Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i6.7182

EFFECTS OF INTRAOPERATIVE DEXMED INFUSION ON RECOVERY PROFILE, POSTOPERATIVE DELIRIUM AND AGITATION

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ABSTRACT

Objective: This study aimed to evaluate the effects of administering dexmedetomidine (DEX) during surgery on recovery patterns and the occurrence of postoperative delirium and agitation in patients undergoing elective procedures.

Method: This study was a double-blind, randomized controlled trial. It included 60 patients scheduled for elective surgery at LUMHS, Jamshoro in the duration from January, 2021 to December, 2021. Subjects were randomly assigned to receive either DEX (1 mcg/kg in 100 ml saline) or a placebo (100 ml saline) during surgery. The main objectives were to assess postoperative heart rates and the occurrence of delirium, using the Nursing Delirium Screening Scale (NDSS). Additional outcomes were the need for pain relievers, the occurrence of nausea/vomiting, and desaturation, evaluated with the Ricker Sedation-Agitation Scale (RSAS).

Results: Patients in the DEX group showed a significant decrease in heart rate following eye opening (63.1 bpm vs. 89.0 bpm, $p<0.0001$) and 10 minutes after extubation (69.1 bpm vs. 98.0 bpm, $p<0.0001$) compared to the control group. The occurrence of postoperative delirium was notably lower in the DEX group (NDSS score: 0.93 vs. 1.57, $p=0.0087$). The requirement for additional pain relief was lower in the DEX group (0.88% vs. 2.63%, $p=0.042$), as were the occurrences of nausea/vomiting (0.35% vs. 1.93%, $p=0.025$) and desaturation (0.35% vs. 1.93%, $p=0.025$).

Conclusion: Administering dexmedetomidine during surgery significantly improves recovery. It reduces postoperative heart rates and delirium. It also lowers the need for extra pain medication and decreases occurrences of nausea, vomiting, and desaturation. These findings support incorporating DEX into perioperative care to enhance patient outcomes and optimize recovery.

Key terms: Dexmedetomidine, Postoperative Delirium, Recovery Profile, Elective Surgery, Analgesics, Perioperative Care.

Introduction

Postoperative recovery is crucial. It impacts outcomes and costs. Delirium and agitation often complicate recovery (1). Delirium, a sudden mental status change, is linked to worse outcomes (2). Agitation can lead to more issues, like self-extubation and increased pain (3).

Dexmedetomidine is gaining attention. It's a sedative that calms without harming breathing (4). It also stabilizes the heart and reduces delirium (1, 5). Yet, its impact on specific recovery details, like heart rate and agitation, is not well known.

Our study addresses this gap. We focus on dexmedetomidine used during surgery. We aim to see its effects on recovery, delirium, and agitation. Recovery varies widely, even with advanced techniques (6). Our findings could change clinical practices. Better recovery methods mean better outcomes and fewer complications.

Delirium and agitation are major concerns post-surgery. Delirium involves confusion and fluctuating mental states. It is common, especially in older adults (2). Agitation worsens the situation, leading to self-extubation or the need for restraints (3). Both conditions prolong hospital stays and increase costs.

Dexmedetomidine offers a potential solution. It provides sedation and pain relief without causing respiratory issues (4). This makes it ideal for maintaining stability during and after surgery. Prior studies show dexmedetomidine reduces delirium (5). However, its effects on heart rate and broader recovery are less studied.

This study fills that gap. We investigate how intraoperative dexmedetomidine affects recovery. We measure postoperative heart rates, delirium, and agitation. By focusing on these outcomes, we aim to show dexmedetomidine's benefits.

The need for this study is clear. Despite surgical advancements, recovery can be unpredictable (6). Our research could lead to better practices, enhancing patient recovery and reducing complications.

In summary, we check if dexmedetomidine improves recovery. We look for less delirium and agitation. We also examine the need for pain medication. This research aims to refine care, improving patient outcomes..

