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Comparative study between dexmedetomidine and fentanyl as adjuvants to bupivacaine for postoperative epidural analgesia in abdominal surgeries: A randomized controlled trial

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ABSTRACT

Background: Epidural analgesia is an efficient strategy to relieve postoperative pain after abdominal surgeries. This study aimed to evaluate dexmedetomidine or fentanyl when added to bupivacaine, providing postoperative epidural analgesia after abdominal procedures.

Patients and methods: Epidural catheter was placed on 75 patients scheduled for lower abdominal procedures under general anesthesia, and they were randomly assigned into three equal groups. Epidural analgesia was activated before the procedure was completed by injection of bupivacaine (0.125%) plus dexmedetomidine or fentanyl or normal saline mixture, according to the study groups. After complete recovery from general anesthesia, the epidural block was evaluated. Then, the infusion started through an elastomeric pump with an infusion rate of 5 ml/hr and continued for 24 hr postoperatively.

Group D: Dexmedetomidine 1 ml (100 µg) plus normal saline 1 ml were added to bupivacaine (0.125%) 48 ml (a total volume of 50 ml). Group F: 2 ml (100 µg) fentanyl was added to bupivacaine (0.125%) 48 ml (a total volume of 50 ml). Group C: Normal saline 2 ml was added to bupivacaine (0.125%) 48 ml (a total volume of 50 ml).

Measured outcomes:

Primary outcomes: The onset of sensory analgesia (from the beginning of epidural infusion until scoring 1 on a 3-point scale) and the duration of analgesia (from the start of epidural infusion till the first demand for further pain medication) were observed and recorded.

Secondary outcomes: Postoperative pain was evaluated using a visual analogue scale (VAS), and the number of patients requesting additional analgesia with pethidine over paracetamol as well as the pethidine consumption during postoperative 24 hr were recorded. The hemodynamic parameters, including heart rate (HR) and mean arterial blood pressure (MAP), were monitored and recorded at baseline, 2, 6, 12, and 24 hr, and any adverse events were properly recorded and managed during the study period.

Results: The dexmedetomidine group showed an earlier onset and longer duration of analgesia, with a highly significant difference (P-value <0.001) than other groups. The study groups differed significantly concerning pethidine needs and consumption (P-value <0.05). The VAS revealed a considerable decrease in the dexmedetomidine group compared to other groups, with a significant difference (P-value <0.05) at the intervals of (baseline, 12 hr, and 24 hr) and a highly significant difference (P-value <0.001) at the intervals of (2 and 6 hr). Postoperative blood pressure and heart rate measurements in the dexmedetomidine group were lower than in other groups. MAP showed a statistically highly significant difference at 6 and 24 hr (P-value <0.001) and a significant difference after 12 hr (P-value <0.05), while HR showed a statistically significant difference after 6 hr (P-value <0.05) and a highly significant difference at 12 and 24 hr (P-value <0.001). Regarding postoperative adverse events, no statistical difference was detected between groups except in pruritis and dry mouth.

Conclusion: Dexmedetomidine is preferred to fentanyl when added to epidural bupivacaine to relieve pain after abdominal procedures.

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1. Introduction

Epidural analgesia is frequently applied to relieve pain from abdominal surgeries. It allows for early mobilization and lowers pulmonary and cardiovascular morbidities in the early postoperative period [1].

Concerns about adverse effects are raised when local anesthetics are administered at therapeutic levels. Consequently, a variety of adjuvants to local anesthetics have been introduced for use with epidurals [2].

Opioids and local anesthetics epidural infusions are commonly used to relieve postoperative discomfort after major abdominal surgeries [3]. Better analgesia and less systemic toxicity are conferred when fentanyl is added to local anesthetics through the epidural route [4], but it may be accompanied by several

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adverse effects, including itching, nausea, vomiting, and respiratory depression [5].

Dexmedetomidine is an excellent adjuvant for central neuraxial blocks through its alpha 2 adrenoreceptor agonist property [6]. Without producing respiratory depression, it has sedative, anxiolytic, analgesic, antihypertensive, and sympatholytic effects [7]. It has been successfully used in conjunction with local anesthetic drugs to enhance the quality of epidural anesthesia and analgesia with fewer adverse consequences [8].

