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Original Research Article

Randomized Controlled Study to Compare Intravenous Clonidine and Intravenous Dexmedetomidine for Attenuation of Pressor Response During Endotracheal Intubation and Intraoperative Hemodynamic Stability in Laparoscopic Surgery

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Conflict of interest: Nil

Abstract:

Background: Laryngoscopy and endotracheal intubation during general anaesthesia can cause sympathetic stimulation leading to tachycardia and hypertension. These responses may worsen during laparoscopic surgery due to pneumoperitoneum. Alpha-2 adrenergic agonists such as clonidine and dexmedetomidine are used to attenuate these responses. This study compared intravenous dexmedetomidine and clonidine for attenuation of the pressor response during endotracheal intubation and maintenance of intraoperative hemodynamic stability in laparoscopic surgery.

Methods: This randomized controlled study was conducted in the Department of Anaesthesia at GMERS Medical College, Sola, Ahmedabad, from March 2023 to February 2025. Fifty patients aged 20–60 years with ASA physical status I and II undergoing elective laparoscopic surgery were randomly divided into two groups (n=25 each). Group A received intravenous dexmedetomidine (1 µg/kg) and Group B received intravenous clonidine (2 µg/kg) as a slow infusion over 10 minutes before induction of anaesthesia. Hemodynamic parameters including heart rate, systolic blood pressure, diastolic blood pressure, oxygen saturation (SpO_2), and end-tidal CO_2 ($EtCO_2$) were recorded at baseline and at predefined intraoperative intervals.

Results: Baseline demographic characteristics were comparable between the groups. The dexmedetomidine group showed significantly lower heart rate and blood pressure values during important intraoperative periods such as after intubation, during pneumoperitoneum, and during surgery ($p<0.05$). Oxygen saturation and end-tidal CO_2 remained stable and comparable between both groups throughout the procedure.

Conclusion: Intravenous dexmedetomidine was more effective than clonidine in attenuating the pressor response during laryngoscopy and endotracheal intubation and provided better intraoperative hemodynamic stability during laparoscopic surgery without affecting respiratory parameters.

Keywords: Alpha-2 Adrenergic Agonists, Clonidine, Dexmedetomidine, Endotracheal Intubation, General Anaesthesia, Hemodynamic Stability, Laparoscopic Surgery.

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Introduction

Hemodynamic stability is a critical component of safe anaesthetic management during surgical procedures performed under general anaesthesia. Laryngoscopy and endotracheal intubation are among the most potent stimuli during induction of anaesthesia and are known to produce significant cardiovascular responses such as tachycardia and hypertension. These responses occur primarily due to activation of the sympathetic nervous system and subsequent release of catecholamines [1,2]. Although these hemodynamic changes are usually transient in healthy individuals, they may precipitate serious complications in patients with cardiovascular or cerebrovascular diseases. Therefore, attenuation of the pressor response associated with airway manipulation remains an important objective in anaesthetic practice. Various pharmacological agents have been evaluated to suppress this stress response; however, an ideal drug should provide adequate sedation and analgesia, maintain hemodynamic stability, and reduce the requirement of other anaesthetic agents. Alpha-2

adrenergic agonists, particularly clonidine and dexmedetomidine, have shown promising efficacy in blunting sympathetic responses during airway instrumentation [3].

Laparoscopic surgery has become increasingly popular due to its advantages over conventional open surgical procedures, including smaller incisions, reduced tissue trauma, less postoperative pain, minimal blood loss, and faster recovery. In addition, laparoscopic procedures are associated with shorter hospital stays, fewer postoperative complications, and improved cosmetic outcomes, making them both efficient and cost-effective [4].

However, laparoscopic surgery is associated with several physiological alterations that may influence cardiovascular function. Carbon dioxide (CO_2) insufflation used to create pneumoperitoneum increases intra-abdominal pressure, which can reduce venous return, decrease cardiac output, and cause compensatory tachycardia. Compression of major abdominal vessels and increased intrathoracic pressure may further affect cardiovascular dynamics. Additionally, CO_2 absorption can stimulate sympathetic activity and increase systemic vascular resistance, leading to hypertension and tachycardia [4].

Dexmedetomidine is a highly selective alpha-2 adrenergic agonist with greater receptor affinity than clonidine and attenuates sympathetic responses by reducing norepinephrine release. Clonidine also suppresses sympathetic activity and decreases anaesthetic and opioid requirements while enhancing baroreceptor reflex sensitivity. Considering these pharmacological properties, the present study was undertaken to compare the effectiveness of intravenous dexmedetomidine and clonidine in attenuating hemodynamic responses during laryngoscopy and endotracheal intubation and maintaining intraoperative hemodynamic stability in patients undergoing laparoscopic surgery [5].

