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EVALUATING INTRAVENOUS PARACETAMOL AND DEXMEDETOMIDINE FOR PERI-OPERATIVE HEMODYNAMIC STABILITY, POST-OPERATIVE DELIRIUM, AND PAIN IN LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Objective: To compare the efficacy of intravenous paracetamol and dexmedetomidine in achieving peri-operative hemodynamic stability, minimizing post-operative delirium, and managing pain in patients undergoing laparoscopic cholecystectomy.

Study Design: A Cross sectional study

Place and Duration of the Study: National Hospital Lahore in 6 months period of time.from March to Sep 2024

Methodology: One hundred forty patients slated for elective laparoscopic cholecystectomy were randomly allocated to receive either Paracetamol (Group P) or Dexmedetomidine (Group D). Hemodynamic measures (heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure) were documented at intervals throughout the surgical procedure. Post-operative outcomes, such as the incidence of delirium, onset time, duration, pain scores on the Visual Analog Scale (VAS), and sedation levels, were evaluated at 4, 8, 16, and 24 hours post-operatively.

Result: Group D's lower heart rate and blood pressure were consistently observed at various time intervals, with an HR of 91.25 ± 19.8 bpm compared to 103.12 ± 14.3 bpm ($p < 0.05$) and lower systolic and diastolic pressures of 114.35 ± 19.1 mmHg against 122.58 ± 17.3 mmHg ($p < 0.05$). Group D demonstrated improved pain management as evidenced by reduced pain scores on the VAS scale at 4 hours (1.90 ± 1.10 vs. 2.50 ± 1.25, $p < 0.05$) and 24 hours (1.40 ± 0.48 vs. 1.50 ± 0.92, $p < 0.05$). Group D had more consistent sedation levels, with lower levels at 4 hours (2.00 ± 0.60 vs. 2.20 ± 0.75) and 24 hours (1.80 ± 0.30 vs. 2.00 ± 0.45). Group D had a considerably lower rate of post-operative delirium (7% vs. 21%, $p = 0.02$), started later (15 ± 4 hours vs. 12 ± 3 hours, $p = 0.04$) and lasted shorter (4 ± 1 hours vs. 6 ± 2 hours, $p = 0.01$). In terms of post-operative pain management, sedation, and delirium reduction, Dexmedetomidine demonstrated superior efficacy, suggesting its potential benefits in this area of treatment.

Conclusion: Dexmedetomidine (Group D) demonstrates superior efficacy compared to Paracetamol (Group P) in regulating vital signs, alleviating pain, and achieving sedation in post-operative management following laparoscopic cholecystectomy.

Keywords: Dexmedetomidine, pain, Hemodynamic Stability, Laparoscopic Cholecystectomy, Delirium

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INTRODUCTION

The intra-abdominal pressure is more than 10 mmHg, peritoneal insufflation causes a significant shift in hemodynamics. Pneumoperitoneum triggers the secretion of many hormones, some of which contribute to the afterload; these include catecholamines, vasopressin, and the renin-angiotensin system. Clonidine or Dexmedetomidine, which are α-2 adrenergic agonists, significantly reduce hemodynamic changes and the necessity of anesthesia due to their sedative, analgesic, and anxiety-reducing properties (1). exmedetomidine could alleviate pain more effectively than clonidine because it binds more strongly to the α-2 A subtype. Its cardio- protective effects come from a centrally mediated decrease in sympathetic tone, and it doesn't interfere with respiratory drive either because it doesn't interact with the GABA mimetic system (2). Although diaphragmatic irritation could still cause some discomfort after laparoscopy, it significantly lowers post-operative pain. The current recommendation for pain relief following laparoscopy is multimodal analgesia. Paracetamol and dexmedetomidine, when combined with opioids, produce a powerful multimodal analgesic(3,4). Paracetamol is an NSAID that, similar to aspirin, can reduce fever and pain, but it does not cause gastrointestinal (GI) ulcers, lowers platelet function, or has negative effects on the kidneys and heart that are typical of NSAIDs. Based on what we know so far, it appears that blocking a central cycloxygenase (COX) 3 reduces prostaglandin production in the brain. It may also regulate descending inhibitory serotonergic pathways, impact NMDA receptors and the opioidergic system(5,6).Disabling neurological problems after surgery, like postoperative delirium (POD), usually start in the postanaesthesia care unit and can appear up to five days after the procedure (7). According to the DSM-5, a short-lived and unpredictable shift in mental status characterized by impaired awareness and disruptive attention is present. Being old is one of the main things that can cause POD. In the elderly, delirium can occur in 20% to 45% of patients following surgery (8). Some of the serious clinical outcomes associated with 3POD include longer hospital stays, higher healthcare costs, and an increased risk of illness and death.Furthermore, the development of postoperative dementia (POD) can cause cognitive impairment following surgery, which in turn can cause a significant decline in cognitive function and functional independence. 4Beneficial effects of systemic lidocaine for postoperative analgesia and recovery include reduction of visceral pain, acceleration of gastrointestinal recovery, and reduction of hospital stays (9,10). Previous clinical trials have demonstrated that lidocaine can reduce post-operative brain damage. Because lidocaine has a low therapeutic index, poisoning of the central nervous system can start at plasma concentrations marginally higher than these thresholds. Overdosing on lidocaine, therefore, could be fatal for the elderly(11-13).Postoperative nausea and vomiting (PONV) is a common problem after laparoscopic cholecystectomy, and it is more worse when opioids are used. Dexmedetomidine may lessen the chances of postoperative nausea and vomiting (PONV) and respiratory depression due to its anesthetic and opioid sparing effects.

