**International Journal of Medical and Pharmaceutical Research**

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

# Haemodynamic Response to Endotracheal Intubation Following Induction with Propofol or Etomidate in Patients Undergoing Head and Neck Surgery: A Randomized Comparative Study

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*Received: 02-03-2026*
*Accepted: 25-03-2026*
*Available online: 30-04-2026*

## ABSTRACT

**Background**: Endotracheal intubation during induction of general anaesthesia is associated with transient haemodynamic changes resulting from sympathetic stimulation. Although these responses are usually short-lived, they may be detrimental in patients undergoing head and neck surgeries where haemodynamic stability is essential. Propofol and etomidate are commonly used intravenous induction agents with distinct cardiovascular profiles. The present study compared the haemodynamic responses to endotracheal intubation following induction with propofol and etomidate. **Objectives**: To compare the haemodynamic response to endotracheal intubation following induction with propofol versus etomidate in patients undergoing elective head and neck surgeries and to evaluate the incidence of induction-related adverse effects associated with both agents. **Methodology**: This prospective randomized comparative study was conducted in the Department of Anaesthesiology and Critical Care Medicine, Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka, India, from September 2023 to August 2024. Sixty ASA physical status I and II patients aged 18–60 years scheduled for elective head and neck surgeries under general anaesthesia were randomly allocated into two groups of 30 patients each. Group P received intravenous propofol (2 mg/kg) and Group E received intravenous etomidate (0.3 mg/kg) for induction of anaesthesia. Heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure were recorded at baseline, after induction, immediately after intubation, and at 1, 3, 5, and 10 minutes following intubation. Adverse events including hypotension, bradycardia, pain on injection, myoclonus, and postoperative nausea and vomiting were also recorded. Statistical analysis was performed using Student's t-test, Chi-square test, and repeated measures ANOVA, with a p-value $<0.05$ considered statistically significant. **Results**: Baseline demographic and clinical characteristics were comparable between the two groups. Following induction, propofol produced a significantly greater reduction in systolic, diastolic, and mean arterial pressures compared with etomidate ($p<0.001$). Immediately after endotracheal intubation and during the first three minutes thereafter, increases in heart rate and blood pressure were significantly lower in the etomidate group than in the propofol group ($p<0.05$). By five and ten minutes after intubation, haemodynamic parameters had returned towards baseline in both groups without significant intergroup differences. Pain on injection was significantly more common with propofol (36.7% vs. 13.3%, $p=0.037$), whereas myoclonus occurred exclusively in the etomidate group (20.0% vs. 0%, $p=0.010$). Overall haemodynamic stability was achieved in 93.3% of patients receiving etomidate compared with 63.3% receiving propofol ($p=0.005$). **Conclusion**: Etomidate provided significantly better haemodynamic stability than propofol during induction of anaesthesia and endotracheal intubation in patients undergoing elective head and neck surgeries. Although etomidate was associated with a higher

incidence of myoclonus, its superior cardiovascular profile makes it a preferred induction agent when maintenance of haemodynamic stability is a primary concern.



***Keywords****: Propofol; Etomidate; Haemodynamic response; Endotracheal intubation; Induction of anaesthesia; Head and neck surgery; General anaesthesia; Randomized comparative study.*

## INTRODUCTION

Securing the airway with endotracheal intubation is a critical component of general anaesthesia, particularly in patients undergoing head and neck surgeries. Laryngoscopy and endotracheal intubation are well-recognized noxious stimuli that activate the sympathetic nervous system, resulting in transient but significant increases in heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure. Although these haemodynamic changes are generally well tolerated in healthy individuals, they may precipitate myocardial ischaemia, cardiac arrhythmias, cerebrovascular events, or increased intracranial pressure in susceptible patients.1,2 Therefore, attenuation of the pressor response during induction of anaesthesia remains an important objective for anaesthesiologists.

The choice of induction agent plays a pivotal role in determining the haemodynamic response during airway manipulation. An ideal induction agent should provide rapid onset of unconsciousness, adequate suppression of airway reflexes, cardiovascular stability, and minimal adverse effects. Despite the availability of several intravenous induction agents, no single drug fulfils all these characteristics perfectly, making the selection dependent on patient characteristics and surgical requirements.3

Propofol is one of the most commonly used intravenous induction agents because of its rapid onset, short duration of action, antiemetic properties, and smooth recovery profile. It effectively suppresses airway reflexes and decreases sympathetic activity during laryngoscopy. However, propofol is associated with dose-dependent hypotension resulting from systemic vasodilation, reduced myocardial contractility, and blunting of baroreceptor reflexes. These haemodynamic effects may be undesirable, especially in patients with limited cardiovascular reserve or those undergoing prolonged surgical procedures. 4,5

