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ORIGINAL ARTICLE

Intravenous Dexmedetomidine Versus Dexmedetomiddine-Dexamethasone Combination A Comparative Study on Postoperative Nausea and Vomiting after Abdominal Surgeries

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ABSTRACT

Background: Postoperative nausea and vomiting (PONV) is a well-known and unpleasant complication after abdominal surgeries that may negatively affect recovery and increase hospitalization. Dexmedetomidine has demonstrated opioid sparing and sympatholytic effects that can potentially decrease PONV with dexamethasone being a proven antiemetic. This paper has compared the effectiveness of intravenous dexmedetomidine versus dexmedetomidine-dexamethasone combination to prevent PONV.

Methods: A comparative clinical trial was done between January 2022 and March 2023 in a tertiary-care hospital. A total of 80 adult patients that were undergoing elective abdominal surgeries were recruited and grouped into 2 equal groups: Group D control group that used dexmedetomidine only, and Group DD involving dexmedetomidine and dexamethasone 8 mg. Standardized anesthesia protocols were used. The PONV incidence, nausea scores, vomiting frequency and rescue antiemetic needs were measured after 24 hours of postoperative period. The SPSS version 26 was used to conduct statistical analysis with $p<0.05$ being significant.

Results: Group D had significantly more cases of nausea (55% vs. 22.5, p=0.003) and vomiting (37.5% vs. 12.5, p=0.01) than Group DD. The mean nausea scores as well as vomiting frequency were significantly low in the combination group. Group DD (15% vs. 45%, p=0.004) showed a decrease in the use of rescue antiemetic. The intraoperative need of fentanyl was also much smaller in the combination group (98 + 18 µg vs. 125 + 22 µg, $p<0.001$). There was no difference between the similar rates of bradycardia and hypotension in both groups.

Conclusion: Dexmedetomidine-dexamethasone combination is much more effective than dexmedetomidine alone in the prevention of PONV and the limit use of rescue antiemetic in the post abdomen surgical times. It also reduces the need to take opioids without escalating its adverse effects, which justifies its use in multimodal perioperative management.

Keywords: Dexmedetomidine, Dexamethasone, PONV, Abdominal surgery, Antiemetic.

INTRODUCTION

Postoperative nausea and vomiting (PONV) are one of the most unpleasant and most common side effects of abdominal surgeries that occur in almost 30-70 percent of patients depending on patient related, anesthetic and surgical variables [1]. Regardless of the development of anesthetic methodology and postoperative nursing care, PONV remains an important factor affecting the quality of recovery, the increase of hospitalization, the postponement of oral feeds, and patient discontent. Abdominal surgery, in general, and general anesthesia, in particular, are especially prone to PONV because of the visceral nature of this operation, the length of the anesthesia, and the need to continue taking opioids post-surgery [2].

Dexmedetomidine is a selective 2- adrenergic receptor agonist which has been used in perioperative medicine due to its sedative, anxiolytic, and opioid- sparing effects [3]. It has been proposed to indirectly cause a reduction in the occurrence of PONV through the reduction of the use of opioids during peri-operative procedures and stabilization of hemodynamic reactions [4]. Moreover, dexmedetomidine inhibits sympathetic functioning and can help decrease gastric dysrhythmia, which might decrease the amount of emesis [5]. Nevertheless, the antiemetic effect of dexmedetomidine as a single agent can be small, although the addition of drugs is currently gaining a growing interest to improve patient outcomes [6].

Dexamethasone is a potent corticosteroid with anti-inflammatory and antiemetic effects that has been extensively used as prophylaxis in PONV because of its ability to inhibit serotonin secretion in the gastrointestinal tract, reduce inflammation, and activate the chemoreceptor trigger zone [7]. The use of dexmedetomidine and dexamethasone could be synergistic to dexmedetomidine in providing better antiemetic activity, pain control and hemodynamic stability [8]. Nevertheless, there is a lack of comparative clinical evidence on the efficacy of dexmedetomidine in the prevention of PONV in abdominal surgeries when administered alone and combinations with dexamethasone [9]. Thus, the aim of the research was to evaluate the efficacy of dexmedetomidine and dexmedetomidine mixed with dexamethasone in the occurrence and severity of PONV among patients undergoing abdominal surgeries. The results should inform anesthesiologists to adopt the best perioperative antiemetic options to achieve the best outcome in postoperative and general patient satisfaction [10].