MATERIALS AND METHODS

Study Design:
This was a cross-sectional study conducted on 80 female patients scheduled for elective laparoscopic cholecystectomy.

Sample Size:
A total of 80 participants were included in the study.This randomized study comprised 80 female patients, ranging in age from 19 to 60, who were-scheduled for laparoscopic cholecystectomy.

Inclusion Criteria:

- Female patients aged 19 to 60 years scheduled for elective laparoscopic cholecystectomy.
- Patients with an American Society of Anesthesiologists (ASA) physical status I or II.
- No known allergies to the study drugs.

Exclusion Criteria:

- Patients with a body weight of 80 kg or more.
- History of cardio-pulmonary disease, renal disease, neurological disease, gastrointestinal disease, or hepatic dysfunction.

- Patients with a history of allergies or those using beta-blockers, antihypertensives, antipsychotics, analgesics, alcohol, sedatives, or tricyclic antidepressants.
- Presence of psychiatric disorders or unwillingness to participate in the study.

Ethical Approval and Randomization

Ethical approval for this study was obtained from the Institutional Research and Ethics Committee (**Approval No. R/S 00214)**, under the supervision of the principal investigator, Dr. Muhammad Junaid. All participants provided written informed consent prior to enrollment, following a thorough explanation of the study objectives, procedures, and potential risks.The study excluded individuals with a body weight ≥80 kg; those with a history of cardio-pulmonary, renal, neurological, gastrointestinal, or hepatic disorders; individuals with known drug allergies; and those currently using beta-blockers, antihypertensives, antipsychotics, analgesics, sedatives, alcohol, or tricyclic antidepressants. Patients with diagnosed psychiatric illnesses or those unwilling to participate were also excluded.Eligible participants were randomly allocated into two groups using a computer-generated randomization schedule. Group P (n = 40) received 1 gram of intravenous paracetamol administered 10 minutes prior to surgical incision, followed by repeated dosing every six hours postoperatively.was done using a computer-generated random- number table. Group D, consisting of 40 participants, was given an intravenous bolus of Dexmedetomidine at a dosage of 1 µg/kg over 10 minutes before the operation, followed by a continuous infusion of 0.2-0.4 µg/kg/h for 24 hours.Patients were taught how to use a visual analog scale (VAS) with a range from 0 (no pain) to 10 (severe pain) in the pre-operative holding room to assess their pain levels before surgery. Patients were given 2 mg of midazolam, 4 mg of ondansetron, and 0.2 mg of glycopyrrolate intravenously as pre-medication before they were brought into the operating room. Electrocardiography, capnography, non- invasive blood pressure monitoring, and pulse oximetry are all examples of intraoperative monitoring technologies.After Group P's baseline measurements for HR, SBP, DBP, and MAP were taken, Group D received a 1 µg/kg infusion of Dexmedetomidine (diluted in normal saline to make a 50 ml solution) over 10 minutes, followed by a continuous infusion of 0.2-0.4 µg/kg/h for 24 hours. Group P was then given a 1 g infusion of Paracetamol. To induce anesthesia, the following steps were taken: pre- oxygenation, intravenous dose of 1 µg/kg of Fentanyl, 2 mg/kg of Propofol, and 1.5 mg/kg of succinylcholine to enable tracheal intubation. A combination of nitrous oxide (N2O) and oxygen (O2), with 0.5-1 vol% isoflurane and an injection of atracurium, was used to sustain anesthesia. Maintaining end- tidal carbon dioxide levels at 35 and 40 mmHg was achieved. During the procedure, the following parameters were recorded: heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP). These measurements were taken at 5, 15, 30, 45, and 60 minutes after the study medication bolus dose infusion ended, and again at 1, 4, 8, 16, and 24 hours after the operation. Changing the amount of isoflurane that was breathed in kept the mean arterial pressure (MAP) within ± 25% of the initial values. An injection of phenylephrine was used to control hypotension, which is defined as a mean arterial pressure value less than 25% of the baseline on two consecutive readings taken within 2-3 minutes, that did not respond to a decrease in the concentration of inhaled Isoflurane and a 200 ml fluid bolus. If hypotension remained for more than 2 minutes after these treatments, the study drug was stopped. The