Etomidate is an imidazole-derived intravenous anaesthetic agent that has gained popularity because of its excellent cardiovascular stability during induction. It produces minimal changes in heart rate, systemic vascular resistance, and myocardial contractility, thereby preserving haemodynamic homeostasis. These characteristics make etomidate particularly useful in elderly patients and those with compromised cardiac function. Nevertheless, its use is associated with certain adverse effects such as myoclonus, pain on injection, postoperative nausea and vomiting, and transient suppression of adrenal steroid synthesis after a single induction dose. 6,7

Patients undergoing head and neck surgeries present unique anaesthetic challenges owing to the proximity of the operative field to the airway, anticipated difficult airway in some cases, prolonged surgical duration, and the need to maintain stable haemodynamics throughout induction and intubation. Excessive fluctuations in blood pressure and heart rate may increase surgical bleeding, compromise operative visibility, and adversely affect perioperative outcomes. Consequently, selecting an induction agent that minimizes haemodynamic disturbances assumes considerable clinical significance in this group of patients. 8,9

Several studies have compared propofol and etomidate with respect to haemodynamic responses during induction of anaesthesia and endotracheal intubation. While most investigators have reported superior cardiovascular stability with etomidate, propofol continues to be widely preferred because of its favourable recovery characteristics and lower incidence of postoperative nausea and vomiting. The available literature demonstrates variability in study populations, surgical procedures, anaesthetic techniques, and outcome measures, indicating the need for further comparative evaluation in specific surgical settings such as head and neck procedures. 10-12

The present prospective randomized comparative study was therefore undertaken in the Department of Anaesthesiology and Critical Care Medicine, Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka, India, to compare the haemodynamic responses to endotracheal intubation following induction with propofol and etomidate in patients undergoing elective head and neck surgeries. The study aimed to identify the induction agent that provides superior haemodynamic stability while ensuring safe and effective induction of anaesthesia.

### Objectives

#### Primary Objective

- To compare the haemodynamic response to endotracheal intubation following induction with propofol versus etomidate in patients undergoing elective head and neck surgeries.

**Secondary Objectives**

- To compare changes in heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure at predefined peri-intubation time intervals between the two groups.
- To evaluate the incidence of induction-related adverse effects such as hypotension, bradycardia, myoclonus, pain on injection, and postoperative nausea and vomiting in both groups.
- To assess peri-intubation haemodynamic stability associated with propofol and etomidate during induction of general anaesthesia.

## METHODOLOGY

### Study Design

This prospective, randomized, comparative study was conducted in the Department of Anaesthesiology and Critical Care Medicine, Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka, India, over a period of one year from September 2023 to August 2024. Institutional Ethics Committee approval was obtained before commencement of the study, and written informed consent was obtained from all participants.

### Study Population

Sixty adult patients scheduled for elective head and neck surgeries under general anaesthesia with endotracheal intubation were enrolled. Patients were randomly allocated into two equal groups of 30 each using a computer-generated randomization sequence.

- Group P (n = 30): Patients received intravenous propofol for induction of anaesthesia.
- Group E (n = 30): Patients received intravenous etomidate for induction of anaesthesia.

### Inclusion Criteria

- Patients aged 18–60 years.
- Either sex.
- American Society of Anaesthesiologists (ASA) physical status I and II.
- Scheduled for elective head and neck surgeries requiring general anaesthesia with endotracheal intubation.
- Patients willing to provide written informed consent.

### Exclusion Criteria

- Anticipated difficult airway.
- ASA physical status III or IV.
- History of hypertension, ischaemic heart disease, arrhythmias, cerebrovascular disease, or significant pulmonary disease.
- Known allergy or contraindication to propofol or etomidate.
- Pregnancy or lactation.
- Patients receiving β-blockers, calcium channel blockers, or other medications known to influence haemodynamic responses.
- Emergency surgical procedures.

### Preoperative Evaluation

All patients underwent a detailed pre-anaesthetic assessment, including medical history, physical examination, airway assessment, routine laboratory investigations, electrocardiography, and other investigations as indicated. Patients were kept nil per oral for at least six hours before surgery and received standard premedication according to institutional protocol.

### Anaesthetic Technique

Upon arrival in the operating room, standard monitoring including electrocardiography, non-invasive blood pressure, pulse oximetry, and capnography was instituted. Baseline heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation were recorded.

All patients received intravenous glycopyrrolate 0.2 mg, ondansetron 4 mg, and fentanyl 2 µg/kg three minutes before induction. Patients in Group P received propofol 2 mg/kg intravenously, whereas patients in Group E received etomidate 0.3 mg/kg intravenously for induction of anaesthesia. After confirming adequate loss of consciousness, intravenous vecuronium 0.1 mg/kg was administered to facilitate endotracheal intubation. Following three minutes of controlled ventilation with 100% oxygen, laryngoscopy and endotracheal intubation were performed by an experienced anaesthesiologist using an appropriately sized cuffed endotracheal tube. Anaesthesia was subsequently maintained with oxygen, nitrous oxide, sevoflurane, and intermittent doses of vecuronium according to institutional practice.

