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Research Article

Propofol Versus Dexmedetomidine for Postoperative Nausea and Vomiting in Ureteroscopic Procedures Under Spinal Anesthesia: A Randomized, Placebo-Controlled Clinical Trial

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ABSTRACT

Background: Propofol and dexmedetomidine have a mitigating effect on postoperative nausea and vomiting (PONV). However, their efficacy in preventing PONV in patients following ureteroscopic operations remains uncertain. This study evaluated the efficacy and safety of infusions of dexmedetomidine versus propofol with respect to the incidence of PONV in patients scheduled for ureteroscopic surgeries under spinal anesthesia.

Methods: This randomized controlled trial included 72 adult patients scheduled for ureteroscopic surgery under spinal anesthesia with multiple risk factors for PONV (female, history of PONV, non-smoker). The patients were randomized into three groups (24 patients each). The propofol, dexmedetomidine, and control groups received intravenous infusions of propofol, dexmedetomidine, and normal saline, respectively. The study outcomes were the incidence of PONV (primary outcome) as well as the time and need for antiemetics, Ramsay Sedation Scale, and incidence of intraoperative hemodynamic changes (secondary outcomes).

Results: Dexmedetomidine infusion resulted in significantly lower PONV scores and heart rates during and after surgery compared to the propofol and control groups. Both intervention groups had significantly deeper sedation, but dexmedetomidine was more sedating than propofol ($p = 0.001$) in comparison to the control group. At 40 and 60 minutes intra- and postoperatively, both the propofol and dexmedetomidine groups had a significant reduction in mean blood pressure in comparison to the control group. Mean blood pressure was similar in the two groups.

Conclusion: During ureteroscopic procedures under spinal anesthesia, dexmedetomidine effectively and safely reduces the incidence of PONV in highly susceptible patients. It also provides deeper sedation and better hemodynamic control compared to propofol.

Introduction

Despite numerous studies conducted over several decades, the occurrence of postoperative nausea and vomiting (PONV) remains unacceptably high. This is mainly due to the complex mechanisms involved in developing PONV and the lack of attention given to this issue. The management of PONV involves evaluating risk factors, implementing interventions to reduce risk, administering prophylactic measures for PONV, and providing rescue treatment. Patient risk

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factors, such as gender, smoking status, and history of PONV or motion sickness, can be measured using risk scores like the Apfel score [1]. Apfel's risk stratification model indicates that the presence of no risk factors or just one risk factor can result in PONV occurring in approximately 10% to 21% of cases. However, if at least two risk factors are present, the incidence of PONV may increase to a range of 39% to 78% [2-4]. Furthermore, certain surgical procedures, such as laparotomy and ureteroscopy, increase the risk of PONV [5].

Efficiently managing PONV is essential for minimizing patient suffering, lowering healthcare expenses, and enhancing overall patient satisfaction and outcomes [6]. Propofol, an intravenous drug commonly used for general anesthesia, has also been shown to be effective in treating PONV at sub-hypnotic doses (20-40 mg) [7].

Dexmedetomidine is a potent agonist on alpha-2 adrenergic receptors. It has been found to reduce the incidence of emergence agitation, promote positive recovery, and reduce postoperative pain without adverse effects on the patient's cardiovascular system [8-9]. However, its effectiveness in preventing PONV in patients following ureteroscopy remains uncertain.

The aim of this study was to evaluate the safety and efficacy of infusions of dexmedetomidine versus propofol in reducing the incidence of PONV in patients undergoing ureteroscopic surgeries under spinal anesthesia.

Methods

Ethical considerations

The study obtained approval from the Ethics Committee of the Faculty of Medicine, Cairo University, Egypt (ID: MD-62-2022, Date: April 17, 2022). This trial was registered at ClinicalTrials.gov (ID: NCT05875077, Date: May 25, 2023). Each participant gave written informed consent, and participants' information was kept confidential.

Study design, setting, and date

This randomized, double-blind, placebo-controlled, parallel-group clinical trial was carried out at Cairo University Hospitals, Egypt, during the period from May 2022 to August 2023.

Eligibility criteria

The study enrolled 72 adult patients of both sexes, aged 18 to 60 years, classified as American Society of Anesthesiologists physical status I or II and scheduled for ureteroscopic surgery under spinal anesthesia with multiple risk factors for PONV (e.g., female, history of PONV, non-smoker).