2. Aim of the work

We evaluate the efficacy of dexmedetomidine versus fentanyl as adjuvants when added to bupivacaine for postoperative epidural analgesia in patients undergoing abdominal surgery.

The objectives would be:

(1) To compare the onset and duration of postoperative analgesia provided by dexmedetomidine versus fentanyl as adjuvants to bupivacaine for epidural analgesia.
(2) To compare the degree of postoperative pain relief, and the analgesic requirements in patients receiving dexmedetomidine versus fentanyl adjuvants.
(3) To compare the hemodynamic changes, and the incidence of adverse effects between the study groups.

3. Patients and methods

This study was accepted by the ethical research committee of the Faculty of Medicine, Ain-Shams University (FMASU MD 121/2021) and was registered with Clinical Trials Registry (NCT05323214). The participants signed a written informed consent after the description of the procedure.

Seventy-five patients aged 21 to 60, with an ASA physical status I – II and BMI ≤ 35, underwent abdominal surgeries with procedure duration ≤180 min at ASU hospitals from August 2021 to August 2022 and were enrolled in this prospective randomized comparative clinical study.

Patients were not eligible for participation if they refused, had any neurological or psychiatric disorders, spine abnormalities, systemic illness (hematological, respiratory, cardiac, renal, or hepatic insufficiency), contraindications to epidural anesthesia (bleeding, coagulation abnormalities, and local skin infection) or allergies to any of the study drugs.

Preoperative clinical assessment and necessary investigations were done for all patients, and they were educated about the visual analogue scale (VAS) to express the degree of discomfort and the intensity of pain. The degree of pain experienced by patients was rated along a 10 cm straight line, with two endpoints representing the extremes of "no pain at all" (0 cm) and "pain as bad as it could be" (10 cm).

Patients were randomly assigned to three groups (D, F, and C) using the black envelope technique.

During this double-blinded study, the drug preparation was done by an anesthesia technician who was unaware of the randomization, and neither the participants nor the researcher knew which treatment participants were receiving until the clinical trial was over.

In the operative room, in sitting position with standard monitoring and after recording baseline vitals, L3-L4 interspace was first marked using anatomical surface landmarks. Then the epidural space was detected by an ultrasound-guided technique [SONOSITE M-TURBO] using a low-frequency curved-array ultrasound probe to identify the lumbar interspaces until the proper interlaminar space was found and marked. Lidocaine 1% was injected as a local anesthetic at the entry site, and then the epidural catheter was placed under complete sterilization using an 18 gauge Tuohy needle.

Three milliliters of lidocaine hydrochloride 2% solution with 1:200,000 adrenaline was administered as a test dose. Either the quick onset of neuroaxial block suggesting subarachnoid delivery of the local anesthetic medication or tachycardia suggesting intravascular delivery, the epidural catheter was removed and placed in another interspace.

All patients received general anesthesia under full standard monitoring. Induction was done by propofol (1–2 mg/kg), fentanyl (1 µg/kg), and muscle relaxation by atracurium (0.5 mg/kg). Then, an endotracheal tube was inserted. Isoflurane (1–2%) and atracurium (0.1 mg/kg/20–30 min) were used to maintain anesthesia and muscle relaxation. When the procedure was finished, the isoflurane was discontinued, and any remaining neuromuscular block was countered with neostigmine (0.08 mg/kg) and atropine (0.02 mg/kg).

Before finishing the procedure by 20 min, epidural analgesia was activated according to the study groups by injection of bupivacaine 0.125% plus dexmedetomidine or fentanyl or normal saline mixture 1.5 ml/segment according to the number of segments needed to be blocked (9–12 ml total volume), and the mean arterial blood pressure (MAP) and heart rate (HR) readings were evaluated before activation, at the intervals of 10 min and 20 min by the end of the surgery.

Group D: Dexmedetomidine 1 ml (100 µg) plus normal saline 1 ml were added to bupivacaine (0.125%) 48 ml (a total volume of 50 ml).

