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COMPARATIVE EFFICACY OF INTRAVENOUS DEXMEDETOMIDINE AND ESMOLOL IN ATTENUATING HEMODYNAMIC RESPONSES TO LARYNGOSCOPY AND ENDOTRACHEAL INTUBATION

CHANDRA KARUPPAIAH[1], SARANYA LINGESAN[2], CHANDRESH SHANKAR[3], SAFNEEDHA P M[*4]

[1]Assistant professor, Dept of Anaesthesiology, Sri Muthukumaran Medical College and Research Institute, Chennai, Tamil Nadu, India.
[2]Assistant professor, Dept of Anaesthesiology, Sri Muthukumaran Medical College and Research Institute, Chennai, Chennai, Tamil Nadu, India.
[3]Assistant professor, Dept of Anaesthesiology, Sri Muthukumaran Medical College and Research Institute, Chennai, Chennai, Tamil Nadu, India.
*[*4]Professor, Dept of Anaesthesiology, Sri Muthukumaran Medical College and Research Institute, Chennai, Chennai, Tamil Nadu, India.*

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Corresponding Author
Safneedha P M
Professor, Dept of Anaesthesiology, Sri Muthukumaran Medical College and Research Institute, Chennai, Chennai, Tamil Nadu, India.

ABSTRACT

Background: Laryngoscopy and endotracheal intubation produce sympathetic stimulation, resulting in transient tachycardia and hypertension. Pharmacological attenuation of these responses is important for maintaining perioperative hemodynamic stability. Dexmedetomidine and esmolol act through different mechanisms and are commonly used to control cardiovascular responses during airway manipulation.

Aim: To compare the efficacy of intravenous dexmedetomidine and esmolol in attenuating hemodynamic responses to direct laryngoscopy and endotracheal intubation in patients undergoing elective surgery under general anesthesia.

Methods: This prospective, randomized, double-blind comparative study included 60 adult patients aged 20–60 years belonging to American Society of Anesthesiologists physical status I or II. Patients were randomly allocated into two groups of 30 each. Group D received intravenous dexmedetomidine 1 µg/kg diluted in 100 mL normal saline over 10 minutes, whereas Group E received intravenous esmolol 2 mg/kg as a bolus before intubation. Heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure were recorded at baseline, immediately after intubation, and at 1, 5, 10, and 15 minutes. Adverse events, including hypotension and bradycardia, were monitored.

Results: Baseline demographic characteristics and hemodynamic measurements were comparable between groups. Dexmedetomidine produced lower heart rate and blood-pressure values than esmolol during post-intubation monitoring. At 5 minutes, mean heart rate was 76.77 ± 7.35 beats/minute in Group D compared with 85.03 ± 12.64 beats/minute in Group E. Corresponding mean arterial pressures were 75.14 ± 8.73 and 83.21 ± 8.29 mmHg. Significant between-group differences were observed at several post-intubation time points. No episodes of clinically documented hypotension or bradycardia were reported.

Conclusion: Intravenous dexmedetomidine provided greater attenuation of post-intubation hemodynamic measurements than esmolol in relatively healthy adults undergoing elective surgery. However, the greater reduction in blood pressure warrants careful consideration when selecting patients.

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INTRODUCTION

Laryngoscopy and endotracheal intubation are essential components of airway management during general anesthesia. Despite advances in anesthetic techniques, these procedures frequently evoke transient cardiovascular responses characterized by tachycardia, hypertension, and changes in myocardial oxygen demand. The hemodynamic response is predominantly attributed to sympathetic nervous system activation following mechanical stimulation of the laryngeal and tracheal structures. Although these responses are generally well tolerated by healthy individuals, excessive cardiovascular stimulation may have serious consequences in patients with underlying cardiovascular or cerebrovascular disease [1].

The magnitude of the cardiovascular response depends on several factors, including the depth of anesthesia, duration

of laryngoscopy, baseline sympathetic activity, airway difficulty, and pharmacological agents administered before intubation. Prys-Roberts and colleagues demonstrated that patients with hypertension may exhibit exaggerated cardiovascular responses during induction and tracheal intubation [2]. Such responses may precipitate myocardial ischemia, arrhythmias, acute ventricular dysfunction, or cerebrovascular complications in susceptible individuals [3].