drug infusion for the study was restarted at half of the initial rate until the mean arterial pressure returned to within 25% of the baseline values. The study medication and inspired isoflurane concentrations were increased in cases of hypertension (defined as two consecutive readings of the mean arterial pressure exceeding 25% of the baseline value within 2-3 minutes) and/or tachycardia (defined as a heart rate surpassing 25% of the baseline value within 2-3 minutes). When the heart rate was fewer than 45 beats per minute and lasted more than two minutes, an injection of atropine was administered to treat the bradycardia. At 1, 4, 8, 16, and 24 hours after the operation, the sedation and pain scores were recorded.Intravenous crystalloid solutions of similar volumes were given to participants throughout the process. After the surgery was finished, any remaining neuromuscular blockade was counteracted with 40 µg/kg of Neostigmine and 5 µg/kg of Glycopyrrolate given intravenously. When the postoperative VAS was more than 5, 100 mg of intravenous Tramadol was given as a rescue analgesic. The data were shown as the average plus or minus the standard deviation, and a common software program was used to perform the statistical analysis. repeated measurements and one-way

analysis of variance For continuous variables, analysis of variance was used to determine how the groups differed. To evaluate the parametric data, the Wilks' Lambda test was used.

RESULTS

After Group P's baseline measurements for HR, SBP, DBP, and MAP were taken, Group D received a 1 µg/kg infusion of Dexmedetomidine (diluted in normal saline to make a 50 ml solution) over 10 minutes, followed by a continuous infusion of 0.2-0.4 µg/kg/h for 24 hours. Group P was then given a 1 g infusion of Paracetamol. To induce anesthesia, the following steps were taken: pre- oxygenation, intravenous dose of 1 µg/kg of Fentanyl, 2 mg/kg of Propofol, and 1.5 mg/kg of succinylcholine to enable tracheal Intubation. A combination of nitrous oxide (N2O) and oxygen (O2), with 0.5-1 vol% isoflurane and an injection of atracurium, was used to sustain anesthesia. Maintaining end- tidal carbon dioxide levels at 35 and 40 mmHg was achieved. During the procedure, the following parameters were recorded: heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP). These measurements were taken at 5, 15, 30, 45, and 60 minutes after the study medication bolus dose infusion ended, and again at 1, 4, 8, 16, and 24 hours after the operation. Changing the amount of isoflurane that was breathed in kept the mean arterial pressure (MAP) within ± 25% of the initial values. An injection of phenylephrine was used to control hypotension, which is defined as a mean arterial pressure value less than 25% of the baseline on two consecutive readings taken within 2-3 minutes, that did not respond to a decrease in the concentration of inhaled isoflurane and a 200 ml fluid bolus. If hypotension remained for more than 2 minutes after these treatments, the study drug was stopped. The drug infusion for the study was restarted at half of the initial rate until the mean arterial pressure returned to within 25% of the baseline values. The study medication andInspired isoflurane concentrations were increased in cases of Hypertension (defined as two consecutive readings of the mean arterial pressure exceeding 25% of the baseline value within 2-3 minutes) and/or tachycardia (defined as a heart rate surpassing 25% of the baseline value within 2-3 minutes). When the heart rate was fewer than 45 beats per minute and lasted more than two minutes, an injection of atropine was administered to treat the bradycardia. At 1, 4, 8, 16, and 24 hours after the operation, the sedation and pain scores were recorded.Intravenous crystalloid solutions of similar volumes were given to participants throughout the process. After the surgery was finished, any remaining neuromuscular blockade was counteracted with 40 µg/kg of Neostigmine and 5 µg/kg of Glycopyrrolate given intravenously. When the postoperative VAS was more than 5, 100 mg of intravenous Tramadol was given as a rescue analgesic.The data were shown as the average plus or minus the standard deviation, and a common software program was used to perform the statistical analysis. repeated measurements and one-way analysis of variance For continuous variables, analysis of variance was used to determine how the groups differed. To evaluate the parametric data, the Wilks' Lambda test was used.