Aim:

The aim of this study was to compare the effectiveness of intravenous clonidine and intravenous dexmedetomidine in controlling heart rate and blood pressure responses during endotracheal intubation and maintaining intraoperative hemodynamic stability in patients undergoing laparoscopic surgery.

Objectives:

Primary Objective: To assess the effects of intravenous dexmedetomidine and clonidine on the hemodynamic response during laryngoscopy and endotracheal intubation.

Secondary Objectives:

1. To evaluate and compare intraoperative hemodynamic stability, including heart rate, systolic blood pressure, and diastolic blood pressure, between the two groups throughout the laparoscopic procedure.
2. To assess the incidence of adverse effects such as bradycardia, hypotension, or any other drug-related complications in both groups.
3. To determine the aesthetic and analgesic-sparing effects of clonidine and dexmedetomidine during surgery.

Materials and Methodology

Study Design and Setting: This randomized controlled study was conducted in the Department of Anaesthesia at GMERS Medical College, Sola, Ahmedabad, over a period of two years from March 2023 to February 2025.

Study Population: The study included 50 patients classified as American Society of Anaesthesiologists (ASA) physical status Grade I and II, aged between 20 and 60 years, of either sex, who were scheduled to undergo elective laparoscopic surgery.

Sample Size: A total of 50 patients were included in the study and were randomly divided into two equal groups of 25 patients each.

- **Group A:** Dexmedetomidine group (1 μg/kg)
- **Group B:** Clonidine group (2 μg/kg)

Sample Size Calculation: The sample size was calculated using the formula for comparison of two means:

$$\mathbf{n = ((Z\alpha/2 + Z\beta)^2 \times (2\sigma^2)) / \Delta^2}$$

Where:

- **n** = required sample size per group
- **$Z\alpha/2$** = Z value at significance level $\alpha = 0.01$ = **2.576**
- **$Z\beta$** = Z value corresponding to power $(1 - \beta)$ = 99% = **2.326**
- **σ** = pooled standard deviation
- **Δ** = expected difference between the two means = **7.5**

Calculation of Pooled Standard Deviation

$\sigma pooled = \sqrt{[(\sigma_1^2 + \sigma_2^2) / 2]}$

$\sigma pooled = \sqrt{[(7.68^2 + 6.16^2) / 2]}$

$\sigma pooled = \sqrt{[(58.9824 + 37.9856) / 2]}$

$\sigma pooled = \sqrt{(96.968 / 2)}$

$\sigma pooled = \sqrt{48.484}$

$\sigma pooled \approx$ **6.96**

Substituting Values in the Formula

$n = ((2.576 + 2.326)^2 \times (2 \times 6.96^2)) / 7.5^2$

$n = (4.902^2 \times (2 \times 48.484)) / 56.25$

$n = (24.019 \times 96.968) / 56.25$

$n = 2328.085 / 56.25$

$n \approx$ **41.39**

Considering feasibility and study design, 50 patients were enrolled and equally allocated into two groups of 25 each.

Inclusion Criteria

1. ASA Grade I and II patients
2. Patients posted for elective laparoscopic surgery
3. Patients willing to provide valid informed consent
4. Patients with body mass index between 18–24 kg/m²
5. Patients aged between 20–60 years of either sex

Exclusion Criteria

1. Patients refusing to give consent
2. Patients with clinically significant coagulopathy
3. Patients with pre-existing neuromuscular, severe cardiovascular, pulmonary disease, renal or hepatic disorders, or history of drug abuse
4. History of allergy to the study drugs
5. Patients undergoing emergency surgery
6. Patients younger than 20 years or older than 60 years
7. Anticipated difficult airway with mouth opening less than two fingers

Preoperative Assessment: All patients underwent a routine pre-anaesthetic evaluation, which included general and systemic examination, airway assessment, and routine investigations such as complete blood count, renal function test, liver function test, serum electrolytes, chest X-ray, and electrocardiogram.

All patients were kept fasting for at least six hours prior to surgery.

Anaesthetic Procedure: Upon arrival in the operating theatre, intravenous access was secured using an 18-gauge cannula, and crystalloid fluids were started according to body weight.