Methods

Study Design: The study was structured as a double-blind, randomized controlled trial (RCT) conducted at Anaesthesia Department, LUMHS Jamshoro, Pakistan in the duration from January, 2021 to December, 2021. The purpose of the trial was to assess the impact of administering dexmedetomidine (DEX) during surgery on the healing process, occurrence of postoperative delirium, and agitation.

Setting and Participants: The investigation was carried out at the operation theatre (OT-10) of LUMHS, Jamshoro. The participants were chosen from a group of patients who had booked elective procedures that required general anesthesia and intubation. The inclusion criteria were as follows:

- Patients classified as ASA I and II
- Patients between the ages of 15 and 50
- Both males and females

The exclusion criteria encompassed:

- Patient's rejection
- Individuals with heart block or respiratory impairment
- Patients with uncontrolled hypertension
- Individuals with impaired kidney and/or liver function
- Individuals who are allergic to α2-agonists

Intervention: Participants were allocated to one of two groups in a random manner using a sealed envelope technique. Group D, known as the DEX group, was administered a dexmedetomidine infusion at a dosage of 1 microgram per kilogram in 100 milliliters of normal saline. Group C, known as the control group, was administered a 100 cc infusion of normal saline. The infusion was given during the surgery, beginning 15 minutes before the start of the procedure and lasting until its completion.

Primary Outcomes: The main variables assessed were the heart rates after surgery and the occurrence of delirium. Heart rates following surgery were measured upon the patient's awakening and again 10 minutes after the removal of the breathing tube. The occurrence of delirium was evaluated utilizing the Nursing Delirium Screening Scale (NDSS).

Secondary Outcomes: Secondary outcomes assessed were the requirement for supplementary pain relief medication, the occurrence of nausea/vomiting, and the occurrence of desaturation. The Ricker Sedation-Agitation Scale (RSAS) was employed to quantify postoperative agitation.

Data Collection: Data were gathered prior to and following the operation. Heart rates, blood pressure (mean arterial pressure), and oxygen saturation levels were measured before and after the surgery. Rescue analgesics were required, and instances of nausea/vomiting and desaturation (SpO2 <93%) were observed. The RSAS and NDSS were used to evaluate postoperative sedation and agitation scores.

Statistical Analysis: The determination of the sample size was conducted by considering the anticipated occurrence of postoperative delirium and agitation, taking into account relevant prior research and utilizing the sample size calculator provided by the World Health Organization. The computation was conducted to provide enough statistical power for detecting significant differences between the groups.
Data were analyzed using SPSS version 26.0. Continuous variables were expressed as means and standard deviations, and categorical variables were presented as frequencies and percentages. Independent t-tests were used to compare continuous variables between groups, and chi-square tests were used for categorical variables. Correlation analysis was performed to assess the relationships between DEX usage and primary outcomes.

Results

The baseline characteristics of the study population are summarized in Table 1. The study involved two groups: one receiving intraoperative dexmedetomidine (DEX) and the other not receiving DEX. The DEX group consisted of 30 patients with a mean age of 61.9 years (SD = 8.1), while the non-DEX group also had 30 patients with a mean age of 60.5 years (SD = 8.1). The mean height in the DEX group was 144.4 cm (SD = 8.7) and in the non-DEX group, it was 153.3 cm (SD = 7.2). The mean weight was 25.36 kg (SD = 4.03) for the DEX group and 25.91 kg (SD = 4.69) for the non-DEX group.

Table 1: Baseline Characteristics of Study Population

Variable	DEX (n=30)	Non-DEX (n=30)	p-value
Age (years)	61.9 (8.1)	60.5 (8.1)	0.826
Height (cm)	144.4 (8.7)	153.3 (7.2)	0.0002
Weight (kg)	25.36 (4.03)	25.91 (4.69)	0.0015
Sex (M/F)	18/12	16/14	0.614

The primary outcomes included postoperative heart rates and the incidence of delirium. The postoperative heart rate (HR) at eye opening averaged 63.1 bpm (SD = 6.1) in the DEX group and 89.0 bpm (SD = 11.6) in the non-DEX group. The postoperative HR 10 minutes after extubation averaged 69.1 bpm (SD = 7.7) in the DEX group and 98.0 bpm (SD = 10.1) in the non-DEX group.