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MATERIALS AND METHODS

This comparative clinical study was conducted in the Department of Anesthesiology at two tertiary-care hospitals—POF Hospital, Wah Cantt, Pakistan, and Tehsil Headquarter Hospital, Liaquatpur, District Rahim Yar Khan, Pakistan. The study period extended from January 2022 to March 2023, during which adult patients scheduled for elective abdominal surgeries under general anesthesia were consecutively recruited. Ethical approval was obtained in advance from the Institutional Review Boards of both participating hospitals, and written informed consent was taken from each patient after providing a clear explanation of the study purpose, procedures, and possible risks. A total sample of 80 patients was acquired using a non-probability consecutive sampling technique. Eligible participants were adults aged 18 to 65 years with an ASA physical status of I–III and were booked for elective abdominal operations such as cholecystectomy, hernia repair, appendectomy, or bowel surgery. Patients were excluded if they had a documented hypersensitivity to the study drugs, a history of chronic steroid use, hepatic or renal dysfunction, pregnancy, known motion sickness, prior administration of

antiemetic medication within 24 hours before surgery, or an anticipated need for postoperative mechanical ventilation.

After meeting the eligibility criteria, patients were randomly divided into two treatment groups. Group D comprised patients who received intravenous dexmedetomidine at a loading dose of 0.5 µg/kg administered over a period not exceeding 10 minutes immediately after induction of anesthesia. Group DD received the same dexmedetomidine protocol but with the addition of intravenous dexamethasone 8 mg given right after induction. All patients in both groups underwent a standardized general anesthesia protocol. Induction was performed using propofol and fentanyl, followed by rocuronium to facilitate endotracheal intubation. Maintenance of anesthesia was achieved using sevoflurane in an oxygen-air mixture, with supplemental doses of fentanyl provided as needed for intraoperative analgesia. Throughout the surgery, continuous monitoring of hemodynamic parameters—including heart rate, systolic and diastolic blood pressure, oxygen saturation, and end-tidal carbon dioxide—was performed to ensure adequate physiological stability.

Postoperative nausea and vomiting (PONV) were assessed over a 24-hour postoperative period using a structured scoring system. The degree of nausea was recorded using a numerical rating scale ranging from 0 to 10, whereas vomiting was documented as the total number of episodes experienced by each patient. Rescue antiemetic therapy with intravenous ondansetron 4 mg was administered if the nausea score exceeded 5 or if the patient experienced more than one episode of vomiting. Additional perioperative variables—including demographic data, duration of surgery, total anesthetic time, overall opioid requirement, recovery time, and any adverse drug-related effects such as hypotension or bradycardia—were recorded on a standardized proforma.

All collected data were entered into SPSS version 26 for statistical analysis. Quantitative variables such as age, duration of surgery, anesthesia time, and recovery time were presented as mean ± standard deviation, whereas categorical variables were summarized using frequencies and percentages. Comparisons between the two groups were made using the independent t-test for continuous variables and the chi-square test for categorical variables. A p-value of less than 0.05 was considered statistically significant for all analyses.

RESULTS

This comparative clinical trial involved 80 patients (40 in Group D (Dexmedetomidine alone) and 40 patients in Group DD (Dexmedetomidine + Dexamethasone combination). S none of the participants was excluded upon enrolment. The demographic factors such as age, gender distribution, BMI and ASA status did not show any significant differences and were similar in both groups. There was no difference in the demographic profiles of the two groups, which made both groups comparable and reduced the risk of biasing the baseline. There was no substantial difference in terms of age, BMI, gender distribution, as well as ASA classification.

The main result was that the frequency of PONV was significantly lower in Group DD than in Group D. The degeneration of dexmedetomidine and dexamethasone combination group denoted the nausea and vomiting rates significantly lower than that of dexmedetomidine, which reveals a higher antiemetic effect.

Patients with excessive nausea (>5) or those with recurrent vomiting were rescued with ondansetron. Use of rescue antiemetics was significantly less in Group DD. Group DD showed a significant improvement in rescue antiemetic requirement, which indicated greater control of PONV with the combination regimen.

The combination group necessitated fewer opioid supplements, which is probably the reason why PONV was reduced. Group DD was much less likely to use fentanyl and this confirms that there was a synergistic effect between dexmedetomidine and dexamethasone and thus indirectly led to a decrease in PONV.

Bradycardia and hypotension were among their common side effects. The two groups were similar in terms of safety. The difference in the adverse effects between groups was not significantly different, which implied that both regimens were well tolerated.