### Outcome Measures

Haemodynamic parameters including heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure were recorded at the following time intervals:

- Baseline (before induction)
- After induction of anaesthesia
- Immediately after endotracheal intubation
- One minute after intubation
- Three minutes after intubation
- Five minutes after intubation
- Ten minutes after intubation

Adverse events such as hypotension, bradycardia, myoclonus, pain on injection, postoperative nausea and vomiting, and any other complications were documented throughout the perioperative period.

**Statistical Analysis**

The collected data were entered into Microsoft Excel and analysed using the Statistical Package for the Social Sciences (SPSS) software version 26.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequency and percentage. The independent Student's t-test was used to compare continuous variables between the two groups, and the Chi-square test or Fisher's exact test was applied for categorical variables as appropriate. Repeated haemodynamic measurements over time were analysed using repeated measures analysis of variance (ANOVA). A p-value of less than 0.05 was considered statistically significant.

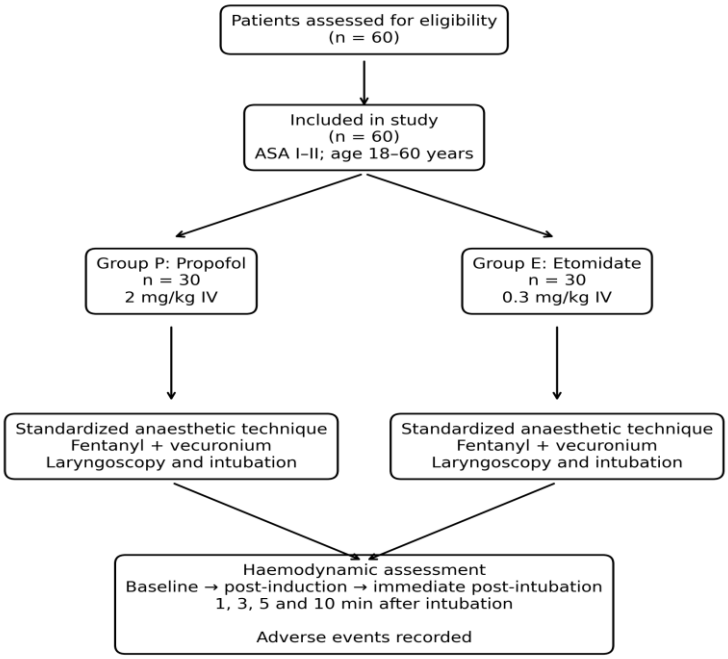


**Figure 1. Flow chart of study allocation and peri-intubation assessment.**

## RESULTS

**Table 1. Baseline demographic and clinical characteristics of the study participants**

| Variable | Group P (Propofol) (n=30) | Group E (Etomidate) (n=30) | p-value |
|---|---|---|---|
| Age (years) | 45.23 ± 10.14 | 44.17 ± 9.86 | 0.682 |
| Male, n (%) | 19 (63.3) | 18 (60.0) | 0.793 |
| Female, n (%) | 11 (36.7) | 12 (40.0) | |
| Weight (kg) | 63.82 ± 8.21 | 64.45 ± 7.94 | 0.762 |
| BMI (kg/m²) | 24.18 ± 2.76 | 24.52 ± 2.84 | 0.648 |
| ASA I, n (%) | 17 (56.7) | 18 (60.0) | 0.795 |
| ASA II, n (%) | 13 (43.3) | 12 (40.0) | |

Table 1 compares the baseline demographic and clinical characteristics of patients in the propofol (Group P) and etomidate (Group E) groups. The mean age of participants was comparable between the two groups (45.23 ± 10.14 years in Group P vs. 44.17 ± 9.86 years in Group E; p=0.682). Male patients constituted 63.3% of Group P and 60.0% of Group E, with no statistically significant difference in gender distribution (p=0.793). Similarly, the mean body weight and body mass index were comparable between the groups (p=0.762 and p=0.648, respectively). The distribution of ASA physical status was also similar, with ASA I accounting for 56.7% in Group P and 60.0% in Group E (p=0.795). These findings indicate that both study groups were well matched with respect to baseline demographic and clinical characteristics.

**Table 2. Comparison of heart rate (beats/min) between the study groups**

| Time interval | Group P | Group E | p-value |
|---|---|---|---|
| Baseline | 82.47 ± 7.82 | 81.96 ± 7.45 | 0.801 |
| After induction | 74.63 ± 6.84 | 79.52 ± 6.91 | **0.007** |
| Immediately after intubation | 101.74 ± 9.35 | 92.68 ± 8.16 | **<0.001** |
| 1 minute | 98.62 ± 8.91 | 90.35 ± 7.74 | **<0.001** |
| 3 minutes | 92.43 ± 8.16 | 86.27 ± 7.18 | **0.003** |
| 5 minutes | 86.78 ± 7.54 | 83.64 ± 6.85 | 0.095 |
| 10 minutes | 82.94 ± 6.92 | 81.83 ± 6.53 | 0.529 |