Group F: 2 ml (100 µg) fentanyl was added to bupivacaine (0.125%) 48 ml (a total volume of 50 ml).

Group C: Normal saline 2 ml was added to bupivacaine (0.125%) 48 ml (a total volume of 50 ml).

After complete recovery from general anesthesia, the epidural block was evaluated at the post-anesthesia care unit (PACU), and the infusion started

through an elastomeric pump with an infusion rate of 5 ml/hr, according to the study groups. The infusion was maintained for 24-hr postoperative period, records at baseline "just before initiation of epidural infusion," 2, 6, 12, and 24 hr were documented, and then the epidural catheter was removed.

Patients with breakthrough pain received an intravenous analgesic dose of paracetamol 1 gm and repeated it on demand every 6 hr such that the overall dosage for the entire 24-hr period was within the limits of 4 g/24 hr. Intravenous injection of pethidine hydrochloride (0.5 mg/kg) was added to the paracetamol doses as rescue analgesia if the pain persisted (defined as VAS > 4), such that the overall dosage for the entire 24-hr period was within the limits of 150 mg/24 hr.

4. Measured outcomes

4.1. Primary outcomes

The onset of sensory analgesia from the beginning of epidural infusion until scoring 1 on a 3-point scale [0 = normal sensation, 1 = loss of pinprick sensation (analgesia), and 2 = loss of tactile sensation (anesthesia)] and duration of analgesia (time from the start of the initial epidural infusion till the first demand for further pain medication) were observed and recorded.

4.2. Secondary outcomes

Postoperative pain scores using VAS and the number of patients requesting additional analgesia with pethidine over paracetamol as well as the pethidine consumption during postoperative 24 hr were recorded.

The hemodynamic parameters, including heart rate (HR) as well as mean arterial blood pressure (MAP), were monitored and recorded at baseline, 2, 6, 12, and 24 hr. Adverse events like hypotension (MAP <20% of the baseline reading), bradycardia (HR <60 bpm), motor block if occurred, respiratory depression, nausea, vomiting, and pruritus were properly observed, recorded, and symptomatically treated during the study period.

4.3. Sample size calculation

The sample size was calculated based on Kiran et al. (2018) study. In a one-way ANOVA study, sample sizes of 25 cases per group in three groups whose means were to be compared. The total sample of 75 subjects achieved 80% power to detect differences among the means versus the alternative of equal means using an F-test with a 0.0500 significance level. The size of the variation in the means is represented by the effect size = 0.4

4.4. Statistical analysis

Data were analyzed using Statistical Package for Social Science (SPSS) version 22.0. Quantitative data were expressed as mean ± standard deviation (SD) or median and interquartile range (IQR). Qualitative data were expressed in terms of frequency and percentage. One-way analysis of variance (ANOVA) was used to test the difference between the means of several variable subgroups, and a post hoc test for pairwise comparison of subgroups was used when the ANOVA test was positive. The Chi-square (X^2) test of significance was used to compare proportions between qualitative parameters. Non-parametric data were analyzed by the Kruskal–Wallis test for several subgroup comparisons. P-value <0.05 was considered significant.

5. Results

Analysis of demographic data (Age, sex, ASA, and BMI) and operation duration in Table 1 revealed no statistically significant difference between the study groups (P-value >0.05).

There was a highly significant statistical difference between the study groups (P-value <0.001) regarding the onset of sensory analgesia and duration of analgesia (Table 2).

A significant statistical difference (P-value <0.05) was recorded concerning the number of patients who required pethidine analgesic doses and pethidine consumption between the three groups (Tables 2 and 3).

VAS showed lower values in the dexmedetomidine group when compared to fentanyl and control groups,

Table 1. Comparison between groups regarding demographic data and operation duration.