Patients with any of the following were excluded: infection at the injection location, bleeding tendency, known left ventricular outflow obstruction, hypovolemia, elevated intracranial pressure, previous allergic reactions or hypersensitivity to propofol or dexmedetomidine, or gastrointestinal disorders. Participants with gastroenteritis, peptic ulcer disease, ear infections, or cirrhosis of the liver; those who had used antiemetic medicine within 48 hours of surgery or whose surgery lasted more than two hours; and those who refused to participate were also excluded from the study.

Randomisation, allocation concealment, and blinding

Seventy-two patients were randomized to one of three groups, with 24 participants in each group. The propofol group received a propofol infusion at 1 mg/kg/hour. The dexmedetomidine group received a dexmedetomidine infusion at 0.5 µg/kg/hour without boluses [10]. The control group received normal saline 0.9% at the same rate as the dexmedetomidine infusion was administered.

The trial utilized computer-generated sequences and the sequentially numbered, opaque, sealed envelope method for randomization and allocation concealment [11]. The researchers and study participants were unaware of the allocation of the intervention.

Anaesthesia and perioperative care

All patients underwent a comprehensive medical evaluation, including their age, sex, weight, medication use, and any special habits such as smoking. Additionally, their medical history was reviewed for any prior occurrences of PONV and other comorbidities. A thorough physical examination was also conducted. Before the procedure, all patients fasted for a minimum of 6-8 hours for solid foods and a minimum of 2 hours for clear liquids.

Upon arrival in the operating room, the medical team prepared the intravenous line and installed five-lead electrocardiograms, peripheral oxygen saturation, and noninvasive arterial blood pressure monitoring. The patient's heart rate, oxygen saturation, pulse rate, systolic, diastolic, and mean arterial blood pressure were monitored before and after the induction of spinal anesthesia and then at 10-minute intervals until the end of the surgery.

Prior to spinal anesthesia, each patient received 500 ml of Ringer's solution. Spinal anesthesia was accomplished by a 25-gauge spinal needle while the patient was seated. The L3-L4 interspace was chosen for the procedure, using the midline route under sterile conditions. After observing free cerebrospinal fluid flow, 12.5-17.5 mg of bupivacaine was administered intrathecally. Subsequently, the patients were positioned in a supine position, maintained in a horizontal orientation for a minimum duration of five minutes.

Patients were randomly allocated to one of three groups. In the propofol group (P), 24 participants received a propofol infusion at a rate of 1 mg/kg/hour. Propofol was administered with no dilution in a 50 ml

syringe (10 mg/ml). In the dexmedetomidine group (D), 24 participants received a dexmedetomidine infusion at a rate of 0.5 µg/kg/hour without boluses [10]. Dexmedetomidine was prepared by drawing up the required dose and diluting it with normal saline to 50 ml in a 50 ml syringe with a concentration of (2 µg/ml), which was then infused over 60 min via an infusion pump. In the control group, 24 participants received normal saline 0.9% at a rate of 0.5 ml/kg/hour as a placebo.

After spinal anesthesia, supplemental oxygen was administered through a nasal cannula at a rate of 3 l/minute. A pinprick test was performed to assess sensory level at T10, and then surgery began.

The incidence and severity of nausea and vomiting were observed intraoperatively every 10 minutes and then hourly for 6 hours after surgery using a four-point (0-3) scoring system. Postoperative nausea and vomiting score: 0 = no nausea and no retching; 1 = complaining of nausea and retching; 2 = vomiting once or twice in 30 minutes; 3 = vomiting more than twice in 30 minutes [12]. If the participant experienced two or more episodes of nausea and vomiting, a dose of 10 mg of metoclopramide was given intravenously as an emergency antiemetic.

The Ramsay Sedation Scale was applied for the evaluation of patient sedation. Sedation scores were recorded immediately prior to study drug administration and then at 10-minute intervals until the patient was discharged from the recovery room. The Ramsay Sedation Scale measured behavior on a scale of 1 to 6. A score of 1 indicated anxious, agitated, and restless behavior, while a score of 2 indicated sedation-oriented and quiet behavior. A score of 3 indicated calm with response to commands, while a score of 4 indicated a brisk response to a light glabellar tap. A score of 5 indicated a sluggish response to a light glabellar tap, and a score of 6 indicated deep sedation with no response [13].