Effective attenuation of the pressor response therefore remains an important objective of anesthetic management. Various pharmacological agents have been evaluated, including opioids, intravenous lidocaine, calcium channel blockers, vasodilators, beta-adrenergic antagonists, and central alpha-2 adrenergic agonists. However, their effectiveness varies according to dosage, timing, pharmacodynamic properties, and patient-related factors.

Dexmedetomidine is a highly selective alpha-2 adrenergic receptor agonist possessing sedative, sympatholytic, analgesic-sparing, and anesthetic-sparing properties. Its central sympatholytic action reduces norepinephrine release, thereby attenuating heart rate and blood-pressure responses associated with stressful procedures. Clinical investigations have demonstrated that dexmedetomidine can suppress sympathoadrenal activation during tracheal intubation and reduce anesthetic requirements [4].

The cardiovascular effects of dexmedetomidine are related to its central and peripheral adrenergic actions. Central alpha-2 receptor activation decreases sympathetic outflow, producing reductions in heart rate and arterial pressure. Earlier studies demonstrated its ability to attenuate hemodynamic changes during intubation in patients undergoing ophthalmic and other surgical procedures [5,6]. In addition, dexmedetomidine provides sedation and analgesic-sparing effects without causing the degree of respiratory depression typically associated with opioid-based sedation [7].

Esmolol is an ultra-short-acting, relatively beta-1-selective adrenergic receptor antagonist. Its rapid onset and short duration of action make it particularly suitable for controlling transient tachycardia and adrenergic responses during airway manipulation. Esmolol reduces heart rate, myocardial contractility, and myocardial oxygen consumption. Its cardiovascular effects are dose-dependent, and previous investigations have demonstrated that different bolus doses may provide varying degrees of attenuation of heart-rate and blood-pressure responses [8].

A comparative evaluation of commonly used pharmacological agents has shown that esmolol can provide clinically useful attenuation of the cardiovascular response to laryngoscopy, although the magnitude of suppression may vary with the administered dose [9]. Nevertheless, esmolol primarily blocks peripheral beta-adrenergic effects, whereas dexmedetomidine reduces central sympathetic outflow. These mechanistic differences may influence their relative effectiveness in controlling cardiovascular variables during anesthesia.

Previous randomized studies comparing dexmedetomidine and esmolol have suggested that dexmedetomidine may provide greater attenuation of the sympathomimetic response following laryngoscopy and tracheal intubation [10–12]. However, the comparative efficacy of these agents remains dependent on the study population, anesthetic technique, dosage, administration schedule, and timing of hemodynamic assessment. Against this background, the present study was conducted to compare intravenous dexmedetomidine and intravenous esmolol in attenuating hemodynamic responses associated with direct laryngoscopy and endotracheal intubation among adults undergoing elective surgery under general anesthesia.

The primary objective was to compare changes in heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure between the two treatment groups. The secondary objective was to assess the occurrence of adverse hemodynamic events, particularly hypotension and bradycardia, during the early post-intubation period.

2. MATERIALS AND METHODS

2.1 Study design and setting

A prospective, randomized, double-blind, comparative clinical study was conducted at a tertiary care hospital to evaluate the efficacy of intravenous dexmedetomidine and esmolol in attenuating the hemodynamic response to laryngoscopy and endotracheal intubation. The study was undertaken after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants before enrollment. The study procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki.

2.2 Study population and sample size

The study included 60 adult patients scheduled for elective surgical procedures requiring general anesthesia with endotracheal intubation. Patients were allocated equally into two groups comprising 30 participants each. The sample size was determined using OpenEpi software, considering a statistical power of 80%, a significance level of 5%, and a clinically relevant difference in mean arterial pressure based on a previous comparative investigation. The study protocol accounted for potential participant withdrawal.

