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Study on the hemodynamic changes observed with the adjuvant 8mg Dexamethasone with 20 ml of 0.2% ropivacaine in USG guided caudal analgesia for patients undergoing elective spine surgeries

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Abstract

Background: Pain after lumbosacral spine surgeries is due to activation of various pain mechanisms like inflammatory, nociceptive and neuropathic. Also, by handling structures like vertebrae, intervertebral disc, dura and nerve root sleeves, facet joint capsules, muscles, fascia and ligaments. Several studies have shown that caudal epidural injections are relatively safe, simple, and effective in relieving postoperative pain. Regional blockade can be prolonged by adding different adjuvants. **Methodology**-The study was conducted in the Anesthesiology department, at the tertiary care hospital for a period of 18 months. 40 patients selected for lumbar spine surgery were included in this study. Further the patients were divided into two groups consisting of 20 patients in each. Group 1 received 0.2% Ropivacaine and Group 2 received 0.2% Ropivacaine + 8mg Dexamethasone. Patients were further monitored for hemodynamic changes such as for Heart rate (HR), Respiratory rate (RR), Non- invasive Blood pressure (NIBP), arterial oxygen saturation (SpO2). Changes were noted and analyzed. **Results**- The mean of group 1 (N=25) was recorded as 80.96 ± 703 with the range between minimum 65 and maximum 95, whereas the mean of group 2 was recorded as 82.36 ± 9.92 for OPHR. OPSBP mean of group 1 (N=25) was recorded as 112.92 ± 10.27 with the range between minimum 90 and maximum 130, whereas the mean of group 2 was recorded as 118.84 ± 11.82 with the range between minimum90 and maximum 138.**Conclusion**-Pre-emptive caudal block with 0.2% Ropivacaine and 8 mgDexamethasone provides longer and better analgesia for lumbosacral spine surgeries with no hemodynamic side effects.

Keywords-Caudal, block, hemodynamic**,** analgesia, spine

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Introduction

Pain after lumbosacral spine surgeries is due to activation of various pain mechanisms like inflammatory, nociceptive and neuropathic. Back pain occurs in a variety of tissues, including vertebrae, intervertebral discs, ligaments, dura, nerve root sleeves, facetjoint capsules, fascia, and muscles. Inflammation following surgery, mechanical irritation, or

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compression cause pain. Post-operative pain is more frequently associated with referred pain rather than local or diffuse pain in patients with pre-existing chronic pain [1]. Post-operative pain differs from chronic pain in that it is transitory and gradually improves with time, regardless of the location of surgery. It also occurs in surgeries of the cervical spine, thoracic spine, and lumbar spine [2]. For lumbar spine surgical procedures, the literature notes various advantages of RA over GA, including reduced pulmonary complications, intra-operative blood loss, perioperative cardiac ischemic incidents, hypoxic episodes, arterial and venous thrombosis, and decreased incidence of post-operative cognitive dysfunction, all of which suggests advantages of RA over GA in certain orthopedic procedures. RA also has the potential to reduce length of inpatient stays and reduce overall hospital costs. Early post-operative pain may be decreased in patients receiving regional anesthesiafor intra-operative management.

Ropivacaine is a long-acting regional anaesthetic that is structurally linked to Bupivacaine. Ropivacaine inhibits impulse conduction in nerve fibres by causing reversible suppression of sodium ion inflow. Ropivacaine has selective effect on the pain- transmitting A delta and C nerves rather than A beta fibres, which are involved in motor function because it is less lipophilic than bupivacaine and less likely to penetrate big myelinated motor fibres [3]. In animals and healthy individuals, ropivacaine has a substantially greater threshold for cardiotoxicity and CNS toxicity than bupivacaine due to its lower lipophilicity compared to bupivacaine and its stereo selective characteristics [4]. Ropivacaine exhibits antibacterial action in vitro, preventing the development of Pseudomonas aeruginosa, Escherichia coli, and Staphylococcus aureus [5]. The effectiveness of ropivacaine for surgical anaesthesia, labour pain, and postoperative pain in adults and children has been examined in several clinical studies. According to clinical research, ropivacaine is a powerful regional anaesthetic when used in a variety of ways [6]. A glucocorticoid with a lengthy half-life is dexamethasone. Compared to hydrocortisone, it has 30 times the anti-inflammatory power. There is no salt retentionactivity. There are oral, injectable, and topical forms available [7]. Peripheral nerve block analgesia has been demonstrated to last longer when dexamethasone is administered. Its anti-inflammatory effects serve as the basis for the mechanism of action [8]. Further, adding dexamethasone as an adjuvant to Ropivacaine decreases post-operativepain and analgesic requirement [9].