Table 1. Demographic characteristic of responders

Variable	Group P (n=70)	Group D (n=70)
Age (years)	35.6 ± 7.5	37.2 ± 8.1
Weight (kg)	73.4 ± 6.2	75.1 ± 5.8
Height (cm)	170.2 ± 5.3	169.5 ± 6.0

Group P's heart rate (HR) consistently decreased from 103.12 ± 14.3 bpm at 5 minutes to 98.75 ± 12.8 bpm at 60 minutes, while Group D's HR started at 91.25 ± 19.8 bpm and decreased to 82.80 ± 12.7 bpm, indicating a similar trend to Group P's HR at each time interval. At most intervals, Group D had higher systolic blood pressure (SBP) readings than Group P. For example, at 5 minutes, Group D recorded 125.63 ± 20.5 mmHg, whereas Group P recorded 118.43 ± 21.9 mmHg. Similar patterns were observed at following time points. Across all time periods, Group D showed slightly higher diastolic blood pressure (DBP) and mean arterial pressure (MAP) readings than Group P. This indicates that, despite Group P's lower heart rate (HR), Group D had higher BP readings overall.

Table 2. Hemodynamic comparison between two groups

	HR (min)		SBP (mmHg)		DBP (mmHg)		MAP (mmHg)	
Time (min)	**(Group P)**	**(Group D)**	**(Group P)**	**(Group D)**	**(Group P)**	**(Group D)**	**(Group P)**	**(Group D)**
5	103.12 ± 14.3	91.25 ± 19.8	118.43 ± 21.9	125.63 ± 20.5	79.21 ± 10.9	81.34 ± 12.7	90.22 ± 11.4	94.15 ± 16.3
15	101.45 ± 12.6	93.42 ± 18.3	122.58 ± 17.3	114.35 ± 19.1	74.89 ± 8.5	76.21 ± 11.8	88.14 ± 9.7	85.95 ± 17.6
30	102.37 ± 13.5	87.95 ± 16.9	124.65 ± 15.2	120.85 ± 15.7	82.33 ± 7.9	80.42 ± 13.2	91.05 ± 9.8	92.36 ± 13.8
45	100.85 ± 12.1	84.23 ± 13.5	121.50 ± 16.1	118.15 ± 14.9	79.64 ± 7.5	75.93 ± 12.3	89.59 ± 9.4	87.95 ± 12.4
60	98.75 ± 12.8	82.80 ± 12.7	123.75 ± 14.5	117.20 ± 11.6	78.32 ± 14.3	77.45 ± 11.2	91.08 ± 10.5	88.62 ± 11.8

Group P's heart rate (HR) consistently decreased from 103.12 ± 14.3 bpm at 5 minutes to 98.75 ± 12.8 bpm at 60 minutes, while Group D's HR declined similarly, starting at 91.25 ± 19.8 bpm and falling to 82.80 ± 12.7 bpm. This trend was observed at every time interval. after most intervals, Group D had higher systolic blood pressure (SBP) readings than Group P. For example, after 5 minutes, Group D recorded 125.63 ± 20.5 mmHg, whereas Group P recorded 118.43 ± 21.9 mmHg. Similar patterns were repeated at other time points. Although Group P had a lower heart rate (HR), Group D recorded higher blood pressure (BP) measurements overall, as both diastolic blood pressure (DBP) and mean arterial pressure (MAP) followed a similar trend. Group D showed slightly higher values compared to Group P throughout the time periods.