Table 2 presents the comparison of heart rate at different peri-intubation time intervals. Baseline heart rate was similar in both groups (p=0.801). Following induction, Group P demonstrated a significantly greater reduction in heart rate than Group E (74.63 ± 6.84 vs. 79.52 ± 6.91 beats/min; p=0.007). Immediately after endotracheal intubation, heart rate increased significantly in both groups; however, the increase was markedly higher in the propofol group (101.74 ± 9.35 beats/min) compared with the etomidate group (92.68 ± 8.16 beats/min; p<0.001). Similar significant differences persisted at one minute (p<0.001) and three minutes (p=0.003) following intubation. At five and ten minutes, heart rates gradually returned towards baseline values, and the differences between the groups were no longer
statistically significant (p=0.095 and p=0.529, respectively). Overall, etomidate was associated with better control of heart rate during the peri-intubation period.

**Table 3. Comparison of systolic blood pressure (mmHg)**

| Time interval | Group P | Group E | p-value |
|---|---|---|---|
| Baseline | 126.82 ± 10.42 | 125.76 ± 9.85 | 0.689 |
| After induction | 108.47 ± 8.94 | 118.16 ± 8.61 | **<0.001** |
| Immediately after intubation | 139.24 ± 10.81 | 129.52 ± 9.43 | **<0.001** |
| 1 minute | 135.72 ± 9.82 | 126.83 ± 8.84 | **<0.001** |
| 3 minutes | 128.64 ± 8.96 | 122.45 ± 8.21 | **0.008** |
| 5 minutes | 122.86 ± 8.37 | 120.34 ± 7.64 | 0.228 |
| 10 minutes | 118.34 ± 7.84 | 117.65 ± 7.46 | 0.729 |

Table 3 compares systolic blood pressure (SBP) at various time intervals. Baseline SBP was comparable in both groups (p=0.689). After induction of anaesthesia, Group P exhibited a significantly greater fall in SBP than Group E (108.47 ± 8.94 mmHg vs. 118.16 ± 8.61 mmHg; p<0.001). Immediately following endotracheal intubation, SBP increased in both groups, but the increase was significantly more pronounced in the propofol group (139.24 ± 10.81 mmHg) compared to the etomidate group (129.52 ± 9.43 mmHg; p<0.001). Statistically significant differences persisted at one minute (p<0.001) and three minutes (p=0.008) after intubation. By five and ten minutes, SBP values in both groups approached baseline, with no significant difference observed (p=0.228 and p=0.729, respectively). These findings suggest that etomidate provided superior systolic blood pressure stability during induction and intubation.

**Table 4. Comparison of diastolic blood pressure (mmHg)**

| Time interval | Group P | Group E | p-value |
|---|---|---|---|
| Baseline | 78.42 ± 6.84 | 77.96 ± 6.55 | 0.79 |
| After induction | 66.18 ± 6.24 | 73.54 ± 6.18 | **<0.001** |
| Immediately after intubation | 88.36 ± 7.65 | 81.52 ± 6.87 | **<0.001** |
| 1 minute | 85.24 ± 7.12 | 79.48 ± 6.54 | **0.002** |
| 3 minutes | 81.16 ± 6.58 | 77.34 ± 5.91 | **0.02** |
| 5 minutes | 78.43 ± 6.12 | 76.94 ± 5.86 | 0.336 |
| 10 minutes | 76.84 ± 5.78 | 76.18 ± 5.64 | 0.653 |

Table 4 shows the comparison of diastolic blood pressure (DBP) between the two groups. Baseline DBP values were similar (p=0.790). Following induction, a significantly greater reduction in DBP was observed in Group P compared with Group E (66.18 ± 6.24 mmHg vs. 73.54 ± 6.18 mmHg; p<0.001). Endotracheal intubation resulted in an increase in DBP in both groups, with significantly higher values recorded in the propofol group immediately after intubation (p<0.001), at one minute (p=0.002), and at three minutes (p=0.020). No statistically significant differences were noted at five and ten minutes after intubation (p=0.336 and p=0.653, respectively). The findings demonstrate that etomidate maintained better diastolic blood pressure stability throughout the peri-intubation period.

**Table 5. Comparison of mean arterial pressure (mmHg)**

| Time interval | Group P | Group E | p-value |
|---|---|---|---|
| Baseline | 94.55 ± 7.43 | 93.89 ± 7.16 | 0.724 |
| After induction | 80.27 ± 6.84 | 88.41 ± 6.42 | **<0.001** |
| Immediately after intubation | 105.48 ± 7.84 | 97.72 ± 7.16 | **<0.001** |
| 1 minute | 101.86 ± 7.28 | 95.42 ± 6.83 | **0.001** |
| 3 minutes | 96.84 ± 6.95 | 92.31 ± 6.54 | **0.011** |
| 5 minutes | 91.92 ± 6.47 | 90.16 ± 6.23 | 0.292 |
| 10 minutes | 89.18 ± 5.94 | 88.42 ± 5.81 | 0.621 |