When the mean arterial blood pressure decreased by 20% below the baseline level, an intermittent dose of 2.5-5 mg of ephedrine was given. If the low blood pressure continued for 3-5 minutes, the dosage was repeated until the hypotension was resolved.

Outcomes

The primary outcome was the incidence of PONV episodes using a four-point (0-3) scoring system. Secondary outcomes included the time and need for antiemetics, patient sedation with the Ramsay Sedation Scale, and the incidence of intraoperative changes in hemodynamics, including heart rate, systolic, diastolic, and mean arterial blood pressure.

Sample size

Sample size was calculated using the G*Power software. The study design included three groups, with planned comparisons to be conducted using one-way analysis of variance (ANOVA) for normally distributed variables or the Kruskal-Wallis test for non-normally distributed variables. An effect size (Cohen's f) of 0.4 was assumed, representing a large effect. This choice was made due to the absence of prior studies directly comparing the outcomes of interest across the three groups, as designed in the present study. The alpha level was set at 0.05 and the power at 0.80. Based on these parameters, the minimum required sample size was calculated to be 22 participants per group. The sample size was increased to 24 subjects per group to account for potential dropouts.

Statistical analysis

Statistical analysis was done using the Statistical Package for Social Sciences (IBM SPSS Statistics for Windows, Version 23.0). Quantitative data were presented as mean ± standard deviation or median (interquartile range), depending on the distribution. Qualitative data were expressed as frequencies and percentages. Associations between categorical variables were assessed using Pearson's chi-square test. For quantitative data, normally distributed variables were analyzed using one-way ANOVA, followed by post hoc analysis with the least significant difference (LSD) test. Non-normally distributed variables were analyzed using the Kruskal-Wallis test, followed by post hoc analysis with the Mann-Whitney U test. A p-value of less than 0.05 was considered statistically significant.

Results

Ninety participants were screened for eligibility. Two patients refused to participate and were excluded from the study, and 16 patients failed to meet the inclusion criteria. Seventy-two patients were randomized to three groups (24 patients each). Patients in groups P and D received propofol and dexmedetomidine, respectively, while the control group received normal saline. All enrolled patients were included in the final analysis (Figure 1).

(Table 1) shows no significant discrepancies between the three groups as regards the patient characteristics.

Intraoperatively, in the post-anesthesia care unit, and at 6 hours postoperatively, the PONV score was significantly lower in group D compared to both group P and the control group (p=0.043, 0.037, and 0.022, respectively). At 2 and 4 hours postoperatively, the incidence of PONV was significantly reduced in group D compared to the control group (p=0.042 and 0.032, respectively). Patients in group D had better Ramsay Sedation Scale scores than those in group P and the control group (all $p < 0.05$). The number of PONV attacks

in 6 hours, antiemetic requirement, and time to first antiemetic call were comparable in the three groups with no statistically significant differences (p=0.223, 0.411, and 0.289, respectively) (Table 2).

(Table 3) compares the heart rates of the three groups during and after surgery. At baseline, the three groups had comparable heart rates with no significant difference (p=0.091). After spinal anesthesia, the mean intraoperative heart rate was statistically lower in group D than in both group P and the control group and remained significantly lower postoperatively (all $p < 0.05$). There was no statistical difference between group P and the control group during and after surgery (all $p > 0.05$).

(Table 4) compares systolic, diastolic, and mean blood pressures between the three groups during and after surgery. At the baseline and the beginning of surgery, the three groups had comparable systolic blood pressure values (all $p > 0.05$). However, at 40 minutes intraoperatively, systolic blood pressure was significantly lower in group D than in the control group (p=0.024). At 60 minutes intraoperatively and after surgery, the systolic blood pressure was statistically significantly reduced in group P and group D compared to the control group (p=0.028 and 0.004, respectively). Both groups D and P had comparable effects on systolic blood pressure during and after surgery. At the baseline and the beginning of surgery, the three groups had comparable diastolic blood pressure values (all $p > 0.05$). However, at 40 minutes intraoperatively, the diastolic blood pressure was significantly reduced in group D compared to group P and the control group (p=0.004). At 60 minutes intraoperatively, diastolic blood pressure was significantly reduced in group D compared to the control group (p=0.013). After surgery, diastolic blood pressure was significantly reduced in group P and group D compared to the control group (p=0.016). At the baseline and the beginning of surgery, the three groups had comparable mean blood pressure with no statistically significant differences (all $p > 0.05$). However, at 40 and 60 minutes intraoperatively and after surgery, the mean blood pressure was significantly reduced in group P and group D compared to the control group (p=0.001, 0.015, and 0.003, respectively). Nevertheless, groups D and P had comparable effects on mean blood pressure during and after surgery, with no significant differences between both groups.