Standard monitoring including electrocardiography (ECG), non-invasive blood pressure (NIBP), and pulse oximetry (SpO_2) was initiated. Baseline heart rate, systolic blood pressure, diastolic blood pressure, and oxygen saturation were recorded.

Patients were randomly allocated into two groups:

Group A (Dexmedetomidine group): Patients received dexmedetomidine 1 µg/kg diluted in 10 ml normal saline administered as a slow intravenous infusion over 10 minutes before induction.

Group B (Clonidine group): Patients received clonidine 2 µg/kg diluted in 10 ml normal saline administered as a slow intravenous infusion over 10 minutes before induction.

Premedication

All patients received the following intravenous premedication:

- Ondansetron 0.15 mg/kg
- Glycopyrrolate 0.004 mg/kg
- Midazolam 0.05 mg/kg
- Fentanyl 2 µg/kg

Pre-oxygenation was performed with 100% oxygen for five minutes.

General anaesthesia was induced with propofol 2 mg/kg intravenously, and endotracheal intubation was facilitated using succinylcholine 2 mg/kg.

Anaesthesia was maintained with a mixture of oxygen and nitrous oxide (50:50) along with sevoflurane at a concentration of 1.5–2%.

Muscle relaxation was maintained with atracurium 0.5 mg/kg initially, followed by intermittent doses of 0.1 mg/kg as required.

Controlled mechanical ventilation was provided to maintain end-tidal CO_2 between 35–45 mmHg. Intra-abdominal pressure during pneumoperitoneum was maintained between 12–14 mmHg.

Continuous monitoring included electrocardiography, non-invasive arterial blood pressure, capnography, and pulse oximetry.

At the end of surgery, residual neuromuscular blockade was reversed using neostigmine (0.05 mg/kg) and glycopyrrolate (0.008 mg/kg) administered intravenously. Patients were extubated after complete reversal of neuromuscular blockade and restoration of spontaneous respiration and were then shifted to the recovery room.

Outcome Measures

Hemodynamic Parameters: Hemodynamic parameters were compared between the two groups. Heart rate, non-invasive blood pressure, SpO_2, and end-tidal CO_2 were recorded at the following time points:

- Baseline
- After administration of loading dose
- After intubation
- At the time of pneumoperitoneum
- At 15 minutes intraoperatively
- At 30 minutes intraoperatively
- During deflation of pneumoperitoneum
- After extubating

Complications

Complications related to endotracheal intubation such as bleeding, laryngeal oedema, or hoarseness of voice were recorded and managed accordingly.

Data Collection: Data were collected using a pre-designed and pilot-tested data collection proforma. The proforma included details of patients' demographic characteristics such as age, weight, and gender, as well as intraoperative clinical parameters. All relevant information was obtained from the patients' medical records, anaesthesia charts, and direct intraoperative monitoring.

Hemodynamic parameters including heart rate, systolic blood pressure, diastolic blood pressure, oxygen saturation (SpO_2), and end-tidal CO_2 ($EtCO_2$) were recorded at predetermined time intervals: baseline, after loading dose, after intubation, at pneumoperitoneum, 15 minutes and 30 minutes after pneumoperitoneum, during deflation of pneumoperitoneum, and after extubating.

All observations were recorded systematically by the investigator and entered into a structured data sheet for further statistical analysis.

Statistical Analysis: Data were analysed using Statistical Package for the Social Sciences (SPSS) version 25.0. Continuous variables such as heart rate, systolic blood pressure, diastolic blood pressure, oxygen saturation (SpO_2), and end-tidal CO_2 ($EtCO_2$) were expressed as mean ± standard deviation (SD). Categorical variables such as gender were presented as frequency and percentage.

The independent Student's t-test was used to compare continuous variables between the two groups, while the Chi-square test or Fisher's exact test was applied for comparison of categorical variables. A p-value <0.05 was considered statistically significant.

Ethical Issues Considered: This study approved by Institutional Ethics Committee.

The patient's right to take part in the study was protected. They were allowed to leave the study at any moment, for any reason, and without losing access to medical treatment because participation was entirely voluntary.