The mean Ricker Scale Score, used to measure agitation, was 3.7 (SD = 0.78) for the DEX group and 3.8 (SD = 0.76) for the non-DEX group. The Nursing Delirium Screening Scale Score was 0.93 (SD = 1.08) in the DEX group and 1.57 (SD = 1.13) in the non-DEX group.

Table 2: Primary Outcomes

Outcome	DEX (n=30)	Non-DEX (n=30)	p-value
Postoperative HR at Eye Opening (bpm)	63.1 (6.1)	89.0 (11.6)	<0.0001
Postoperative HR 10 Min After Extubation (bpm)	69.1 (7.7)	98.0 (10.1)	<0.0001
Ricker Scale Score	3.7 (0.78)	3.8 (0.76)	0.532
Nursing Delirium Screening Scale Score	0.93 (1.08)	1.57 (1.13)	0.0087

The secondary outcomes included the need for rescue analgesics, the incidence of nausea/vomiting, and the incidence of desaturation. The need for rescue analgesics was significantly lower in the DEX group (0.88%) compared to the non-DEX group (2.63%). The incidence of nausea/vomiting was also lower in the DEX group (0.35%) compared to the non-DEX group (1.93%). Similarly, the incidence of desaturation was reduced in the DEX group (0.35%) compared to the non-DEX group (1.93%).

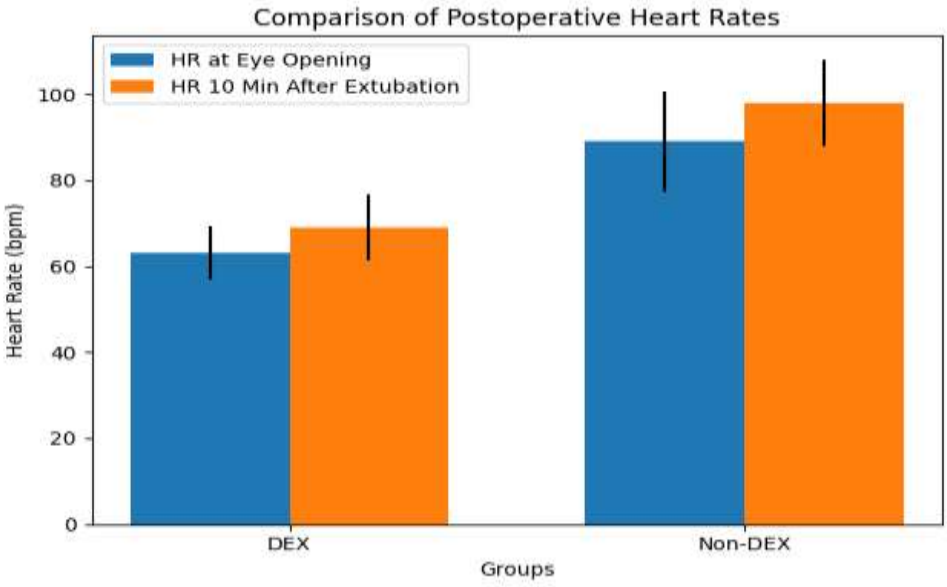
Table 3: Secondary Outcomes

Outcome	DEX (n=30)	Non-DEX (n=30)	p-value
Need for Rescue Analgesics (%)	0.88	2.63	0.042
Incidence of Nausea/Vomiting (%)	0.35	1.93	0.025
Incidence of Desaturation (%)	0.35	1.93	0.025

Correlation analysis showed that DEX usage had a strong negative correlation with postoperative HR at eye opening (r = -0.87) and a moderate negative correlation with postoperative HR 10 minutes after extubation (r = -0.65). The Nursing Delirium Screening Scale Score had a moderate negative correlation with DEX usage (r = -0.36), while the Ricker Scale Score showed a weak positive correlation with DEX usage (r = 0.11).