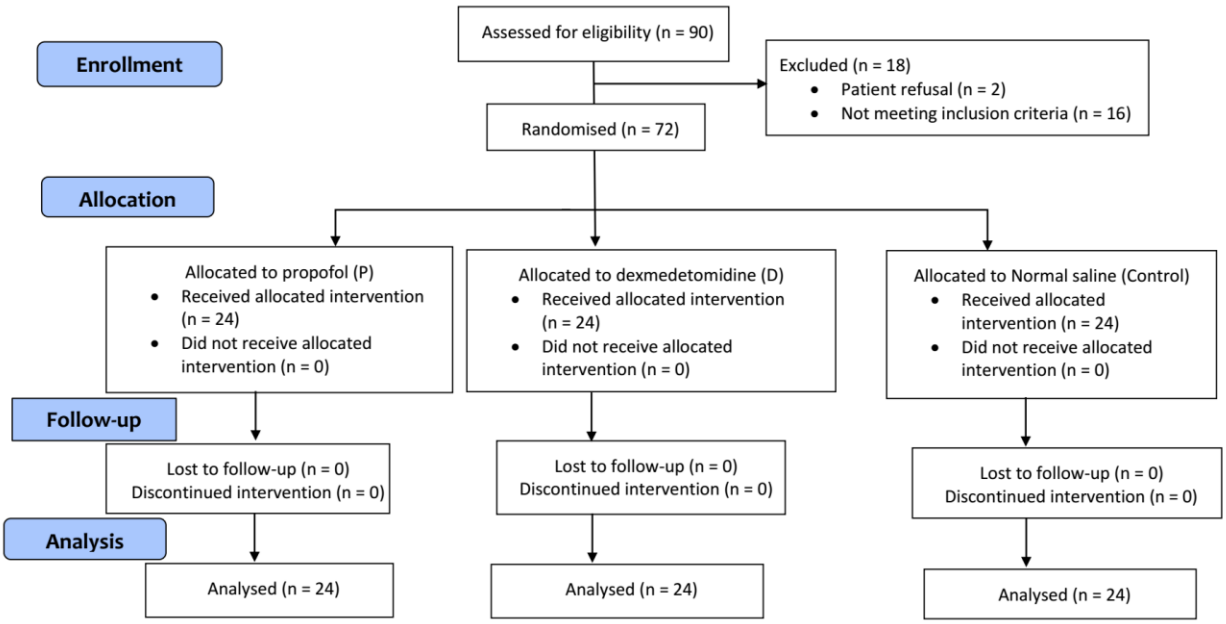

Figure 1- The CONSORT flow diagram of the trial.

Table 1- Demographic profile of the study's subjects.

Variables	Group P	Group D	Control Group	P value
Age (years), mean±SD	38.83±11.39	36.29±9.20	37.08±11.47	0.704
Sex, n (%)				0.797
Male	13 (54.2%)	15 (62.5%)	13 (54.2%)	
Female	11 (45.8%)	9 (37.5%)	11 (45.8%)	
ASA, n (%)				0.407
I	19 (79.2%)	18 (75.0%)	15 (62.5%)	
II	5 (20.8%)	6 (25.0%)	9 (37.5%)	

Smoking, n (%)				0.570
No	14 (58.3%)	17 (70.8%)	17 (70.8%)	
Yes	10 (41.7%)	7 (29.2%)	7 (29.2%)	
History of PONV, n (%)				0.351
No	14 (58.3%)	18 (75.0%)	18 (75.0%)	
Yes	10 (41.7%)	6 (25.0%)	6 (25.0%)	
Weight (kg), mean±SD	84.88±11.70	82.29±11.27	85.50±8.38	0.539
Height (cm), mean±SD	165.29±9.29	168.21±8.69	165.00±7.45	0.358
Length of surgery (min), mean±SD	72.71±23.36	71.88±11.78	70.21±15.14	0.880
Fluids infused (ml), mean±SD	925.00±316.91	970.83±178.71	891.67±205.19	0.524

Group P: propofol; Group D: dexmedetomidine; ASA: American Society of Anesthesiologists; SD: standard deviation; n: number; PONV: postoperative nausea and vomiting

Table 2- PONV score and number of PONV attacks in 6 hours, need for antiemetic, time to 1st call antiemetic and Ramsay Sedation Score.