The above study was conducted to observe the hemodynamic changes with the adjuvant 8mg Dexamethasone with 20 ml of 0.2% ropivacaine in USG guided caudal analgesia for patients undergoing elective spine surgeries.

Materials And Method

Study place- The study was conducted in the Anesthesiology department, at the tertiary care hospital for a period of 18 months.

Study design- Prospective randomized control study.

Inclusion criteria- Patients aged from 18-70 years, belonging to either gender, posted for spine surgery and willing to give written consent for participation,

Exclusion Criteria-Patients previously operated for spine surgery, having known cardiac, hepatic, renal disorders, spine abnormalities, contraindicated for regional anaesthesia, requiring fusion or instrumentation, or with a non-degenerative spinal pathology (tumor, trauma, or infection) using of benzodiazepines, anticonvulsants, alcohol, or other psychotropic drugs (chronically or within 24 hours before the induction of anaesthesia) and refusing to give written consent for participation.

Sample size- 40 patients were selected and further divided into two groups of 20 patients each. Group 1 received 0.2% Ropivacaine and Group 2 received 0.2% Ropivacaine + 8mg Dexamethasone.

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Data analysis-Data was gathered, analyzed and entered in MS Excel. Continuous variables will be presented as percentage. Descriptive statistics such as Mean and standard deviation will be calculated.

Ethical considerations- The Institutional Ethical Committee permissions was taken before beginning the study.

Subjects enrolled for the study were pre medicated the night before and morning of the surgery with T. Alprazolam 0.25mg and T. Pantoprazole sodium 40mg. A minimum 6-hour pre-operative Nil per oral (NPO) status was ensured prior to procedure. In pre-operative holding room, patient was examined again. Intravenous access was made using 18G cannula and intravenous fluids were started. Patient was connected to monitors for Heart rate (HR), Respiratory rate (RR), Non- invasive Bloodpressure (NIBP), arterial oxygen saturation (SpO2) and continuous ECG monitoring. Baseline vitals are recorded prior to procedure. General anaesthesia was administered in both the groups following the standard technique. Pre-medication followed by Induction was given for neuromuscular blockade. The sacral hiatus was visualised and a 20-gauge (0.9 × 90-mm) spinal needle was inserted under sonographic guidance through the sacro-coccygeal ligament into the epidural space of the sacral canal. Slow injection of about 2 mL of air was used as a final check of correct needle placement.

Group 1 patients received 20ml of 0.2% Ropivacaine.

Group 2 patients received 20ml of 0.2% Ropivacaine + 8mg Dexamethasone.

All patients were assessed for hemodynamic changes (Hypotension, bradycardia). Intra operatively, patients were monitored for continuous electrocardiogram (ECG), Heart rate (HR), Respiratory rate (RR), Non-invasive blood pressure (NIBP), arterial oxygen saturation (SpO2) and end tidal carbon dioxide (ETCO2).

Result

Table 1: IOSBP time rate calculation with its mean among the studied group

IOSPB	Group 1(mmhg)	Group 2 (mmhg)	T value	P value
IOSPB 0 min	123.04 ± 10.38	123.72 ± 8.15	-0.258	0.798
IOSPB 10 min	119.56 ± 11.04	117.12 ± 9.34	0.843	0.403
IOSPB 20 min	114.88 ± 10.21	117.52 ± 6.60	-1.085	0.283
IOSPB 30 min	114.64 ± 8.15	115.84 ± 8.15	-0.52	0.605
IOSPB 40 min	114.96 ± 7.42	115.60 ± 8.39	-0.286	0.776
IOSPB 50 min	114.84 ± 8.49	114.36 ± 8.20	0.203	0.840
IOSPB 60 min	114.16 ± 7.94	111.80 ± 9.54	-0.95	0.347
IOSPB 75 min	113.72 ± 7.95	111.52 ± 8.03	0.973	0.335
IOSPB 90 min	113.40 ± 8.26	112.64 ± 8.36	0.323	0.748
IOSPB 120 min	114.72 ± 8.86	112.68 ± 8.57	0.827	0.412
IOSBP 150 min	114.86 ± 7.69	112.90 ± 8.41	0.797	0.430
IOSBP 180 min	114.91 ± 8.95	112.00 ± 10.82	0.659	0.518
IOSBP 210 min	107.33 ± 15.01	126.00 ± 0.00	-1.668	0.194
IOSBP 240 min	106.00 ± 16.97	124.00 ± 0.00	-0.866	0.546