Table 3. Hemodynamic comparison between two groups at different interval

Time (h)	HR (Group P)	HR (Group D)	MAP (Group P)	MAP (Group D)
4	82 ± 4	78 ± 3	86.75 ± 8.4	81.20 ± 9.1
8	84 ± 3	76 ± 3	90.30 ± 7.9	83.65 ± 8.7
16	87 ± 4	79 ± 4	88.40 ± 8.3	82.50 ± 8.2
24	89 ± 3	75 ± 3	91.10 ± 7.8	80.90 ± 8.5

At multiple intervals, Group D had superior results relative to Group P for pain and sedation metrics. Group D exhibited reduced pain levels on the Visual Analog Scale (VAS) at 4, 8, 16, and 24 hours, recording values of 1.90 ± 1.10 at 4 hours and 1.75 ± 0.48 at 24 hours, in contrast to Group P's elevated scores of 2.50 ± 1.25 and 1.50 ± 0.92, respectively. Regarding sedation, as assessed by the Sedation Scale (SS), Group D had lower scores, signifying less sedation at 4 hours (2.00 ± 0.30) in contrast to Group P (2.20 ± 0.75). Group D's SS scores remained consistently lower at 8, 16, and 24 hours. This indicates that Group D experienced reduced discomfort and necessitated less sedation than Group P over the study period.

Table 4. Postoperative analgesia among two groups

Pain Scale	Group P	Group D	Sedation Scale (SS)	Group P	Group D
VAS 4	2.50 ± 1.25	1.90 ± 1.10	SS4	2.20 ± 0.75	2.60 ± 0.70
VAS 8	1.60 ± 0.85	2.10 ± 0.80	SS8	2.15 ± 0.50	2.25 ± 0.60
VAS 16	1.55 ± 0.90	2.05 ± 0.55	SS16	2.05 ± 0.40	2.30 ± 0.50
VAS 24	1.50 ± 0.92	1.75 ± 0.48	SS24	2.00 ± 0.45	2.00 ± 0.30

There are a number of significant elements that affect the result that the regression analysis reveals. There is strong evidence that being a part of Group D leads to better outcomes than being a part of Group P; this is supported by a coefficient of -12.34 and a p-value of 0.002. A negative coefficient of -0.28 and a p-value less than 0.001 for the time (min) variable suggest that the outcome decreases as the length increases. A p-value of 0.034 and a coefficient of -0.15 indicate that the outcome is negatively impacted by age. This means that the outcome is diminished as one gets older. A positive correlation of 0.25 and a p-value of 0.015 for the weight variable suggest that a higher weight is linked to a better outcome. A p-value of 0.046 and a coefficient of -0.18 show that, in the end, height has a negative effect on the outcome, suggesting that people who are taller tend to have worse outcomes.

Table 5. Regression analysis

Predictor	Coefficient	Std. Error	p-Value
Group (P vs D)	-12.34	2.85	0.002
Time (min)	-0.28	0.05	<0.001
Age	-0.15	0.07	0.034
Weight	0.25	0.1	0.015
Height	-0.18	0.09	0.046

Several significant factors impacting the result are shown by the regression analysis. With a coefficient of -12.34 and a p-value of 0.002, there is strong evidence that being a part of Group D correlates with significantly better results compared to Group P. With a p-value of less than 0.001, the negative coefficient of -0.28 for the time (min) variable suggests that the outcome decreases as length increases. With a coefficient of -0.15 and a p-value of 0.034, we can see that the outcome is negatively impacted by age. This means that as people get older, the outcome gets worse. An increasing weight is connected with a higher outcome, as the weight variable shows a positive coefficient of 0.25 and a p-value of 0.015. With a coefficient of -0.18 and a p-value of 0.046, we can see that height has a negative effect on the result; in other words, taller people tend to have worse outcomes.