Results:

Table 1: Demographic Characteristics of the Study Population

Parameter	Group A (Dexmedetomidine) (n=25)	Group B (Clonidine) (n=25)	p Value
Age (years)	37.84 ± 9.87	38.72 ± 8.37	0.74
Weight (kg)	60.24 ± 9.33	57.44 ± 7.12	0.23
Gender			
Male	6 (24.0%)	2 (8.0%)	0.123
Female	19 (76.0%)	23 (92.0%)	
Total	25 (100%)	25 (100%)	

The demographic characteristics of the study population were comparable between the two groups. The mean age in the Dexmedetomidine group was 37.84 ± 9.87 years, while in the Clonidine group it was 38.72 ± 8.37 years, with no statistically significant difference (p = 0.74). Similarly, the mean body weight was 60.24 ± 9.33 kg in the Dexmedetomidine group and 57.44 ± 7.12 kg in the Clonidine group, which was also not statistically significant (p = 0.23).

In terms of gender distribution, the Dexmedetomidine group included 6 males (24%) and 19 females (76%), whereas the Clonidine group included 2 males (8%) and 23 females (92%). The difference in gender distribution between the groups was not statistically significant (p = 0.123). Overall, there were no significant differences in demographic variables between the two groups, indicating that both groups were comparable at baseline.

Table 2: Comparative Changes in Heart Rate (beats/min)

Time	Group A Mean ± SD	Group B Mean ± SD	p Value
Baseline	86.04 ± 6.73	86.60 ± 6.10	0.759
After loading dose	80.56 ± 10.36	82.72 ± 8.08	0.415
After intubation	82.28 ± 7.20	90.52 ± 7.15	0.0002
At pneumoperitoneum	88.12 ± 7.41	93.68 ± 7.30	0.01
After 15 min	72.12 ± 2.96	77.80 ± 8.80	0.004
After 30 min	73.20 ± 5.51	74.56 ± 6.62	0.004
Deflating pneumoperitoneum	72.32 ± 2.69	74.64 ± 5.56	0.066
After extubating	75.20 ± 5.51	76.04 ± 6.15	0.613

Heart rate was similar in both groups at baseline (86.04 ± 6.73 vs 86.60 ± 6.10 beats/min; p = 0.759) and after the loading dose (p = 0.415).

After endotracheal intubation, the Dexmedetomidine group showed a significantly lower heart rate (82.28 ± 7.20 beats/min) compared to the Clonidine group (90.52 ± 7.15 beats/min; p = 0.0002). A significant difference was also observed at pneumoperitoneum (88.12 ± 7.41 vs 93.68 ± 7.30 beats/min; p = 0.01).

During the intraoperative period, heart rate remained significantly lower in the Dexmedetomidine group at 15 minutes (72.12 ± 2.96 vs 77.80 ± 8.80 beats/min; p = 0.004) and 30 minutes (73.20 ± 5.51 vs 74.56 ± 6.62 beats/min; p = 0.004).

However, during deflation of pneumoperitoneum (p = 0.066) and after extubating (p = 0.613), the difference between the groups was not statistically significant. Overall, Dexmedetomidine provided better control of heart rate during intubation and surgery than Clonidine.

Table 3: Comparative Changes in Systolic Blood Pressure (mmHg)

Time	Group A Mean ± SD	Group B Mean ± SD	p Value
Baseline	124.5 ± 10.5	125.8 ± 11.5	0.693
After loading dose	125.1 ± 12.7	129.4 ± 17.3	0.319
After intubation	131.12 ± 10.77	134.28 ± 15.61	0.017
At pneumoperitoneum	132.08 ± 10.86	138.24 ± 6.68	0.020
After 15 min	114.0 ± 6.6	122.0 ± 8.7	0.001
After 30 min	117.4 ± 9.1	120.0 ± 9.2	<0.0001
Deflating pneumoperitoneum	114.4 ± 6.0	120.6 ± 6.5	0.001
After extubating	119.7 ± 9.7	120.1 ± 9.2	0.894

Systolic blood pressure was comparable between the two groups at baseline (124.5 ± 10.5 vs 125.8 ± 11.5 mmHg; p = 0.693) and after the loading dose (p = 0.319).

After endotracheal intubation, systolic blood pressure was significantly lower in the Dexmedetomidine group (131.12 ± 10.77 mmHg) compared to the Clonidine group (134.28 ± 15.61 mmHg; p = 0.017). A similar significant difference was observed at pneumoperitoneum (132.08 ± 10.86 vs 138.24 ± 6.68 mmHg; p = 0.020).

During the intraoperative period, systolic blood pressure remained significantly lower in the Dexmedetomidine group at 15 minutes (p = 0.001) and 30 minutes (p < 0.0001). A significant difference was also seen during deflation of pneumoperitoneum (p = 0.001).