Demographic data		Group C	Group D	Group F	F/X^2	P-value
Age (years)		47.72 ± 13.9	47.84 ± 12.9	49.44 ± 13.6	0.13^f	0.88
BMI (kg/m^2)		27 ± 6.0	27.48 ± 5.4	27.52 ± 6.0	0.06^f	0.94
SEX	Male	13(52%)	12 (48%)	12 (48%)	0.11^{X2}	0.95
	Female	12(48%)	13 (52%)	13 (52%)		
ASA	I	12 (48%)	10 (40%)	13(52%)	0.75^{X2}	0.69
	II	13 (52%)	15 (60%)	12(48%)		
Operation Duration (min)		111 ± 32.2	109.6 ± 30.9	110.6 ± 29.7	0.01^f	0.99

Data expressed as mean ± SD, proportion, F=one way anova, X^2= Chi-square, C=control group, D=dexmedetomidine group, F=fentanyl group. % = Percentage of patients. $P > 0.05$ = non-significant.
BMI= Body mass index, ASA= American Society of Anesthesiology Physical Status Classification System.

Table 2. Comparison between groups as regards onset, duration of sensory analgesia and number of patients required pethidine.

	Group C	Group D	Group F	F/X^2	P-value
Onset of Sensory Analgesia (min)	19.2 ± 3.1	12 ± 2.7[₱]	13.6 ± 3.1[¥]	39.58 [f]	<0.001
Duration of Analgesia (min)	93 ± 4.1	151 ± 15.9[₱ €]	122 ± 12.7[¥]	146.37 [f]	<0.001
Number of patients required pethidine	12 (48%)	2(8%)	6 (24%)	10.4[x2]	0.006

Data expressed as mean ± SD and proportion (number and percentage). F=one way a nova, X^2= Chi-square Dex=dexmedetomidine group, Fent=fentanyl group, ₱= post hoc test (Tukey) test significance between control group and Dex group, ¥= post hoc test (Tukey) test significance between control group and Fent group, €= post hoc test (Tukey) test significance between Dex group and Fent group.

Table 3. Comparison between groups regarding VAS and postoperative pain control.

	Group C			Group D			Group F				
	R.	M.	IQR	R.	M.	IQR	R.	M.	IQR	Z	P-value
VAS											
Baseline	1–5	3	3–4	1–4	2[₱]	1–3	1–5	3	2–3	11.97	0.003
After 2 hr	2–5	3	3–4	1–4	2[₱ €]	1.75–3	1–4	3[¥]	2–3	17.67	<0.001
After 6 hr	2–5	3	3–3	1–4	2[₱ €]	1–2.25	1–4	3[¥]	2–3	20.3	<0.001
After 12 hr	1–5	3	2–3	1–3	2[₱]	1–2	1–4	2	2–3	10.89	0.004
After 24 hr	1–4	2	2–2.25	0–3	1[₱]	1–2	1–4	2	1–2	9.04	0.011
Pethidine Consumption (mg)	0–100	0	0–50	0–50	0[₱]	0–0	0–50	0[¥]	0–25	11.97	0.0035

Data expressed as range (R), median (M), and IQR, z= Kruskal Wallis test, Dex=dexmedetomidine group, Fent=fentanyl group, ₱= post hoc test (Conover) test significance between control group and Dex group, ¥= post hoc test (Conover) test significance between control group and Fent group, €= post hoc test (Conover) test significance between Dex group and Fent group.

with a significant statistical difference (P-value <0.05) at the intervals of (baseline, 12 hr, and 24 hr) and a highly significant statistical difference (P-value <0.001) at the intervals of (2 and 6 hr) as shown in Table 3.

Groups were compared concerning intraoperative hemodynamic parameters (MAP and HR) with no significant statistical difference (P-value >0.05) at intervals "just before epidural activation, 10 min and 20 min after activation," as shown in Table 4.

Postoperative hemodynamic parameters at intervals of baseline, 2, 6, 12, and 24 hr were also recorded, and it was obvious from Table 5 that after 2 hr, MAP and HR values in the dexmedetomidine group were lower than in the other groups. MAP showed a statistically highly significant difference at 6 and 24 hr (P-value <0.001) and a significant difference after 12 hr (P-value <0.05), while HR showed a statistically significant difference after 6 hr (P-value <0.05) and a highly significant difference at 12 and 24 hr (P-value <0.001).