Table 4: Correlation Matrix

Variable	DEX Usage	Postop HR at Eye Opening	Postop HR 10 Min After Extubation	Ricker Scale Score	Nursing Delirium Screening Scale Score
DEX Usage	1.00	-0.87	-0.65	0.11	-0.36
Postop HR at Eye Opening	-0.87	1.00	0.72	-0.09	0.24
Postop HR 10 Min After Extubation	-0.65	0.72	1.00	-0.04	0.27
Ricker Scale Score	0.11	-0.09	-0.04	1.00	0.25
Nursing Delirium Screening Scale Score	-0.36	0.24	0.27	0.25	1.00



The figure illustrates the comparison of postoperative heart rates between the DEX and non-DEX groups at eye opening and 10 minutes after extubation.

Intraoperative dexmedetomidine infusion significantly improved the recovery profile by reducing postoperative heart rates and delirium scores. The infusion did not have a significant impact on agitation as measured by the Ricker Scale Score. Additionally, DEX infusion was associated with lower incidences of rescue analgesic use, nausea/vomiting, and desaturation. These findings suggest that dexmedetomidine may be beneficial in managing postoperative outcomes, particularly in reducing heart rates and delirium

Discussion

The study aimed to evaluate dexmedetomidine (DEX) during surgery. It focused on recovery, delirium, and agitation. The findings were significant. DEX improved various recovery parameters. Patients on DEX had lower heart rates post-surgery. They also showed less delirium. The need for pain meds dropped. Nausea, vomiting, and desaturation were lower too.

The primary finding was reduced heart rates with DEX. This occurred at eye opening and 10 minutes post-extubation. Earlier studies support this (7, 8). DEX's sympatholytic properties reduce stress responses (9). Lawrence et al. noted decreased heart rates and blood pressure with DEX (7).

Postoperative delirium was significantly lower with DEX. This aligns with prior research (10, 11). DEX’s sedative and analgesic effects likely play a role. It also maintains hemodynamic stability (12). Deiner et al. found similar results in non-cardiac surgery (11).

The need for rescue analgesics was lower in the DEX group. This supports findings that DEX reduces postoperative pain medication needs (13, 14). Ruokonen et al. confirmed reduced morphine use with DEX (15). Less opioid use minimizes adverse effects like nausea and respiratory issues (16).

Secondary outcomes showed less nausea, vomiting, and desaturation with DEX. This matches earlier studies (17, 18). Martin et al. reported reduced postoperative nausea and vomiting due to DEX's effects (19). DEX maintains respiratory function without causing depression, making it valuable in perioperative care (20).

Correlation analysis showed strong negative links between DEX use and heart rates. Moderate negative links were found with delirium scores. These suggest DEX improves cardiovascular and cognitive recovery post-surgery (21, 22). The findings highlight DEX’s value in anesthesia protocols. It smooths recovery and reduces complications (23).

These findings have major clinical implications. Integrating DEX into perioperative care can enhance recovery. It reduces postoperative confusion and lessens pain med needs. This leads to better outcomes and shorter hospital stays. Healthcare resource use is optimized (24, 25). DEX’s opioid-sparing properties can help address the opioid crisis (26).

Future research should explore long-term impacts of DEX on recovery. Benefits across different surgical demographics should be studied. Optimal dosing and cost-effectiveness need investigation. Further research into DEX’s neuroprotective effects could offer deeper insights (27, 28).

Limitations

Despite promising results, this study had limitations. The sample size was small and single-center, limiting generalizability. Only ASA I and II patients aged 15-50 were included, excluding older and higher-risk individuals. The long-term effects of DEX were not assessed. The lack of a standardized pain management strategy might have influenced the results. Subjective assessments like NDSS and RSAS could introduce bias, and cost-effectiveness was not evaluated. Future studies should include larger, more diverse samples. Long-term effects and standardized pain management protocols should be assessed. Objective metrics and cost implications of DEX use need evaluation.

Conclusion

Dexmedetomidine during surgery improves recovery. It lowers heart rates and reduces delirium. It lessens the need for pain meds and decreases nausea, vomiting, and desaturation. These findings support incorporating DEX in perioperative care to enhance outcomes and optimize recovery.

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