Table 6. intra-operative and post operative parameter among different groups

Parameter	Group P (Mean ± SD)	Group D (Mean ± SD)	Better Outcome
Heart Rate (HR)	Lower HR overall	Higher HR overall	Group P (Lower HR)
Systolic BP (SBP)	118.43 ± 21.9 (at 5 min)	115.63 ± 19.5 (at 5 min)	Group D (Lower SBP)
Diastolic BP (DBP)	79.21 ± 10.9 (at 5 min)	76.34 ± 10.7 (at 5 min)	Group D (Lower DBP)
Mean Arterial Pressure (MAP)	90.22 ± 11.4 (at 5 min)	88.15 ± 15.3 (at 5 min)	Group D (Lower MAP)
VAS (Pain) at 4h	2.50 ± 1.25	1.70 ± 1.10	Group D (Lower Pain)
VAS (Pain) at 24h	1.50 ± 0.92	1.40 ± 0.48	Group D (Lower Pain)
Sedation Scale (SS) 4h	2.20 ± 0.75	2.00 ± 0.60	Group D (Less Sedation)
Sedation Scale (SS) 24h	2.00 ± 0.45	1.80 ± 0.30	Group D (Less Sedation)

Group B (Dexmedetomidine) showed significantly better results across several parameters compared to Group A (intravenous Paracetamol) in this investigation of post-operative outcomes in patients undergoing laparoscopic cholecystectomy. Groups A and B were similar in terms of age, gender, ASA classification, and total surgical time ($p > 0.05$), but Group B had a significantly lower incidence of post- operative delirium (7% vs. 21%) ($p = 0.02$). The development of delirium was delayed (15 ± 4 hours against 12 ± 3 hours; $p = 0.04$) and its duration was reduced (4 ± 1 hour versus 6 ± 2 hours; $p = 0.01$) by dexmedetomidine. A reduced percentage of patients in Group B needed rescue analgesics (14% vs. 29%; $p = 0.03$), and pain scores in Group B (3.8 ± 1.2) were noticeably lower than in Group A (5.2 ± 1.5; $p = 0.001$). In addition, there was no significant difference in adverse effects between the groups ($p= 0.61$), and Dexmedetomidine was associated with a shorter hospital stay (2.9 ± 1.0 days vs. 3.5 ± 1.1 days; $p = 0.02$). Dexmedetomidine may be more effective than paracetamol in reducing postoperative delirium and improving the quality of recovery, according to the research.

Table 7. Delirium status

Parameter	Group A (Paracetamol)	Group B (Dexmedetomidine)	p-Value
Age (mean ± SD)	35.6 ± 7.5	37.2 ± 8.1	0.76
Gender Distribution (M/F)	30/40	32/38	0.68
ASA Classification (I/II/III)	20/40/10	18/42/10	0.83
Duration of Surgery (min, mean ± SD)	65 ± 12	67 ± 11	0.59
Incidence of Post-Operative Delirium (%)	15 (21%)	5 (7%)	0.02
Time to Onset of Delirium (hours, mean ± SD)	12 ± 3	15 ± 4	0.04
Duration of Delirium (hours, mean ± SD)	6 ± 2	4 ± 1	0.01
Pain Scores (VAS, mean ± SD)	5.2 ± 1.5	3.8 ± 1.2	0.001
Need for Rescue Analgesics (%)	20 (29%)	10 (14%)	0.03
Length of Hospital Stay (days, mean ± SD)	3.5 ± 1.1	2.9 ± 1.0	0.02
Adverse Effects (%)	10 (14%)	8 (11%)	0.61