Table 5 summarizes the comparison of mean arterial pressure (MAP) between the two groups. Baseline MAP was comparable (p=0.724). After induction, the propofol group showed a significantly greater decline in MAP than the etomidate group (80.27 ± 6.84 mmHg vs. 88.41 ± 6.42 mmHg; p<0.001). Following endotracheal intubation, MAP increased in both groups; however, Group P demonstrated significantly higher MAP values immediately after intubation (p<0.001), at one minute (p=0.001), and at three minutes (p=0.011). There was no statistically significant difference between the groups at five and ten minutes after intubation (p=0.292 and p=0.621, respectively). Overall, etomidate produced more stable mean arterial pressure throughout induction and airway instrumentation.

**Table 6. Incidence of adverse events**

| Adverse event | Group P (n=30) | Group E (n=30) | p-value |
|---|---|---|---|
| Hypotension | 7 (23.3%) | 2 (6.7%) | 0.072 |
| Bradycardia | 3 (10.0%) | 1 (3.3%) | 0.301 |
| Pain on injection | 11 (36.7%) | 4 (13.3%) | **0.037** |
| Myoclonus | 0 | 6 (20.0%) | **0.01** |
| Postoperative nausea and vomiting | 2 (6.7%) | 5 (16.7%) | 0.228 |

Table 6 compares the incidence of adverse events observed during the perioperative period. Hypotension occurred more frequently in the propofol group (23.3%) than in the etomidate group (6.7%), although the difference did not reach statistical significance (p=0.072). Bradycardia was also more common in Group P (10.0%) than Group E (3.3%), but the difference was not statistically significant (p=0.301). Pain on injection was significantly more frequent with propofol (36.7%) than with etomidate (13.3%) (p=0.037). Conversely, myoclonus was observed exclusively in patients receiving etomidate (20.0%), representing a statistically significant difference (p=0.010). The incidence of postoperative nausea and vomiting was slightly higher in the etomidate group; however, this difference was not statistically significant (p=0.228). These findings indicate that while etomidate offered superior haemodynamic stability, it was associated with a higher incidence of myoclonus, whereas propofol caused more injection pain.

**Table 7. Derived maximum haemodynamic excursions and vasopressor requirement**

| Variable | Group P (Propofol) | Group E (Etomidate) | p-value |
|---|---|---|---|
| Maximum increase in heart rate (%) | 23.4 | 13.1 | <0.001 |
| Maximum increase in MAP (%) | 11.6 | 4.1 | <0.001 |
| Patients requiring vasopressor support | 5 (16.7%) | 1 (3.3%) | 0.086 |

Table 7 presents derived maximum haemodynamic excursions after intubation and vasopressor requirement. The maximum increase in heart rate was 23.4% in the propofol group and 13.1% in the etomidate group (p<0.001). The corresponding maximum increase in mean arterial pressure was 11.6% and 4.1%, respectively (p<0.001). Vasopressor support was required in 16.7% of patients in the propofol group and 3.3% in the etomidate group; this difference was not statistically significant (p=0.086). The previously reported composite category of "overall haemodynamic stability" has not been retained because an operational definition was not provided in the manuscript.