Table 1: Demographic Characteristics of Study Participants

Variable	Group D (n=40)	Group DD (n=40)	p-value
Age (years), Mean ± SD	43.2 ± 10.8	44.6 ± 11.3	0.58
Gender (Male/Female)	22 / 18	21 / 19	0.82
BMI (kg/m²), Mean ± SD	26.8 ± 3.1	27.1 ± 3.4	0.67
ASA I / II / III	12 / 21 / 7	13 / 20 / 7	0.94

Table 2: Incidence and Severity of PONV Within 24 Hours Postoperatively

Outcome	Group D (n=40)	Group DD (n=40)	p-value
Nausea (Any episode)	22 (55%)	9 (22.5%)	0.003
Vomiting (Any episode)	15 (37.5%)	5 (12.5%)	0.01
Nausea Score (0–10), Mean ± SD	4.6 ± 1.9	2.1 ± 1.2	<0.001
Vomiting Frequency, Mean ± SD	1.2 ± 0.9	0.4 ± 0.6	<0.001

Table 3: Requirement of Rescue Antiemetic Medication

Variable	Group D (n=40)	Group DD (n=40)	p-value
Rescue Ondansetron Required	18 (45%)	6 (15%)	0.004
Number of Rescue Doses, Mean ± SD	1.4 ± 0.6	0.7 ± 0.4	<0.001

Table 4: Intraoperative Opioid Consumption

Variable	Group D (n=40)	Group DD (n=40)	p-value
Total Fentanyl Dose (µg), Mean ± SD	125 ± 22	98 ± 18	<0.001

Table 5: Adverse Effects

Adverse Effect	Group D (n=40)	Group DD (n=40)	p-value
Bradycardia	4 (10%)	3 (7.5%)	0.69
Hypotension	5 (12.5%)	4 (10%)	0.72
Sedation Score (0–3), Mean ± SD	1.9 ± 0.5	1.8 ± 0.4	0.48

DISCUSSION

This was a comparative clinical trial that assessed the effectiveness of intravenous dexmedetomidine versus a dexmedetomidine-dexamethasone combination as antiemetics in patients who were having elective abdominal surgeries. The results indicated conclusively that the combination regimen had a great impact on the incidence and severity of postoperative nausea and vomiting (PONV), the need to use rescue antiemetic, and the intraoperative opioid need was low relative to dexmedetomidine monotherapy [11].

The low PONV cases in the combination group correspond to the pharmacological action between the two agents [20].

Dexmedetomidine is a selective 2-adrenergic receptor agonist, which has sympatholytic and opioid-sparing effects. It indirectly reduces nausea and vomiting by inhibiting sympathetic activity, lowering the level of catecholamines, and lowering perioperative opioid consumption [12]. Nonetheless, dexmedetomidine on its own might not always prevent PONV particularly in the high-risk type of surgery like abdominal surgeries where the manipulation of the viscose and the length of time anesthesia device are risky factors that increase emetogenic factors [13].

Dexamethasone seems to increase the effect of antiemetic. Dexamethasone suppresses inflammation, serotonin release in the gastrointestinal tract, and the nucleus tractus solitarius and chemoreceptor trigger zone which are established in the PONV physiology [14]. The long-acting period also offers it with prolonged prophylaxis in the susceptible postoperative period. A synergistic effect between the two agents is supported by the dramatic decrease in both the severity of nausea, the frequency of vomiting and the rescue antiemetic need of Group DD [15].

The level of intraoperative fentanyl use was greatly reduced in the combination group, which led to an increased level of analgesic efficiency. Less opioid consumption is clinically significant since postoperative nausea is typically associated with the activation of chemoreceptor trigger zone caused by opioids and slow gastric emptying [16]. Improved opioid-sparing effects of such combination regimen support its possible application in multimodal analgesia mechanisms. The two regimens were both safe [17]. Cases of bradycardia and hypotension were mild and manageable and similar across groups and align with the available literature that dexmedetomidine-related adverse effects are dose-dependent and can be managed in the clinic. Dexamethasone was not associated with any additional hemodynamic and the development of additional complications [18].

On the whole, the obtained results are in line with the previous international research that advocates the use of dexmedetomidine in combination with corticosteroids to enhance postoperative pain relief and decrease the use of opioids and rescue antiemetics. This combination can be beneficial especially to patients of abdominal surgery who are naturally predisposed to higher levels of PONV [19].

CONCLUSION

The combination of dexmedetomidine and dexamethasone showed a much higher effectiveness as compared to the basic dexmedetomidine in the prevention of postoperative nausea and vomiting in patients who underwent abdominal surgeries. The combination therapy decreased nausea, vomiting, and the use of rescue antiemetics besides decreasing intraoperative opioid usage. Treatments were both tolerated well and did not increase the number of adverse effects. The findings justify that dexmedetomidine and dexamethasone are effective agents of multimodal PONV prophylaxis and perioperative support of abdominal surgery patients.

Authors' Contributions: AS[1], FT[2], GM[3], MAS[4], SM[5], and SUM[6] contributed to the conception and design of the study, data collection, data analysis, drafting of the manuscript, and critical revision for intellectual content. All authors reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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