In group 1 (N=25), the mean of IOSBP 0 min was recorded as 123.04 ± 10.38with the range between minimum 106 and maximum 140, whereas in group 2 (N=25),mean of age group was recorded as 123.72 ± 8.15with the range between minimum 108 and maximum 136. Additionally, the T value of the age in two groups was -0.258and p-value 0.789 revealed that there are no significance differences between groups.

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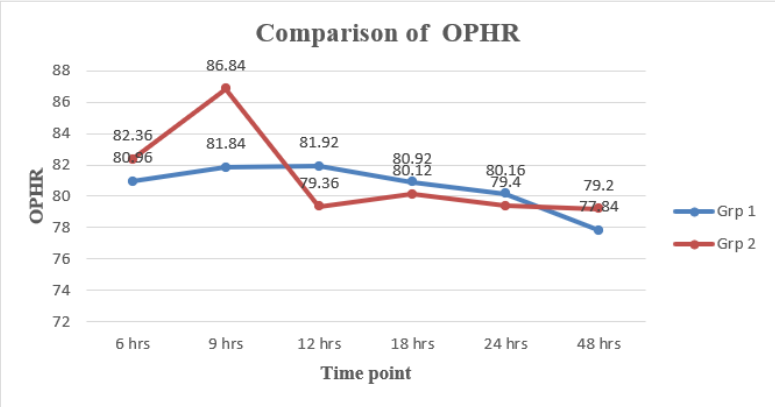
Table 2: IOMAP time rate calculation with its mean among the studied group

IOMAP	Grp 1 (mmhg)	Grp 2(mmhg)	T value	P value
0 min	94.24	92.76	0.687	0.495
10 mins	89.56	86.56	1.252	0.216
20 mins	86.68	86.08	0.272	0.787
30 mins	86..28	83.28	1.391	0.171
40 mins	86.32	83.88	1.397	0.169
50 mins	84.88	84	0.375	0.709
60 mins	83.44	81.32	1.001	0.322
75 mins	85.44	81.16	2.302	0.026
90 mins	84.9	82.16	1.473	0.148
120 mins	84.61	82.73	1.043	0.302
150 mins	81.81	83.13	1.237	0.223
180 mins	84.66	83.11	0.451	0.657
210 mins	81	92.67	-1.42	0.251
240 mins	79	96	-1.636	0.349

In group 1 (N=25), the mean of IOMAP 0 min was recorded as 94.24 ± 7.78with the range between minimum 78.67 and maximum 107.33, whereas in group 2 (N=25), mean of age group was recorded as 92.76 ± 7.44 with the range between minimum 80 and maximum 107. Additionally, the T value of the age in two groups was 0.687 and p-value 0.495 revealed that there are no significance differences between groups.

In group 1(N=2), the mean of IOMAP 240 min was recorded as 79.00 ± 8.48 with the range between minimum 73 and maximum 85, whereas in group 2 (N=1), mean of age group was recorded as 96.00 ± 0.00 with the range between minimum 96 and maximum 96. Additionally, the T value of the age in two groups was -1.636 and p-value 0.349 revealed that there are no significance differences between groups.



Graph 1: OPHR mean comparison of the studied group in regular time interval

In 6hrs, the mean of group 1 (N=25) was recorded as 80.96 ± 703 with the range between minimum 65 and maximum 95, whereas the mean of group 2 was recorded as 82.36 ± 9.92 with the range between minimum 68 and maximum 108. Additionally, the T value of the age in two groups was -0.576 and p-value 0.568 revealed that there are no significance differences between groups.