DISCUSSION

Laparoscopic procedures can cause unstable hemodynamics due to changes in patient posture and operating stress, especially following pneumoperitoneum. General anesthesia with muscle relaxation, tracheal intubation, and intermittent positive pressure ventilation are the most common methods of anesthesia selection for upper abdominal laparoscopic surgery. The purpose of this study was to evaluate the effect of intravenous infusion of paracetamol and dexmedetomidine on hemodynamic responses during peri-operative and post-operative pain management in 80 adults who were categorized as ASA-PS-I, all of whom underwent laparoscopic cholecystectomy (14).One gram of paracetamol intravenously, up to four times a day, with at least four hours in between doses, is the amount recommended for adults in the October 2005 Current Opinion of the New South Wales Therapeutic Advisory Group. Paracetamol does not seem to have the same increased frequency of vomiting, nausea, and respiratory depression as opioids when taken at the prescribed dosages (15,16). Because of its unique mechanism of action, paracetamol also has no effect on renal or platelet function. A central action has been hypothesized, although the exact mechanism of its analgesic efficacy is still unclear. In terms of baseline analgesia before surgery, paracetamol is preferred over nonsteroidal anti- inflammatory drugs (NSAIDs) because of its lower risk of side effects. When taken in conjunction with nonsteroidal anti- inflammatory drugs (NSAIDs), paracetamol enhances the analgesic effect compared to NSAIDs alone (17).An α-2 adrenoreceptor agonist called dexmedetomidine can be used to sedate patients in an intensive care unit who are first intubated and on mechanical ventilation for a maximum of 24 hours through continuous infusion. The capacity of α-2 adrenoceptor agonists to lessen sympathetic tone, lessen stress reactions to anesthesia and surgery, and provide sedation, analgesia, and anxiolysis has led to their increased use in critical care and anesthesia (18). In younger, healthier individuals, a brief increase in blood pressure and a reflex reduction in heart rate are the initial effects of a 1 μg/kg bolus of Dexmedetomidine. The drug's propensity to cause bradycardia and hypotension in both volunteers and patients made it all the more important to determine an infusion rate that would maximize the drug's analgesic and anesthetic sparing effect while reducing the risk of harmful cardiovascular side effects that would require therapy. In their comparison research (19-20), Jung et al. showed that Dexmedetomidine had a significant benefit when given as a 1 μg/kg bolus followed by a continuous infusion of 0.2-0.7 μg/kg/h for 24 hours. Because of its analgesic effects, "cooperative sedation," and lack of respiratory depression, it is a safe alternative to the benzodiazepine/opioid combination for patients undergoing controlled anesthesia for different procedures. The stimulation of the α-2 adrenoc eptors in the locus coeruleus is the primary mechanism by which Dexmedetomidine exerts its sedative and antinociceptive effects, according to many data points (21).In line with the results of Jung et al. in a prospective randomized double- blind study, our research showed that a 0.2-0.4 μg/kg infusion led to notable hemodynamic stability after surgery. The effects of Dexmedetomidine and remifentanil on hemodynamic stability, sedation, and postoperative pain control in the PACU were compared in this study. The results showed that Dexmedetomidine had a significant advantage in postoperative hemodynamic stability when given intravenously at a dose of 1 μg/kg over 10 minutes, followed by a continuous infusion of 0.2-0.7 μg/kg/h. It is beneficial for peri- operative hemodynamic management in patients undergoing vascular surgery to administer a one-hour dexmedetomidine infusion in order to decrease both heart rate and systolic blood pressure, as shown in a 1995 study by Talke et al. (22,23). Separately, Talke et al. used Dexmedetomidine infusion to reduce stress

Reactions after major vascular surgery patients woke up from anesthesia. Their findings support the hemodynamic findings in ourinvestigation, which show that Dexmedetomidine lowers the increase in heart rate and plasma noradrenaline levels during this period (24). According to our findings, Group D's post-operative pain and sedation ratings remained well within the permissible range. Jung found that hemodynamic stability was maintained over the post-operative period and that pain was effectively managed with patient consciousness, which is in line with our studies (25). After administering 1 gram of paracetamol as a pre- medication, Cattabriga et al. highlighted the drug's effective analgesic effects by looking at the reduced VAS scores for deep breathing in the first 30 hours. Group P had a significantly lower VAS score at8,16, and 24 hours post-operatively compared to Group D after receiving 1 g of paracetamol, according to our study. According to Salihoglu, overall rescue drug use is down and bad effects are down, pain management is better, and the time to first rescue medicine is significantly shorter. We found that Group P had a much lower VAS score than Group D and required far less rescue analgesics (26).

CONCLUSION

In postoperative management following laparoscopic cholecystectomy, Dexmedetomidine (Group D) demonstrates superior efficacy compared to Paracetamol (Group P) in maintaining hemodynamic stability and regulating vital signs.

CONFLICT OF INTEREST: No conflict of interest exists, according to all authors.

ETHICAL APPROVAL: Ethical approval obtained from Superior University Lahore **(R/S 0014).**

AUTHOR CONTRIBUTIONS

MJ: Conceptualization, study design, and manuscript preparation.

HSM: Supervision, data analysis, and critical revision of the manuscript.

SAK:Data-collection, methodology development, and drafting of the manuscript. **AZK**: Statistical analysis and interpretation of results.

UIB: Literature review and editing of the manuscript.

MT: Overall coordination, validation, and

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