2.3 Eligibility criteria

Patients aged 20–60 years, belonging to American Society of Anesthesiologists physical status I or II, scheduled for elective surgery under general anesthesia, and having a body mass index of 35 kg/m² or less were eligible for inclusion. All participants provided valid written informed consent.

Patients with physical status III or IV, significant hepatic, renal, cardiovascular, neurological, or respiratory dysfunction, uncontrolled hypertension or diabetes mellitus, chronic pain requiring analgesic medication, known hypersensitivity to the study drugs, obesity exceeding the specified body mass index threshold, pregnancy, or breastfeeding were excluded.

2.4 Randomization and blinding

Participants were randomly allocated into two groups using a computer-generated randomization sequence with a 1:1 allocation ratio. Group D received intravenous dexmedetomidine, whereas Group E received intravenous esmolol. The study was described as double-blind. The study medications were administered by an observer and that the investigator conducting anesthesia was separated from drug administration to minimize observer bias.

2.5 Study interventions

Patients allocated to Group D received dexmedetomidine 1 µg/kg diluted in 100 mL normal saline and administered intravenously over 10 minutes, beginning approximately 20 minutes before intubation. Patients allocated to Group E received esmolol 2 mg/kg as an intravenous bolus

approximately 3 minutes before intubation. The selected interventions were based on their established sympatholytic and cardiovascular pharmacological effects. Previous studies have demonstrated the usefulness of dexmedetomidine in modifying hemodynamic responses during anesthetic induction and airway manipulation [13–15]. The study is represented in a flow diagram in Figure 01.

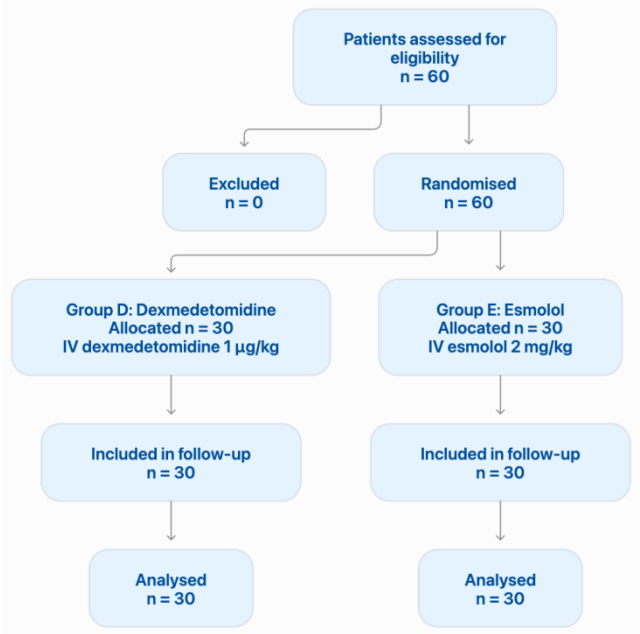


Figure 01: Flow diagram of the study

2.6 Preoperative assessment

All participants underwent detailed preanesthetic evaluation before surgery. Relevant medical and surgical histories were obtained, followed by general physical examination, systemic examination, and airway assessment. Investigations included complete blood count, blood glucose, renal and liver function tests, electrocardiography, and other investigations considered necessary according to the patient's condition. Patients were instructed to maintain preoperative fasting for approximately 6–8 hours before surgery.

2.7 Anesthetic technique

Upon arrival in the operating theatre, standard monitoring was established, including electrocardiography, noninvasive blood-pressure measurement, pulse oximetry, and heart-rate monitoring. Baseline heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure were recorded before administering the study medication. All patients received intravenous midazolam 0.02 mg/kg, fentanyl 1 µg/kg, and ondansetron 4 mg as premedication. General anesthesia was induced using intravenous thiopentone 3–5 mg/kg, titrated until loss of the eyelash reflex. Succinylcholine 1.5 mg/kg was administered to facilitate endotracheal intubation.