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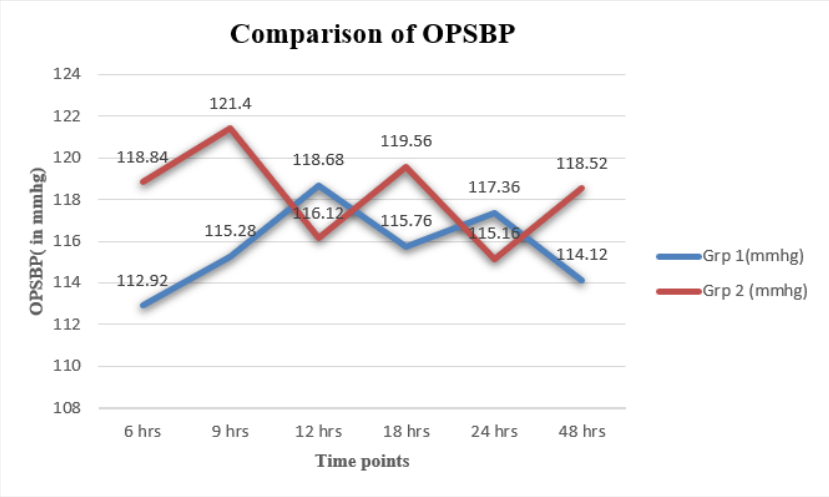
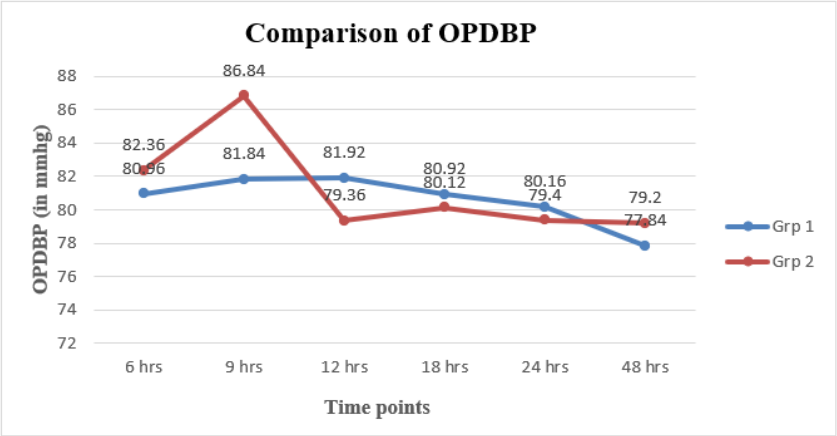


Graph 2: OPSBP mean comparison of the studied group in regular time interval

In 6hrs, the mean of group 1 (N=25) was recorded as 112.92 ± 10.27 with the range between minimum 90 and maximum 130, whereas the mean of group 2 was recorded as 118.84 ± 11.82 with the range between minimum90 and maximum 138. Additionally, the T value of the age in two groups was - 1.890and p-value 0.065 revealed that there are no significance differences between groups.



Graph 3: OPDBP mean comparison of the studied group in regular time interval

In 6hrs, the mean of group 1 (N=25) was recorded as 72.56 ± 9.58 with the range between minimum 52 and maximum 88, whereas the mean of group 2 was recorded as 78.00 ± 6.27 with the range between minimum 60 and maximum 86. Additionally, the T value of the age in two groups was -2.374 and p-value 0.022 revealed that there are high significance differences between groups.