Variables	Group P	Group D	Control Group	P value	P1	P2	P3
PONV Score, median (IQR)							
Intraoperative	0 (0 – 0)	0 (0 – 0)	0 (0 – 1)	0.043*	0.039*	0.522	0.010*
PACU	0 (0 – 1)	0 (0 – 0)	0 (0 – 1)	0.037*	0.035*	0.493	0.013*
After 2 hours	0 (0 – 1)	0 (0 – 0)	1 (0 – 1.5)	0.042*	0.088	0.416	0.012*
After 4 hours	0 (0 – 1.5)	0 (0 – 1)	1 (0 – 2.5)	0.032*	0.202	0.152	0.011*
After 6 hours	0 (0 – 1)	0 (0 – 0)	0 (0 – 1)	0.022*	0.027*	0.575	0.006*
Ramsay Sedation Score, median (IQR)	2 (1 – 2)	2 (2 – 3)	1 (1 – 2)	0.001*	0.002*	0.008*	<0.001*
Number of PONV attacks in 6 hours, median (IQR)	1 (0 – 2)	0 (0 – 1)	1.5 (0 – 2.5)	0.223			
Need for antiemetic, n (%)				0.411			
No	11 (45.8%)	15 (62.5%)	11 (45.8%)				
Yes	13 (54.2%)	9 (37.5%)	13 (54.2%)				
Time to first call antiemetic, median (IQR)	60 (50 – 120)	120 (110 – 150)	100 (30 -140)	0.289			

Group P: propofol group; Group D: dexmedetomidine group; n: number; PONV: postoperative nausea and vomiting; IQR: interquartile range; PACU: post-anesthesia care unit; * significant at p<0.05; p1: P value from the post hoc test comparing groups D and P; p2: P value from the post hoc test comparing group P and the control group; p3: P value from the post hoc test comparing group D and the control group

Table 3- Heart rate.

Variables (mean±SD)	Group P	Group D	Control Group	P value	P1	P2	P3
Heart rate (beats/min)							
Baseline	90.83±12.12	82.58±12.87	91.58±9.12	0.014*	0.015*	0.822	0.008*
After spinal	89.79±15.88	73.13±9.20	90.75±12.66	0.001*	0.001*	0.797	0.001*
10 min	93.04±12.00	83.08±12.62	96.88±12.55	0.001*	0.007*	0.288	0.001*
20 min	92.71±13.80	82.46±13.25	94.46±12.77	0.005*	0.009*	0.649	0.003*
30 min	90.13±12.15	79.42±12.75	90.79±14.79	0.006*	0.007*	0.862	0.004*
40 min	87.96±12.27	77.21±13.56	90.04±13.36	0.002*	0.006*	0.583	0.001*
50 min	96.25±11.57	87.54±11.87	102.46±17.51	0.002*	0.034*	0.127	0.001*
60 min	92.75±11.17	85.42±11.31	98.21±12.58	0.001*	0.033*	0.111	0.001*
Postoperative	92.04±11.20	83.33±10.17	95.13±10.49	0.001*	0.006*	0.319	0.001*

Group P: propofol group; Group D: dexmedetomidine group; SD: standard deviation; n: number; min: minutes; * significant at p<0.05; p1: P value from the post hoc test comparing groups D and P; p2: P value from the post hoc test comparing group P and the control group; p3: P value from the post hoc test comparing group D and the control group

Table 4- Systolic, diastolic, and mean blood pressures.