Following adequate neuromuscular relaxation, direct laryngoscopy was performed, and an appropriately sized endotracheal tube was inserted. Correct tube placement was confirmed clinically and through appropriate monitoring. Anesthesia was maintained using oxygen and nitrous oxide, each at approximately 50%, together with isoflurane at concentrations adjusted according to anesthetic requirements. Intravenous vecuronium 0.08 mg/kg was used for maintenance of neuromuscular relaxation. Mechanical ventilation was adjusted to maintain end-tidal carbon dioxide between approximately 34 and 36 mmHg. Intraoperative fluid therapy and replacement of blood loss were performed according to clinical requirements. At the completion of surgery, neuromuscular blockade was reversed with neostigmine and glycopyrrolate. Patients were extubated after adequate recovery of spontaneous ventilation and transferred to the postoperative recovery area.

2.8 Outcome assessment

The principal outcomes were heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure. Measurements were obtained at the following time points: baseline, immediately after endotracheal intubation, and at 1, 5, 10, and 15 minutes after intubation. The comparative efficacy of dexmedetomidine and esmolol was assessed by examining differences in these hemodynamic measurements between the two groups. The secondary outcome was the occurrence of adverse hemodynamic effects, specifically hypotension and bradycardia, during the initial 15-minute observation period following intubation.

2.9 Statistical analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 26. Continuous variables were expressed as mean and standard deviation, while categorical variables were presented as frequencies and percentages. The independent-samples t-tests for comparisons between groups and paired-samples t-tests for within-group comparisons. Categorical variables were compared using chi-square tests. A two-sided p-value below 0.05 was considered statistically significant.

3. RESULTS

A total of 60 patients undergoing elective surgical procedures under general anaesthesia were included in the study. Patients were randomly allocated into two groups of 30 each. Group D received intravenous dexmedetomidine (1 µg/kg), while Group E received intravenous esmolol (2 mg/kg). Haemodynamic parameters, including heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP), were recorded at baseline, immediately after intubation, and at 1, 5, 10, and 15 minutes following intubation.

Table 01: Baseline demographic and clinical characteristics of the study participants

Characteristics	Group D: Dexmedetomidine (n=30)	Group E: Esmolol (n=30)
Age (years), mean ± SD	33.30 ± 9.94	35.43 ± 11.22
Weight (kg), mean ± SD	61.13 ± 11.22	58.63 ± 7.58
Male, n (%)	13 (43.3)	10 (33.3)
Female, n (%)	17 (56.7)	20 (66.7)
ASA physical status I, n (%)	25 (83.3)	23 (76.7)
ASA physical status II, n (%)	5 (16.7)	7 (23.3)

SD: Standard deviation; ASA: American Society of Anesthesiologists.

The mean age was 33.30 ± 9.94 years in Group D and 35.43 ± 11.22 years in Group E. The corresponding mean body weights were 61.13 ± 11.22 kg and 58.63 ± 7.58 kg.

Female participants constituted 56.7% and 66.7% of the respective groups. Most participants belonged to ASA physical status I, accounting for 83.3% in Group D and 76.7% in Group E (Table 01).

Table 02. Changes in heart rate following laryngoscopy and endotracheal intubation

Time of assessment	Group D (n=30) Mean ± SD (beats/min)	Group E (n=30) Mean ± SD (beats/min)
Baseline	84.06 ± 13.82	87.90 ± 12.67
Immediately after intubation	71.37 ± 8.87	84.53 ± 11.93
1 minute	77.03 ± 8.43	91.00 ± 13.52
5 minutes	76.77 ± 7.35	85.03 ± 12.64
10 minutes	72.67 ± 7.19	81.73 ± 13.15
15 minutes	71.27 ± 8.74	78.53 ± 12.03

Values are expressed as mean ± standard deviation.

The baseline mean heart rate was 84.06 ± 13.82 beats/min in Group D and 87.90 ± 12.67 beats/min in Group E. Immediately after intubation, the mean heart rate decreased to 71.37 ± 8.87 and 84.53 ± 11.93 beats/min, respectively. At one minute, Group E demonstrated a higher mean heart rate (91.00 ± 13.52 beats/min) than Group D (77.03 ± 8.43 beats/min). Heart rate subsequently declined in both groups, with consistently lower mean values observed in Group D throughout the 15-minute monitoring period (Table 02).