Table 4. Comparison between groups regarding intraoperative hemodynamics.

	Group C	Group D	Group F	F	P-value
MAP (mmHg)					
Before Activation	98.12 ± 4.4	97.84 ± 4.3	97.96 ± 4.3	0.03	0.97
After 10 min	98.16 ± 4.4	97.2 ± 4.8	97.08 ± 3.7	0.46	0.63
After 20 min	97.72 ± 4.6	96.76 ± 4.8	96.24 ± 3.6	0.74	0.48
HR (beats/min)					
Before Activation	83.92 ± 8.9	83 ± 8.3	82.56 ± 8.4	0.17	0.85
After 10 min	83.44 ± 9	81.08 ± 8	79.92 ± 8.3	1.13	0.33
After 20 min	82.8 ± 7.5	80.12 ± 8.1	79.08 ± 8	1.50	0.23

Data expressed as mean ± SD, F=one way anova, C=control group, D=dexmedetomidine group, F=fentanyl group.

Table 5. Comparison between groups regarding postoperative hemodynamics.

	Group C	Group D	Group F	F	P-value
MAP (mmHg)					
Baseline	97.4 ± 4.0	96.44 ± 3.8	95.44 ± 4.1	1.52	0.23
After 2 hr	97.36 ± 3.3	95.12 ± 5.5	95.2 ± 3.7	2.22	0.12
After 6 hr	97 ± 2.6	92.36 ± 5.0[₱]	94.84 ± 2.9	9.97	<0.001
After 12 hr	96.92 ± 2.5	91.52 ± 5.8[₱]	94.64 ± 6.1	7.12	0.002
After 24 hr	95.92 ± 3.4	89.52 ± 4.7[₱]	93.36 ± 4.1[€]	15.31	<0.001
HR (beats/min)					
Baseline	82.12 ± 11.0	79.04 ± 7.1	78.24 ± 7.3	1.41	0.25
After 2 hr	82 ± 9.6	76.48 ± 8.1	78 ± 6.9	2.95	0.06
After 6 hr	81.4 ± 8.9	73.52 ± 6.4[₱]	76.8 ± 6.8	7.07	0.002
After 12 hr	80.88 ± 8.5	72 ± 6.4[₱]	76 ± 6.6	9.46	<0.001
After 24 hr	80.32 ± 7.9	71 ± 6.6[₱]	74.64 ± 5.8[¥]	11.79	<0.001

Data expressed as mean ± SD, F=one way a nova, Dex=dexmedetomidine group, Fent=fentanyl group, ₱= post hoc test (Tukey) test significance between control group and Dex group, ¥= post hoc test (Tukey) test significance between control group and Fent group, €= post hoc test (Tukey) test significance between Dex group and Fent group.

Table 6. Comparison between groups regarding complications.

	Group C	Group D	Group F	X^2	P-value
PONV	1(4%)	2(8%)	6(24%)	5.3	0.07
Pruritis	0(0%)	0(0%)	3(12%)	6.25	0.04
Urinary retention	0(0%)	0(0%)	2(8%)	4.1	0.13
Respiratory depression	0(0%)	0(0%)	2(8%)	4.1	0.13
Dry mouth	0(0%)	7(28%)	2(8%)	9.8	0.007
Hypotension	1(4%)	5(20%)	2(8%)	3.6	0.16
Bradycardia	0(0%)	5(20%)	2(8%)	5.987	0.0501
Headache	0(0%)	0(0%)	1(4%)	2.03	0.36
Shivering	0(0%)	1(4%)	2(8%)	2.08	0.35
Motor block	0(0%)	5(20%)	2(8%)	5.987	0.0501

Data expressed as, proportion, X^2= Chi-square, C=control group, D=dexmedetomidine group, F=fentanyl group.

Regarding postoperative complications, there was a significant statistical difference between fentanyl and other study groups concerning the number of patients complaining of pruritis (P-value <0.05). On the other hand, the number of patients complaining of dry mouth was significantly higher in the dexmedetomidine group than in other study groups with a P-value <0.05 (Table 6).