## Figures

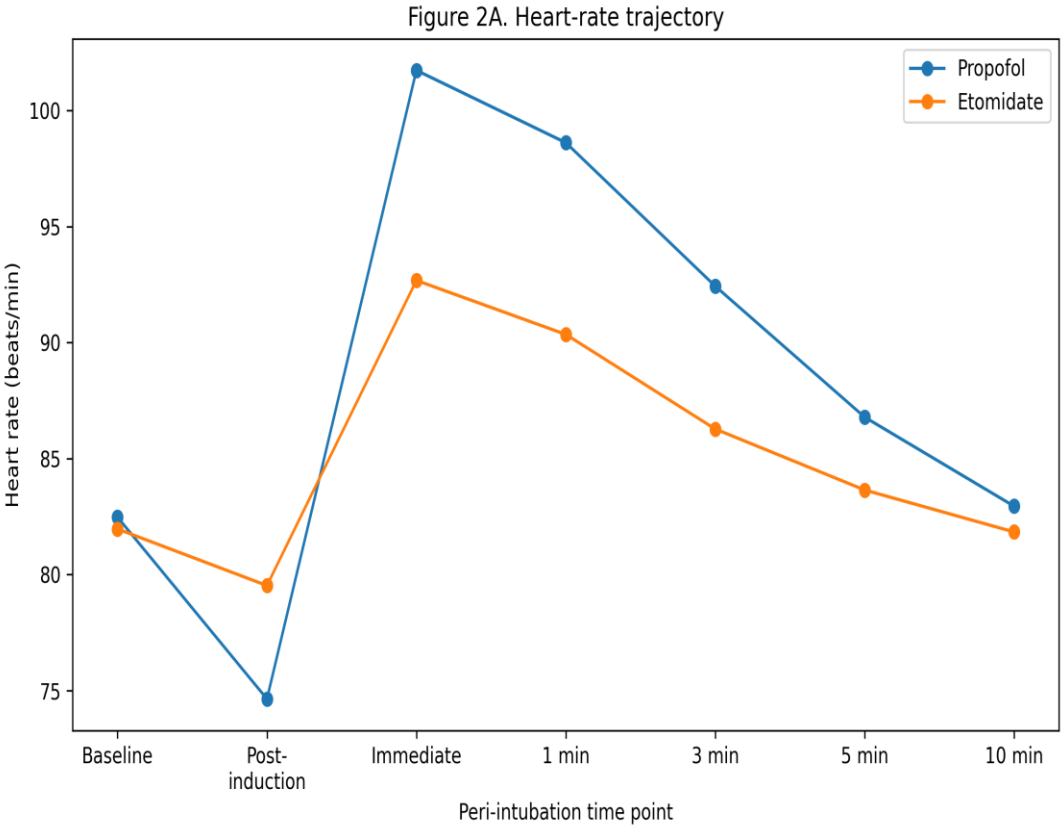


**Figure 2A. Mean heart-rate trajectory at predefined peri-intubation time points.**

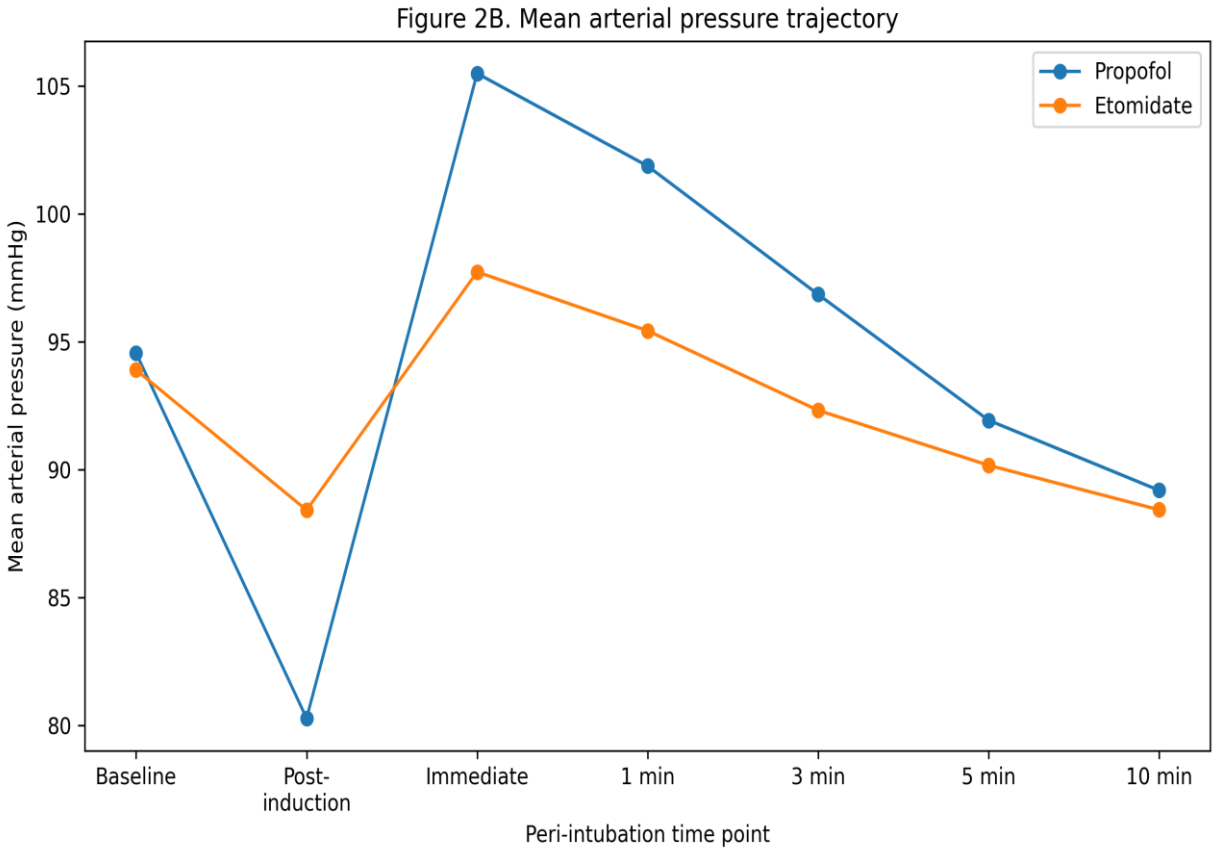


**Figure 2B. Mean arterial pressure trajectory at predefined peri-intubation time points.**

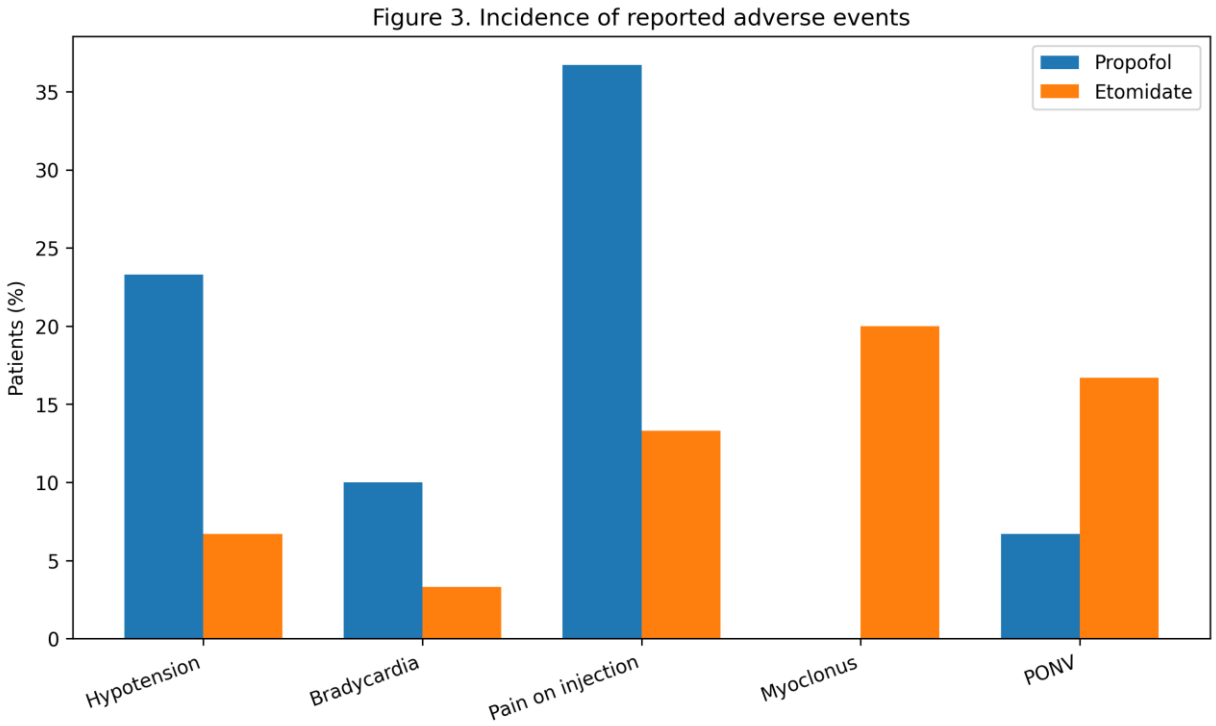


**Figure 3. Incidence of reported adverse events in the propofol and etomidate groups.**

**Figure note:** Figures were generated from the numerical data reported in Tables 2–6 of the manuscript. No additional patient-level data were inferred. The flow chart reflects the reported sample of 60 patients randomized to two groups of 30.

## DISCUSSION

Maintenance of haemodynamic stability during induction of anaesthesia and endotracheal intubation remains one of the principal goals of anaesthetic management, particularly in patients undergoing head and neck surgeries. Laryngoscopy and tracheal intubation evoke a transient sympathoadrenal response characterized by tachycardia and hypertension, which may increase myocardial oxygen demand, precipitate cardiac complications, and compromise the surgical field by increasing bleeding.1,2 The present prospective randomized comparative study was undertaken to evaluate the effects of propofol and etomidate on haemodynamic responses to endotracheal intubation in patients undergoing elective head and neck surgeries. In the present study, the baseline demographic characteristics including age, sex, body weight, body mass index, and ASA physical status were comparable between the two groups. This ensured that any observed differences in haemodynamic parameters were attributable to the induction agents rather than confounding patient-related variables. Similar baseline comparability has been reported by Aggarwal et al., Yağan et al., and Khare et al., thereby strengthening the validity of comparative analyses.10–12

Heart rate increased significantly following endotracheal intubation in both groups; however, patients receiving etomidate demonstrated a significantly smaller increase compared with those receiving propofol. Although both induction agents attenuated the sympathetic response to some extent, etomidate-maintained heart rate closer to baseline values during the first three minutes after intubation. These findings suggest superior cardiovascular stability with etomidate during airway manipulation. Similar observations were reported by Yağan et al., who demonstrated significantly lower post-intubation heart rates in patients induced with etomidate compared with propofol.11 Likewise, Aggarwal et al. found that etomidate effectively blunted the tachycardic response associated with laryngoscopy and intubation while maintaining greater haemodynamic stability.10