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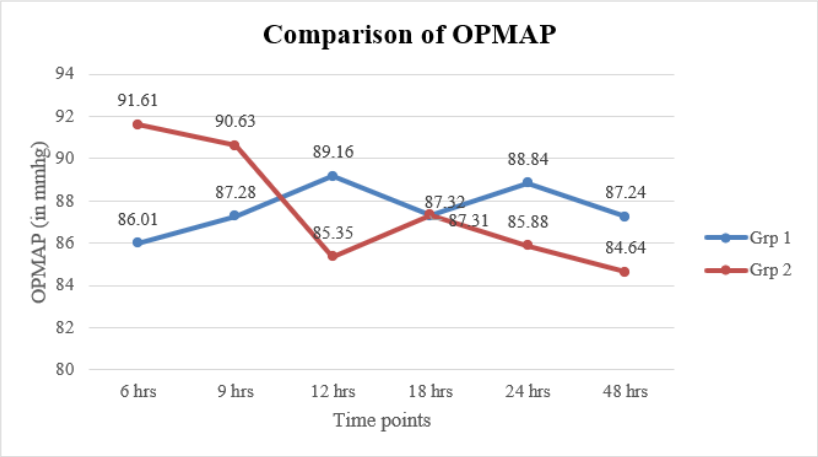
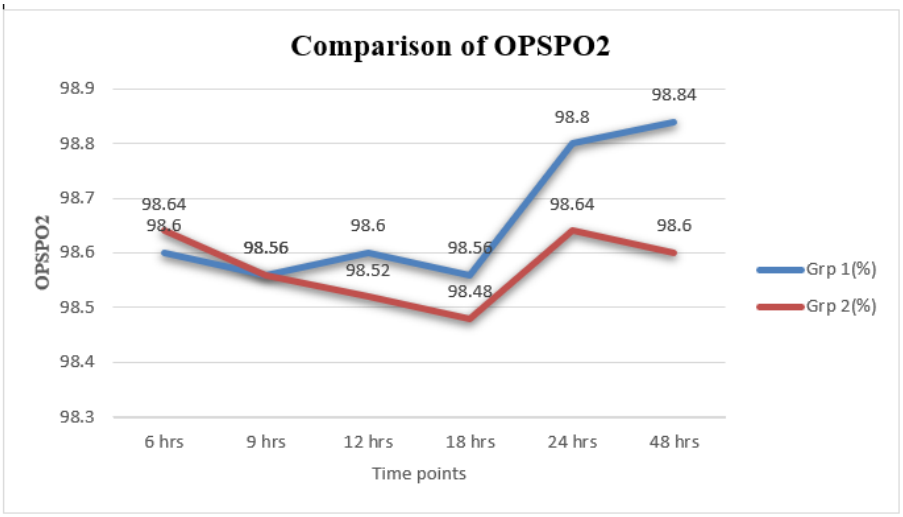


Graph 4: OPMAP mean comparison of the studied group in regular time interval

In 6hrs, the mean of group 1 (N=25) was recorded as 86.01 ± 9.66with the range between minimum 67.33 and maximum 101.33, whereas the mean of group 2 was recorded as 91.61 ± 7.61 with the range between minimum 70 and maximum 103.33. Additionally, the T value of the age in two groups was -2.276 and p-value 0.027 revealed that there are high significance differences between groups.



Graph 5: OPSPO2 mean comparison of the studied group in regular time interval

In 6-hrs, the mean of group 1 (N=25) was recorded as 98.60 ± 0.82 with the range between minimum 97 and maximum 99, whereas the mean of group 2 was recorded as 98.64 ± 0.75 with the range between minimum 97 and maximum 99. Additionally, the T value of the age in two groups was -0.180 and p-value 0.858 revealed that there are no significance differences between groups.

Discussion

In the study conducted above it was found that in group 1 (N=25), the mean of IODHR at 0 min was recorded as 84.12 ± 8.68 bpm with the range between minimum 65bpm and maximum 103bpm, whereas in group 2(N=25), mean of IODHR was recorded as 84.16 ± 9.09 bpm with the range between minimum 60bpm and maximum 101bpm. Additionally, the T value of the IODHR in two groups was -0.016 and p- value 0.987 revealed that there are no significant differences between groups. All the two groups were comparable in terms of intra-operative

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and post-operative hemodynamics in terms of Heart rate and Blood pressure. There was no statistical difference among the 2 groups [10]. There was no statistically significant difference between the IODHR of the Ropivacaine group than Dexamethasone + Ropivacaine group. The mean systolic and diastolic pressure was also almost similar in both the groups and within normal limits. The mean oxygen saturation did not vary very much in both groups. Cummings KC [11] found that Dexamethasone prolonged analgesia in inter-scalene block using Ropivacaine [11.8 (9.7-13.8) vs. 22.2 (18.0-28.6) h] and Bupivacaine [14.8 (11.8-18.1) vs.22.4 (20.5-29.3) h] and also established that dexamethasone prolonged analgesia more with Ropivacaine than with Bupivacaine. In summary, the hemodynamic responses are crucial in maintenance of patients during anesthesia and there were no significant changes in both Heart rate and Saturation in these studies. However, Ropivacaine has already proved its safety especially when used as a local anesthetic. Since the hemodynamic responses were similar, the study concludes that the Ropivacaine with Dexamethasone combination is also safer to use in the caudal epidural block in patients undergoing lumbar spine surgeries.

Conclusion

From the above study it was concluded that Pre- emptive caudal block with 0.2% Ropivacaine and 8 mgDexamethasone provides longer and better analgesia for lumbosacral spine surgeries with no hemodynamic side effects.

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