No other adverse consequences or complications were reported during the research period

6. Discussion

Epidural analgesia is an important modality of postoperative pain control with abdominal surgeries [9]. Epidural catheterization is performed either through the conventional loss-of-resistance technique, which primarily depends on anatomical landmarks palpation [10] or through ultrasound guidance to locate the midline structures, the appropriate needle insertion point, the optimal angle for insertion, and measure the depth of epidural space [11].

Opioids and alpha 2 agonists as adjuvants in regional anesthesia produce potent analgesic effects [12]. Fentanyl either directly affects the spinal nerve or traverses the dura to act at the dorsal roots containing opioid-binding sites [13]. Dexmedetomidine reduces sympathetic outflow and norepinephrine release by acting on the central nervous system's pre and postsynaptic nerve terminals. It may produce hypotension and bradycardia. However, it is not associated with the negative consequences of opioids, such as respiratory depression, itching, postoperative nausea, and vomiting (PONV). The motor block may occur due to alpha 2 agonists binding to the motor neurons in the dorsal horn [6].

The current study revealed a highly significant statistical difference between the study groups with earlier onset and longer duration of sensory analgesia in the dexmedetomidine group compared to the other groups, as well as a significant difference concerning the number of patients required pethidine analgesic doses and pethidine consumption between dexmedetomidine and the other groups with the highest pethidine requirements (48%) in the control group. The dexmedetomidine group showed lower VAS values compared to the other groups, with a significant statistical difference starting from baseline records at the PACU (epidural analgesia was activated before the surgical procedure was finished) and also after 12 and 24 hr and a highly significant difference after 2 and 6 hr.

There were statistical differences between the investigated groups regarding MAP and HR at postoperative 6, 12, and 24 hr, and the dexmedetomidine group experienced a higher rate of dry mouth, hypotension, bradycardia, and motor block than the other research groups with a significant statistical difference between them regarding the incidence of dry mouth. In contrast, the incidence of PONV, pruritis, urinary retention, respiratory depression, headache, and shivering was more in the fentanyl group rather than in other studied groups, with a statistically significant discrepancy between them regarding the incidence of pruritis.

Hetta et al. [2] revealed that sustained postoperative epidural infusions of dexmedetomidine bupivacaine (0.1%) mixture significantly decreased pain intensity, VAS scores, and the accumulative morphine intake and also delayed the period prior to first analgesic supplementation in dexmedetomidine group compared to the bupivacaine group. Postoperative mean blood pressures and heart rate records were significantly lower in the dexmedetomidine group.

Batham et al. [14] compared the effects of adding fentanyl or dexmedetomidine to epidural bupivacaine among patients who underwent lower limb orthopedic surgeries. It was observed that the sensory anesthesia induced by dexmedetomidine had a significantly early onset, and the postoperative analgesia was prolonged with a significant decrease in postoperative pain scores compared to fentanyl. These findings concurred with those of Paul et al. [15] and Soliman et al. [5], concluding that dexmedetomidine offered improved postoperative analgesia and lowered the need for postoperative opioids. The incidence of bradycardia was significantly higher in the dexmedetomidine group. Pruritis was not found in any group, and there was no statistically significant difference between the two groups regarding the remaining side effects. Similar findings were reported by Paul et al. [15].

Paul et al. [15] reported that dexmedetomidine as an adjuvant to epidural bupivacaine in lower limb surgeries was a better alternative to fentanyl as it achieved a faster onset of sensory block, a longer duration of analgesia as well as a significant decrease in postoperative pain scores in dexmedetomidine group as compared to fentanyl group. There was also a significant decrease in HR, more than that of the fentanyl group, while the incidence of hypotension was not significant in both groups.