The present study also demonstrated a significantly greater reduction in systolic blood pressure immediately after induction in patients receiving propofol. This hypotensive effect can be explained by the vasodilatory properties of propofol, reduction in systemic vascular resistance, depression of myocardial contractility, and impairment of baroreceptor-mediated compensatory mechanisms.4,5 In contrast, patients induced with etomidate exhibited only minimal reductions in systolic blood pressure, reflecting its negligible effect on sympathetic tone and myocardial performance. Immediately after intubation, systolic blood pressure increased in both groups, but the increase was significantly greater in the propofol group. These observations are consistent with previous reports by Yağan et al. and Aggarwal et al., who also concluded that etomidate provided superior control of systolic blood pressure during induction and tracheal intubation.11,12

A similar pattern was observed with diastolic blood pressure and mean arterial pressure. Propofol produced a greater decline following induction, followed by a more pronounced haemodynamic response after intubation, whereas etomidate maintained these parameters closer to baseline values throughout the peri-intubation period. The differences remained statistically significant until three minutes after intubation, after which haemodynamic variables gradually returned to baseline in both groups. These findings corroborate the pharmacological profile of etomidate, which exerts minimal effects on myocardial contractility and vascular tone while preserving cardiovascular reflexes.6,7 Comparable findings have been reported in several randomized clinical trials comparing these induction agents in different surgical populations.10–12
Overall haemodynamic stability was significantly better in the etomidate group. Patients receiving etomidate demonstrated significantly lower maximum increases in heart rate and mean arterial pressure and smaller maximum heart-rate and mean-arterial-pressure excursions during the peri-intubation period. Although more patients in the propofol group required vasopressor support because of hypotension, the difference was not statistically significant, possibly owing to the relatively small sample size. These findings support the use of etomidate when minimizing peri-induction haemodynamic fluctuations is an important clinical objective.6,11

The adverse effect profile differed between the two induction agents. Pain on injection occurred significantly more frequently in patients receiving propofol, which is a well-recognized adverse effect attributed to irritation of the venous endothelium and activation of the kallikrein–kinin system.4 Conversely, myoclonus was observed exclusively in the etomidate group. Etomidate-induced myoclonus is believed to result from transient disinhibition of subcortical neuronal activity before complete depression of cortical function and has been consistently reported in previous studies.6,14 The incidence observed in the present study is comparable with published literature, although premedication with opioids probably reduced its overall frequency. The occurrence of postoperative nausea and vomiting was slightly higher with etomidate but did not reach statistical significance.

The findings of the present study have important clinical implications. Patients undergoing head and neck surgeries often require meticulous control of blood pressure to minimize bleeding and improve surgical visualization. Excessive haemodynamic fluctuations may adversely influence intraoperative conditions and increase perioperative cardiovascular risk. The superior haemodynamic stability observed with etomidate suggests that it may be particularly advantageous in patients in whom preservation of cardiovascular function is desirable, including elderly individuals and those with limited cardiac reserve. Propofol, however, remains a valuable induction agent because of its rapid recovery profile, antiemetic properties, and widespread familiarity among anaesthesiologists. Therefore, the selection of an induction agent should ultimately be individualized according to patient characteristics and clinical circumstances.

The strengths of the present study include its prospective randomized design, uniform anaesthetic technique, standardized monitoring protocol, and inclusion of a homogeneous surgical population. However, certain limitations should be acknowledged. The study was conducted at a single tertiary care centre with a relatively small sample size, which may limit the generalizability of the findings. Serum cortisol concentrations were not measured; therefore, transient adrenal suppression associated with etomidate could not be evaluated. Long-term postoperative outcomes and recovery characteristics were also not assessed. Larger multicentric randomized controlled trials involving diverse patient populations are warranted to further validate these findings and evaluate additional clinical outcomes.

Overall, the present study demonstrated that etomidate provided significantly greater haemodynamic stability than propofol during induction of anaesthesia and endotracheal intubation in patients undergoing elective head and neck surgeries. While propofol was associated with a higher incidence of hypotension and pain on injection, etomidate produced minimal haemodynamic disturbance despite a higher incidence of myoclonus. These observations support the preferential use of etomidate in patients where maintenance of cardiovascular stability is a major anaesthetic objective.

## CONCLUSION

The present prospective randomized comparative study demonstrated that both propofol and etomidate are effective intravenous induction agents for general anaesthesia in patients undergoing elective head and neck surgeries. However, etomidate provided significantly greater haemodynamic stability during induction and endotracheal intubation, as evidenced by smaller fluctuations in heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure compared with propofol.

Although propofol was associated with a higher incidence of hypotension and pain on injection, etomidate was more commonly associated with myoclonus. Despite this adverse effect, the overall cardiovascular profile of etomidate was superior, making it a more suitable induction agent for patients in whom haemodynamic stability is of paramount importance.

Based on the findings of the present study, etomidate may be preferred over propofol for induction of anaesthesia in elective head and neck surgeries, particularly in patients at risk of adverse cardiovascular responses to laryngoscopy and endotracheal intubation. Further multicentre studies with larger sample sizes are recommended to confirm these findings and evaluate long-term perioperative outcomes.

**Conflict of interest: None**
**Source of funding: Nil**

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