However, after extubating there was no significant difference between the groups (p = 0.894). Overall, Dexmedetomidine provided better control of systolic blood pressure during intubation and surgery compared to Clonidine.

Table 4: Comparative Changes in Diastolic Blood Pressure (mmHg)

Time	Group A Mean ± SD	Group B Mean ± SD	p Value
Baseline	80.4 ± 8.2	80.8 ± 9.2	0.885
After loading dose	75.2 ± 10.91	83.1 ± 9.9	0.010
After intubation	78.68 ± 6.00	84.16 ± 7.80	0.028
At pneumoperitoneum	86.44 ± 7.66	94.24 ± 3.36	0.00005
After 15 min	73.3 ± 5.7	78.2 ± 4.7	0.002
After 30 min	69.88 ± 6.94	74.5 ± 7.3	0.026
Deflating pneumoperitoneum	72.0 ± 2.7	74.6 ± 3.8	0.007
After extubating	77.8 ± 8.5	77.6 ± 6.7	0.912

Diastolic blood pressure was similar in both groups at baseline (80.4 ± 8.2 vs 80.8 ± 9.2 mmHg; p = 0.885). After the loading dose, the Dexmedetomidine group showed significantly lower diastolic blood pressure compared to the Clonidine group (75.2 ± 10.91 vs 83.1 ± 9.9 mmHg; p = 0.010).

A significant difference was also observed after intubation (78.68 ± 6.00 vs 84.16 ± 7.80 mmHg; p = 0.028) and at pneumoperitoneum (86.44 ± 7.66 vs 94.24 ± 3.36 mmHg; p = 0.00005). During surgery, diastolic blood pressure remained significantly lower in the Dexmedetomidine group at 15 minutes (p = 0.002) and 30 minutes (p = 0.026), as well as during deflation of pneumoperitoneum (p = 0.007).

However, after extubating there was no significant difference (p = 0.912). Overall, Dexmedetomidine provided better control of diastolic blood pressure during intubation and the intraoperative period than Clonidine.

Table 5: Comparative Changes in Oxygen Saturation (SpO_2 %)

Time	Group A Mean ± SD	Group B Mean ± SD	p Value
Baseline	98.5 ± 0.7	98.6 ± 0.5	0.466
After loading dose	98.8 ± 0.5	98.5 ± 0.7	0.158
After intubation	98.9 ± 0.4	98.8 ± 0.5	0.23
At pneumoperitoneum	99.0 ± 0.0	98.7 ± 0.5	0.002
After 15 min	98.6 ± 0.5	98.7 ± 0.5	0.771
After 30 min	98.6 ± 0.5	98.7 ± 0.7	0.567
Deflating pneumoperitoneum	98.6 ± 0.5	99.0 ± 0.0	0.001
After extubating	98.6 ± 0.5	98.6 ± 0.6	0.793

Oxygen saturation (SpO_2) was comparable between the two groups at baseline (98.5 ± 0.7% vs 98.6 ± 0.5%; p = 0.466) and after the loading dose (p = 0.158). No significant difference was observed after intubation (p = 0.23).

At pneumoperitoneum, a statistically significant difference was noted, with slightly higher SpO_2 in the Dexmedetomidine group (99.0 ± 0.0%) compared to the Clonidine group (98.7 ± 0.5%; p = 0.002).

However, during the intraoperative period at 15 minutes (p = 0.771) and 30 minutes (p = 0.567), the difference between the groups was not significant. A significant difference was again observed during deflation of pneumoperitoneum (p = 0.001).

After extubating, both groups showed similar oxygen saturation (p = 0.793). Overall, oxygen saturation remained stable and within normal limits in both groups throughout the study.

Table 6: Comparative Changes in End-Tidal CO_2 ($EtCO_2$)

Time	Group A Mean ± SD	Group B Mean ± SD	p Value
After loading dose	28.5 ± 2.1	29.0 ± 2.3	0.487
After intubation	28.4 ± 2.2	28.9 ± 2.2	0.407
At pneumoperitoneum	28.5 ± 2.2	29.1 ± 1.8	0.302
After 15 min	28.4 ± 1.8	28.4 ± 1.8	0.937
After 30 min	29.3 ± 2.0	28.4 ± 2.1	0.127
Deflating pneumoperitoneum	29.0 ± 2.1	28.4 ± 1.5	0.254
After extubating	29.2 ± 2.2	28.4 ± 2.0	0.182

End-tidal CO_2 ($EtCO_2$) levels were comparable between the two groups throughout the study period. After the loading dose, $EtCO_2$ values were 28.5 ± 2.1 mmHg in the Dexmedetomidine group and 29.0 ± 2.3 mmHg in the Clonidine group (p = 0.487). Similar findings were observed after intubation (p = 0.407) and at pneumoperitoneum (p = 0.302).

