01</td>
<td>2.94±0.63</td>
</tr>
<tr>
<td>75 min</td>
<td>2.14±0.86</td>
<td>2.78±0.58</td>
</tr>
</tbody>
</table>

SD: Standard deviation

### Table 5: Post-operative complication encountered in two study groups

<table>
<thead>
<tr>
<th>Complications</th>
<th>Group RF</th>
<th></th>
<th>Group RD</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>05</td>
<td>12.5</td>
<td>03</td>
<td>7.5</td>
</tr>
<tr>
<td>Nausea</td>
<td>09</td>
<td>22.5</td>
<td>03</td>
<td>7.5</td>
</tr>
<tr>
<td>Pruritus</td>
<td>08</td>
<td>20</td>
<td>01</td>
<td>2.5</td>
</tr>
<tr>
<td>Hypotension</td>
<td>04</td>
<td>10</td>
<td>05</td>
<td>12.5</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>11</td>
<td>27.5</td>
<td>15</td>
<td>37.5</td>
</tr>
</tbody>
</table>

SD: Standard deviation

difference was statistically significant ($P < 0.05$). The mean heart was comparatively less in Group RD than RF. The mean difference was statistically significant between study groups ($P < 0.05$). The mean sedation score was less in Group RD till 15 min, later, the recorded sedation score was higher in Group RD than Group RF [Table 4]. Bradycardia was commonly associated complication in both study groups followed by nausea and vomiting [Table 5].

A study by Kaur et al. noticed in the lower limb orthopedic surgeries that the onset of sensory block to T10 dermatome was 14.18 min in Group R and 12.53 in Group RD. The maximum sensory level was achieved at T6 dermatome level in Group R and T5 dermatome levels in Group RD ($P < 0.05$). The duration for maximum sensory level was 23.24 min in Group R and 21.63 in Group RD.$[^6]$ A study by Gandhi et al. noticed prolonged duration of analgesia in Group RD than Group RF and Group R ($P < 0.05$). The mean SBP, DBP, and respiratory rates were comparable between the study groups. The mean heart rate was not significant between the study groups.$[^7]$ A study by Mufti and Irshad found early inset of sensory and motor block in Group RD than Group RF. The mean heart rate, SBP, and DBP were comparable between the study groups. Post-operative VAS score for pain was less in Group D at 24 h.$[^8]$ A study by Baywa et al. noticed that onset of sensory block T10 was 7.12 min in Group RD and 9.14 in Group RF. The duration of maximum sensory block level was 13.38 min in Group RD and 16.61 min in Group RF. The duration for complete motor block was 18.16 min in Group RD and 12.98 min in Group RF. The sedation score between two study groups was statistically significant ($P < 0.05$). Nausea and vomiting were reported comparatively high in Group RF. In Group RD, dry mouth was significantly higher.$[^9]$ In this study, the mean duration for onset of sensory block at T10 dermatome was 13.01 min in Group RF and 10.56 min in Group RD. The above findings were consistent with the findings of the present study. A study by Pratibha et al. noticed that the onset of sensory block at T10 level was 9.375 min in Group RD and 11.45 min in Group RF. The onset duration of motor block was 14.65 min in Group RD and 17.1 min in Group RF ($P < 0.0001$). The mean heart rate, SBP, and DBP were comparable between study groups. Hypotension was the most common post-operative complication in Group RD followed by nausea, bradycardia, and vomiting.$[^10]$ A study
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Comparison of mean arterial pressure between the study groups concluded that ropivacaine with dexmedetomidine have similar hemodynamic stability. However, ropivacaine with dexmedetomidine has better efficacy in terms of prolonged duration of sensory block, post-operative analgesia, minimal requirement of rescue analgesia, and better patient satisfaction.[12] A study by Rastogi et al. noticed that the onset of sensory block and duration to maximum motor block were less in Group RD that Group RF. The incidence of nausea and vomiting was less if Group RD.[12] A study by Meitei et al. noticed that the onset of sensory block to T10 dermatome was 15.36 min in Group R and 11.16 in Group RD. The total duration of sensory block was 391.68 min in Group R and 529.36 min in Group RD. The duration for motor block was 264.96 min in Group R and 390.44 min in Group RD. Hypotension was common post-operative complication followed by bradycardia.[13] The results of the present study were comparable with the findings of above studies.

Figure 1: Comparison of mean heart rate between the study groups

Figure 2: Comparison of mean arterial pressure between the study groups

A study by Kaur et al. concluded that ropivacaine and ropivacaine with dexmedetomidine have similar hemodynamic stability. However, ropivacaine with dexmedetomidine has better efficacy in terms of prolonged duration of sensory block, post-operative analgesia, minimal requirement of rescue analgesia, and better patient satisfaction.[13] A study by Gandhi et al. concluded that ropivacaine with dexmedetomidine as adjuvant is better in terms of prolonged post-operative analgesia, sedation, and stable hemodynamic parameters.[2] A study by Meitei et al. concluded that dexmedetomidine is better adjuvant to ropivacaine. The results of the present study concluded that the fentanyl and dexmedetomidine are effective adjuvants to ropivacaine. However, dexmedetomidine has better efficacy in terms of prolonged duration of sensory block, motor block, and post-operative analgesia, early onset of sensory block, and better sedation than ropivacaine with fentanyl.[14] A study by Qian et al. concluded that ropivacaine with dexmedetomidine has better efficacy with less incidence of post-operative complications.[7] A study by Meitei et al. concluded that dexmedetomidine with ropivacaine is effective drugs.[9] The present study has limitations in the terms of small sample size due to the COVID-19 pandemic. Patients were denied to be a part of the study and could not conduct prolonged post-operative follow-up.

CONCLUSION

The results of the present study concluded that the fentanyl and dexmedetomidine are effective adjuvants to ropivacaine. However, dexmedetomidine has better efficacy in terms of prolonged duration of sensory block, motor block, and post-operative analgesia, minimal requirement of rescue analgesia and with less post-operative complications.

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