Table 03: Changes in systolic blood pressure following laryngoscopy and endotracheal intubation

Time of assessment	Group D (n=30) Mean ± SD (mmHg)	Group E (n=30) Mean ± SD (mmHg)
Baseline	126.83 ± 14.57	128.93 ± 17.15
Immediately after intubation	101.47 ± 10.11	103.90 ± 12.34
1 minute	101.20 ± 10.62	117.70 ± 17.20
5 minutes	100.60 ± 10.15	107.60 ± 9.74
10 minutes	98.80 ± 7.98	106.43 ± 9.05
15 minutes	98.27 ± 6.87	107.03 ± 11.85

Values are expressed as mean ± standard deviation.

The baseline systolic blood pressure was 126.83 ± 14.57 mmHg in Group D and 128.93 ± 17.15 mmHg in Group E. Immediately after intubation, the corresponding values decreased to 101.47 ± 10.11 and 103.90 ± 12.34 mmHg. At one minute, systolic blood pressure increased to 117.70 ± 17.20 mmHg in Group E, whereas Group D maintained a mean value of 101.20 ± 10.62 mmHg. At 15 minutes, the mean systolic blood pressure remained lower in Group D (98.27 ± 6.87 mmHg) than in Group E (107.03 ± 11.85 mmHg) (Table 03).

Table 04: Changes in diastolic blood pressure following laryngoscopy and endotracheal intubation

Time of assessment	Group D (n=30) Mean ± SD (mmHg)	Group E (n=30) Mean ± SD (mmHg)
Baseline	83.30 ± 11.81	85.73 ± 13.46
Immediately after intubation	63.37 ± 10.27	67.30 ± 11.79
1 minute	63.93 ± 9.13	79.03 ± 12.52
5 minutes	62.40 ± 8.95	71.00 ± 9.66
10 minutes	59.87 ± 7.71	67.90 ± 10.70
15 minutes	57.93 ± 7.75	66.20 ± 12.31

Values are expressed as mean ± standard deviation.

The baseline mean diastolic blood pressure was 83.30 ± 11.81 mmHg in Group D and 85.73 ± 13.46 mmHg in Group E. Following intubation, values decreased in both groups. At one minute, Group D recorded a mean diastolic blood pressure of 63.93 ± 9.13 mmHg compared with 79.03 ± 12.52 mmHg in Group E. This difference in mean values persisted during subsequent assessments. At 15 minutes, diastolic blood pressure was 57.93 ± 7.75 mmHg in Group D and 66.20 ± 12.31 mmHg in Group E (Table 4).

Table 05: Changes in mean arterial pressure following laryngoscopy and endotracheal intubation

Time of assessment	Group D (n=30) Mean ± SD (mmHg)	Group E (n=30) Mean ± SD (mmHg)
Baseline	97.73 ± 11.49	100.13 ± 13.74
Immediately after intubation	76.08 ± 9.31	79.50 ± 11.17
1 minute	76.37 ± 8.96	91.90 ± 12.50
5 minutes	75.14 ± 8.73	83.21 ± 8.29
10 minutes	72.84 ± 7.02	80.74 ± 8.92
15 minutes	72.38 ± 6.14	79.81 ± 10.91

Values are expressed as mean ± standard deviation.

The baseline mean arterial pressure was 97.73 ± 11.49 mmHg in Group D and 100.13 ± 13.74 mmHg in Group E. Immediately after intubation, values decreased to 76.08 ± 9.31 and 79.50 ± 11.17 mmHg, respectively. At one minute, Group E exhibited a higher mean arterial pressure (91.90 ± 12.50 mmHg) than Group D (76.37 ± 8.96 mmHg). Mean arterial pressure subsequently decreased in both groups, reaching 72.38 ± 6.14 mmHg in Group D and 79.81 ± 10.91 mmHg in Group E at 15 minutes (Table 5).