During the intraoperative period, $EtCO_2$ remained almost identical at 15 minutes (28.4 ± 1.8 vs 28.4 ± 1.8 mmHg; p = 0.937) and showed no significant difference at 30 minutes (p = 0.127). Likewise, during deflation of pneumoperitoneum (p = 0.254) and after extubating (p = 0.182), the differences between the groups were not statistically significant.

Overall, $EtCO_2$ remained stable and comparable in both groups during the entire perioperative period.

Discussion

The present study compared the effects of intravenous dexmedetomidine and clonidine in maintaining intraoperative hemodynamic stability during laparoscopic surgery.

The demographic characteristics such as age, weight, and gender distribution were comparable between the two groups (p>0.05), indicating that both groups were homogeneous and that the observed differences in hemodynamic parameters were primarily related to the pharmacological effects of the study drugs rather than demographic variability.

In the present study, heart rate was significantly lower in the dexmedetomidine group at important intraoperative time points such as after intubation, during pneumoperitoneum, and during the intraoperative period (p<0.05). These findings indicate that dexmedetomidine more effectively attenuates the sympathetic response associated with endotracheal intubation and CO_2 insufflation during laparoscopic surgery. Similar findings were reported by Bhanu and Sridevi, who demonstrated that dexmedetomidine produced significantly lower heart rate values compared to clonidine during laparoscopic procedures, indicating better attenuation of the sympathetic response [6].

Systolic blood pressure in the present study was significantly lower in the dexmedetomidine group during intubation, pneumoperitoneum, and intraoperative intervals compared with the clonidine group (p<0.05). These findings suggest that dexmedetomidine provides better suppression of the pressor response associated with airway

manipulation and pneumoperitoneum. Comparable results were reported by Talukdar and Mahanta, who concluded that dexmedetomidine is more effective than clonidine in controlling intraoperative blood pressure changes [7].

Similarly, diastolic blood pressure was significantly lower in the dexmedetomidine group during several intraoperative stages including after drug administration, after intubation, and during pneumoperitoneum ($p<0.05$). These findings are consistent with studies by Kothiya and Sharma [8] and by Rathi and Kulkarni [9], which also reported superior hemodynamic stability with dexmedetomidine during laparoscopic surgeries.

In contrast, oxygen saturation (SpO_2) and end-tidal CO_2 ($EtCO_2$) remained stable and comparable between the two groups throughout the perioperative period, indicating that both drugs are safe and do not adversely affect respiratory parameters.

Overall, the findings of the present study suggest that dexmedetomidine provides better intraoperative hemodynamic stability compared to clonidine during laparoscopic surgeries.

Conclusion

The present study demonstrates that intravenous dexmedetomidine (1 μg/kg) is more effective than intravenous clonidine (2 μg/kg) in attenuating the pressor response to laryngoscopy and endotracheal intubation and in maintaining intraoperative hemodynamic stability during laparoscopic surgery. Patients receiving dexmedetomidine showed significantly lower heart rate and blood pressure values during critical intraoperative periods such as intubation and pneumoperitoneum. Both drugs maintained stable oxygen saturation and end-tidal CO_2 levels, indicating no adverse effects on respiratory parameters.

Overall, dexmedetomidine provided superior control of sympathetic responses compared with clonidine, suggesting that it may be a more effective pharmacological option for achieving better perioperative hemodynamic stability in patients undergoing laparoscopic procedures.

Recommendations

Based on the findings of the present study, intravenous dexmedetomidine (1 μg/kg) can be recommended as a preferred pharmacological agent for attenuating the pressor response associated with laryngoscopy and endotracheal intubation and for maintaining intraoperative hemodynamic stability during laparoscopic surgery. Dexmedetomidine demonstrated better control of heart rate and blood pressure during critical intraoperative periods such as intubation and pneumoperitoneum when compared with clonidine, without causing adverse effects on respiratory parameters such as oxygen saturation and end-tidal CO_2.

Therefore, the use of dexmedetomidine as a pre-induction adjuvant may be beneficial in patients undergoing laparoscopic procedures, particularly in individuals where excessive sympathetic responses may lead to cardiovascular complications.

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