Variables (mean±SD)	Group P (n = 24)	Group D (n = 24)	Control Group (n = 24)	P value	P1	P2	P3
SBP (mmHg)							
Baseline	122.08±12.27	126.46±13.26	124.96±11.40	0.463			
After spinal	116.29±19.32	114.33±14.67	120.96±20.89	0.447			
10 min	114.88±14.87	115.33±17.28	120.00±15.89	0.476			
20 min	116.13±11.34	110.92±15.51	116.33±18.83	0.397			
30 min	114.08±10.59	106.63±15.04	111.88±17.44	0.200			
40 min	113.21±8.24	109.29±12.93	120.42±18.59	0.024*	0.333	0.077	0.007*

50 min	131.83±14.42	126.17±12.83	134.79±12.84	0.084			
60 min	122.17±16.16	122.46±13.05	131.75±11.69	0.028*	0.942	0.019*	0.022*
Postoperative	124.67±10.84	121.67±13.63	133.13±11.27	0.004*	0.389	0.017*	0.001*
DBP (mmHg)							
Baseline	73.46±10.09	71.75±13.84	75.29±11.60	0.592			
After spinal	69.67±13.58	65.04±12.53	71.42±15.45	0.267			
10 min	68.88±13.34	70.21±12.92	72.25±14.42	0.688			
20 min	69.29±10.42	65.25±13.50	70.58±15.33	0.352			
30 min	69.58±9.43	60.96±13.01	65.29±14.41	0.063			
40 min	69.46±12.50	60.63±12.40	73.04±13.49	0.004*	0.020*	0.336	0.001*
50 min	80.54±13.87	77.50±10.01	80.54±13.31	0.625			
60 min	74.83±12.00	70.83±10.36	80.25±9.93	0.013*	0.204	0.087	0.004*
Postoperative	75.04±8.89	73.75±12.53	82.46±11.17	0.016*	0.685	0.022*	0.008*
MBP (mmHg)							
Baseline	89.96±10.39	91.67±12.44	92.58±10.42	0.710			
After spinal	85.63±13.68	82.71±11.23	89.33±16.85	0.271			
10 min	84.58±13.72	86.08±14.95	90.38±14.87	0.363			
20 min	85.92±10.83	80.83±13.13	86.00±16.62	0.334			
30 min	83.29±11.51	76.13±12.36	81.79±14.18	0.128			
40 min	83.25±9.69	77.29±10.23	91.21±15.08	0.001*	0.088	0.024*	<0.001*
50 min	96.58±13.37	94.00±7.87	100.13±11.29	0.165			
60 min	91.04±13.10	89.13±8.31	98.33±11.84	0.015*	0.558	0.028*	0.006*
Postoperative	91.88±8.62	89.88±10.20	99.92±11.52	0.003*	0.498	0.008*	0.001*

SBP: systolic blood pressure; DBP: diastolic blood pressure; MBP: mean blood pressure; Group P: propofol group; Group D: dexmedetomidine group; SD: standard deviation; n: number; min: minutes; * significant at $p<0.05$; p1: P value from the post hoc test comparing groups D and P; p2: P value from the post hoc test comparing group P and the control group; p3: P value from the post hoc test comparing group D and the control group

Discussion

Postoperative nausea and vomiting is a significant contributor to recovery room delays and reduced patient satisfaction. Both dexmedetomidine and propofol have been observed to have antiemetic effects when administered as infusions. There are insufficient data to compare the efficacy of dexmedetomidine and propofol infusions as antiemetic agents in adult patients undergoing surgery with spinal anesthesia [6]. Therefore, the objective of this study was to compare the safety and efficacy of dexmedetomidine infusion versus propofol infusion in reducing the incidence of PONV in patients undergoing ureteroscopic surgeries under spinal anesthesia. Our results confirmed that dexmedetomidine significantly decreased the incidence of PONV score with better hemodynamic control and sedation compared to propofol and placebo in patients undergoing ureteroscopic surgeries under spinal anesthesia. In addition, dexmedetomidine reduced the number of PONV episodes and the need for antiemetics and prolonged the time to antiemetic use, but without a statistically significant difference between groups. This could be attributed to the relatively small sample size.

Dexmedetomidine has the potential to reduce PONV through several mechanisms. It may reduce pain scores, opioid consumption, and the amount of anesthetic required during surgery. Consequently, this reduces the incidence of negative effects related to opioids, such as PONV [14]. In addition, it binds to alpha-2 presynaptic inhibitory adrenoreceptors in the locus coeruleus during surgery, potentially resulting in an antiemetic effect [15].