Overall findings

Across the post-intubation observation period, Group D consistently demonstrated lower mean heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure than Group E. The largest differences in several haemodynamic parameters were observed at one minute after intubation. Both groups exhibited reductions from their respective baseline blood pressure values during the study period. No episodes of bradycardia or hypotension were reported in the thesis.

DISCUSSION

The present study evaluated the effectiveness of intravenous dexmedetomidine and intravenous esmolol in attenuating the haemodynamic response to direct laryngoscopy and endotracheal intubation among adults undergoing elective surgery under general anaesthesia. Both groups demonstrated reductions in heart rate and blood pressure immediately after intubation compared with baseline values. However, patients receiving dexmedetomidine consistently exhibited lower mean heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure during the subsequent observation period. The differences were particularly evident at one minute after intubation, when the sympathetic response to airway instrumentation would be expected to be prominent. These findings suggest that dexmedetomidine, administered at 1 µg/kg over ten minutes, produced greater attenuation of the recorded haemodynamic response than esmolol administered as a 2 mg/kg intravenous bolus. Nevertheless, the lower haemodynamic values observed with dexmedetomidine should not automatically be

interpreted as superior clinical outcomes. The ideal response to laryngoscopy involves minimising excessive sympathetic stimulation while maintaining adequate systemic perfusion and cardiovascular stability.

Effect of dexmedetomidine on haemodynamic responses

Dexmedetomidine is a selective alpha-2 adrenergic receptor agonist that reduces central sympathetic outflow and circulating catecholamine activity. Consequently, it can attenuate both tachycardia and hypertension associated with stressful procedures. Yildiz et al. demonstrated that dexmedetomidine reduced haemodynamic responses to laryngoscopy and intubation, supporting its potential usefulness as an anaesthetic adjunct [16]. Similarly, Jalonen et al., in patients undergoing coronary artery bypass grafting, reported that dexmedetomidine reduced sympathetic responses and anaesthetic requirements, although careful cardiovascular monitoring remained necessary [17].

In the present study, dexmedetomidine was associated with lower heart rate and blood pressure measurements than esmolol throughout the post-intubation observation period. At one minute, the mean heart rate was 77.03 beats/minute in the dexmedetomidine group and 91.00 beats/minute in the esmolol group. Corresponding mean arterial pressure values were 76.37 mmHg and 91.90 mmHg, respectively.

The ability of dexmedetomidine to influence several haemodynamic parameters simultaneously may explain these observations. Unlike a predominantly beta-adrenergic antagonist, dexmedetomidine modifies sympathetic activity centrally, potentially reducing both cardiac stimulation and peripheral vascular responses.

However, dexmedetomidine has concentration-dependent cardiovascular effects. Ebert et al. demonstrated that its haemodynamic actions vary with plasma concentration, including reductions in heart rate and changes in vascular resistance [18]. These pharmacological characteristics highlight the importance of administering the drug slowly and monitoring patients for bradycardia and hypotension.

Effect of esmolol on haemodynamic responses

Esmolol is an ultra-short-acting, relatively beta-1-selective adrenergic antagonist. Its principal effects include reduced heart rate, myocardial contractility, and cardiac oxygen demand. Its rapid onset and short elimination half-life make it suitable for controlling transient perioperative sympathetic stimulation. In the present study, esmolol attenuated the haemodynamic response to intubation, but the mean values recorded after intubation were generally higher than those observed in the dexmedetomidine group. This difference may relate to their distinct mechanisms of action, administration schedules, and duration of effect.

Importantly, the two drugs were not administered at pharmacologically equivalent times. Dexmedetomidine was delivered as an infusion before intubation, whereas esmolol was administered as a bolus shortly beforehand. Consequently, the findings reflect the effects of the specific regimens studied rather than a definitive comparison of the drugs under all possible dosing strategies. The pharmacokinetic and pharmacodynamic characteristics of dexmedetomidine have been comprehensively reviewed by Weerink et al., who emphasised that its cardiovascular effects are influenced by dose, infusion rate, patient characteristics, and concurrent anaesthetic medications [19].