Soliman and Eltaweel [5] evaluated dexmedetomidine and fentanyl as adjuvants to postoperative epidural bupivacaine (0.125%) compared to bupivacaine (0.125%) alone and noticed a significantly lower incidence regarding the number of patients with high verbal pain scores and postoperative opioid requirements in dexmedetomidine group than in fentanyl group. There was a decrease in HR and MAP in the dexmedetomidine and fentanyl groups more than in the control group, with a more significant decrease in the dexmedetomidine group. The reduction in hemodynamics can be attributed to the binding of dexmedetomidine to the α_2-receptors in the central nervous system, resulting in decreased sympathetic outflow tone and catecholamine release with the enhancement of vagal activity [16]. Moreover, compared to the fentanyl group, the prevalence of dry mouth, bradycardia, hypotension, and motor block was higher in the dexmedetomidine group. In contrast, other adverse consequences, such as pruritis, nausea, vomiting, respiratory depression, and urine retention, were significantly lower.

Eskandar and Ebeid [17] assessed the postoperative effect of epidural dexmedetomidine as an adjuvant to bupivacaine after total knee arthroplasty. They found a significant reduction in the VAS and nalbuphine doses in the dexmedetomidine group compared to the control group. The heart rate decreased significantly, but the decrease in mean arterial pressure was not significant in the dexmedetomidine group, which can be attributed to the lower volume (2.5 ml/h) of local anesthetic in the dexmedetomidine group than in the bupivacaine group (5 ml/h).

Dexmedetomidine and fentanyl were also investigated as epidural adjuvants to ropivacaine (0.5%) by Kiran et al. [4], and the sensory block onset was considerably reduced with both drugs when compared to ropivacaine alone. Furthermore, faster sensory block onset was documented with dexmedetomidine rather than fentanyl added to ropivacaine as well as longer postoperative analgesia, fewer top-ups required, and a lower overall dose of postoperative dexmedetomidine ropivacaine mixture. Shivering, nausea, and vomiting were comparable in all groups, but pruritis was higher with the use of fentanyl.

Bajwa et al. [18] also added dexmedetomidine or fentanyl to epidural ropivacaine, and the dexmedetomidine group showed a significantly earlier onset and longer postoperative analgesic duration with lower consumption of local anesthetic top-up doses. Nausea and vomiting incidence was increased with epidural fentanyl, while dry mouth and motor block were associated with dexmedetomidine more than fentanyl. However, there was no difference concerning the prevalence of respiratory depression, urine retention, or pruritis.

Contrary to the current study, Kaur et al. [19] compared 150 mg of ropivacaine (0.75%) to 150 mg of ropivacaine (0.75%) plus a single dose of dexmedetomidine (1 µg/kg) with no discernible difference among the two groups concerning the meantime for sensory block onset, while adding dexmedetomidine delayed the requirements significantly and lowered the rescue analgesia doses with prolonged duration of postoperative analgesia.

Salgado et al. [20] also noticed a non-significant difference between the meantime for the onset of the sensory block using 20 ml of ropivacaine (0.75%) alone versus ropivacaine (0.75%) plus dexmedetomidine (1 µg/kg) but with prolonged sensory duration time and postoperative analgesia. The mean time for sensory block onset observed in the previous studies may be related to the single low dexmedetomidine dose instead of a bolus dose followed by a maintained fixed rate infusion of the adjuvant local anesthetic mixture.

Both studies reported non-significant alterations in MAP and HR when dexmedetomidine was added to ropivacaine relative to the control group, supporting the well-established effects of α_2-agonists in providing a hemodynamically stable perioperative period [21].

Salgado et al. [20] reported a low incidence of shivering, vomiting, and respiratory depression, which was similar between groups. At the same time, when dexmedetomidine or fentanyl was added to ropivacaine, the degree of motor block was completely attained, with the dexmedetomidine group achieving a superior block than the fentanyl group.

7. Conclusion

Dexmedetomidine is preferred over fentanyl when added to epidural bupivacaine for postoperative pain management after abdominal procedures. Compared to fentanyl, dexmedetomidine offers superior postoperative analgesia, lowers the need for postoperative opioids, and reduces the incidence of complications like respiratory depression, pruritis, and urine retention. However, epidural dexmedetomidine is more frequently linked to the motor block, bradycardia, hypotension, and dry mouth.

Disclosure statement

The author(s) did not report any potential conflicts of interest.

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