Several studies have reported the effective role of dexmedetomidine infusion in reducing PONV in various surgical procedures, as found by Hu et al. [16] in parturients undergoing elective cesarean delivery under epidural anesthesia. Jin et al. [10] reported a significant effect of continuous infusion of dexmedetomidine for hemodynamic control and prevention of PONV during general anesthesia. A recent meta-analysis was conducted in patients undergoing thoracic surgery and revealed that the antiemetic efficacy of dexmedetomidine remained consistent across various administration routes, including minimally invasive surgical procedures, and in combination with intravenous or inhaled anesthetics [17].

In contrast, Liang et al. [18] reported in their meta-analysis that dexmedetomidine was effective as an antiemetic only when administered intravenously, not epidurally or intrathecally. The researchers also found that dexmedetomidine was as effective as propofol and midazolam but superior to opioid analgesics. In thyroidectomy and parathyroidectomy under general anesthesia, Gauger et al. [19] concluded that propofol lowered the incidence of PONV in the operating room and post-anesthesia care unit, but not at later stages. In a meta-analysis of 14 randomized controlled trials, Bellon et al. [20] found that dexmedetomidine had no effect on the incidence of PONV, which may be attributed to the limited number and heterogeneity of trials that addressed this outcome. In adult patients undergoing laparoscopic

gynecologic surgery, Geng et al. [21] showed that dexmedetomidine reduced the incidence of nausea within the first 2 hours after surgery. However, there was no significant reduction in the incidence of PONV after 24 hours. A possible reason for these different findings is that the regular use of patient-controlled analgesia with morphine after surgery may have masked the antiemetic effect of dexmedetomidine. In addition, the dose of dexmedetomidine used in their study was relatively low (0.1 μg/kg/hour). Regarding the postoperative sedation score, the deep sedation score was mainly higher in patients who received dexmedetomidine compared to propofol and placebo. The two IV sedatives most frequently utilized are propofol and dexmedetomidine. A retrospective observational study [22] reported that IV sedation with dexmedetomidine during spinal anesthesia was more effective in reducing agitated behavior compared to propofol sedation, which is consistent with our findings. Park et al. [23] demonstrated that the use of dexmedetomidine sedation during lower extremity surgery under spinal anesthesia resulted in a lower incidence of postoperative delirium compared to propofol sedation. Dexmedetomidine induces sleepiness through a central mechanism, and its effect appears to be dose-dependent. Hong et al. [24] administered higher doses of dexmedetomidine and reported excessive sedation. Harsoor et al. [25] highlighted the advantage of using a lower dose of dexmedetomidine to achieve a Ramsay Sedation Scale score of no more than 3.

In this study, dexmedetomidine provided good control of heart rate and blood pressure. It has no direct cardiac effect. The cardiovascular response follows a two-phase pattern [26]. After the rapid injection of dexmedetomidine, its concentration in the blood increases temporarily, causing a brief elevation in blood pressure. This rise in blood pressure triggers a baroreceptor-mediated reflex bradycardia due to stimulation of α2-adrenoceptors located in vascular smooth muscle [27]. After the initial phase, the reduced drug levels in the bloodstream may hinder the sympathetic nervous system activity, resulting in a decrease in blood pressure. A previous meta-analysis showed that administration of the initial loading dose of dexmedetomidine by rapid infusion over a 10-minute period was associated with a higher bradycardia incidence as compared to injection over a 20-minute period [28-29]. This study demonstrated that dexmedetomidine is considered a good approach to prevent PONV. For patients undergoing ureteroscopic surgery, who are more prone to PONV, the current randomised clinical trial is the first to compare the safety and efficacy of propofol versus dexmedetomidine infusions.

Limitations

This single-center study had certain limitations that must be acknowledged. First, we followed patients for only 6 hours after surgery. In addition, we did not evaluate the effect of the drug administered on the length of hospitalization associated with PONV. In addition, we administered only a single infusion dose of dexmedetomidine. For a more accurate understanding of the beneficial effects of dexmedetomidine, it is recommended to perform large multicenter studies with different infusion doses and analyze their effects in correlation with clinical observations. Also, it would be beneficial to follow patients beyond the initial 6-hour period and evaluate the length of hospital stay in relation to PONV.

Conclusion

In conclusion, during ureteroscopic procedures under spinal anesthesia, an intravenous infusion dose of 0.5 μg/kg/hour of dexmedetomidine is an effective and safe approach to reduce the incidence of PONV in highly susceptible patients. In addition, it provides deep sedation and better hemodynamic control compared to propofol.

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