Comparison with previous studies

A systematic review and meta-analysis by Figueredo and Garcia-Fuentes demonstrated that esmolol can attenuate the haemodynamic responses associated with laryngoscopy and tracheal intubation. However, the magnitude of its effects depends on dosing strategies and the haemodynamic outcome evaluated [20]. Gupta and Vyas compared dexmedetomidine and esmolol for attenuation of the haemodynamic response to laryngoscopy and intubation and reported findings supporting the effectiveness of dexmedetomidine in controlling peri-intubation cardiovascular changes [21]. These observations are broadly consistent with the results of the present study. Hussain and Sultan also investigated esmolol for controlling cardiovascular responses to tracheal intubation, contributing evidence for its role as a short-acting pharmacological intervention during airway manipulation [22].

Although the present findings are consistent with previous research, differences in study populations, drug doses, administration timing, induction agents, opioid use, and measurement intervals limit direct comparisons [23]. Furthermore, reductions in heart rate and blood pressure do not necessarily establish improvements in clinically important outcomes such as myocardial injury, perioperative complications, or postoperative recovery.

Clinical interpretation

An important observation was that mean heart rate and blood pressure measurements in both study groups were below their respective baseline values immediately after intubation. This pattern may reflect the combined cardiovascular effects of the study medications, premedication, induction agents, and maintenance anaesthesia.

Because the study did not include an untreated control group, it cannot independently establish the magnitude of the sympathetic response that would have occurred without either intervention. Similarly, the lower measurements in the dexmedetomidine group cannot be attributed exclusively to alpha-2 adrenergic activity without considering differences in drug administration and concomitant anaesthesia.

The absence of reported bradycardia or hypotension is reassuring within the study sample. Nevertheless, the relatively small sample and short observation period do not establish comparative safety, particularly among elderly patients or individuals with significant cardiovascular disease.

Strengths and limitations

The principal strengths of this study include its prospective randomised design, the use of clinically relevant drug regimens, and serial assessment of haemodynamic parameters at predefined intervals. Evaluating heart rate alongside systolic, diastolic, and mean arterial pressures provided a comprehensive description of the early cardiovascular response to intubation.

Few limitations should be acknowledged. First, the sample size was relatively small, with only 30 participants in each group. Second, the study was restricted to adults with American Society of Anesthesiologists physical status I or II, limiting generalisability to higher-risk patients. Third, the different administration schedules may have affected both pharmacological exposure and the practicality of maintaining blinding. Fourth, the observation period

extended only to 15 minutes after intubation, preventing assessment of later cardiovascular events or postoperative outcomes.

Implications for clinical practice and future research

The findings suggest that dexmedetomidine may be considered when attenuation of both heart rate and blood pressure responses is desired during laryngoscopy and intubation. Esmolol remains a useful alternative, particularly when short-duration heart-rate control is the principal objective.

Selection between these agents should account for baseline haemodynamic status, cardiovascular comorbidities, anticipated airway difficulty, anaesthetic technique, and the risks of excessive bradycardia or hypotension. Larger, adequately powered randomised trials using standardised administration schedules and clinically important outcomes are required to establish which patients derive the greatest benefit from either intervention.

CONCLUSION

Intravenous dexmedetomidine at a dose of 1 µg/kg administered over ten minutes was associated with lower heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure measurements following laryngoscopy and endotracheal intubation compared with intravenous esmolol at a dose of 2 mg/kg in adults undergoing elective surgery under general anaesthesia. The differences were most apparent during the early post-intubation period and generally persisted throughout the 15-minute observation interval.

Both treatment regimens were associated with haemodynamic attenuation, and no episodes of bradycardia or hypotension were reported in the study population. Dexmedetomidine demonstrated greater attenuation of the measured haemodynamic responses under the specific study conditions. Its use should nevertheless be individualised, with careful cardiovascular monitoring and attention to the potential consequences of excessive reductions in blood pressure or heart rate.

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CONFLICT OF INTEREST

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AUTHOR CONTRIBUTION

All are contributed equally.

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