World Journal of Biology Pharmacy and Health Sciences

eISSN: 2582-5542

Cross Ref DOI: 10.30574/wjbphs

Journal homepage: https://wjbphs.com/

(Research Article)

Check for updates

Comparative hemodynamic responses to endotracheal intubation versus laryngeal mask airway insertion in burn patients at tertiary care hospital in Peshawar

Israr Muhammad *, Hamza Ayaz, Muhammad Abubakkar, Muhammad Shahid, Muhammad Salman and Asif khan

Department of Anesthesiology, School of Health Sciences (KMU), Peshawar, KP, Pakistan.

World Journal of Biology Pharmacy and Health Sciences, 2026, 26(03), 132-144

Publication history: Received on 02 May 2026; revised on 06 June 2026; accepted on 09 June 2026

Article DOI: https://doi.org/10.30574/wjbphs.2026.26.3.0345

Abstract

Background: Burn patients are more susceptible to hemodynamic stress due to hypermetabolism, catecholamine release, and circulatory instability. Therefore, airway management is a critical consideration for anesthesia services in the context of burn care. Endotracheal tube intubation (ETT) is the established airway management technique, but carries the highest risk of sympathetic stimulation, and therefore increased heart rate and blood pressure. Laryngeal Mask Airway (LMA) insertion is relatively less invasive, and may result in better hemodynamic stability.

Objective: This study aimed to analyze hemodynamic changes, including heart rate, blood pressure (systolic, diastolic, and mean arterial), and the occurrence of arrhythmias, following endotracheal tube (ETT) and laryngeal mask airway (LMA) insertion in burn patients receiving general anesthesia.

Materials and Methods: An observational cross-sectional study was conducted at the Burns and Plastic Surgery Unit at Lady Reading Hospital, Peshawar. This study enrolled 52 patients, aged between 18 to 60 years with burns, and classified as ASA I or II. This was done by using a non-probability, consecutive sampling technique. The patients were divided into two equal (n = 26) groups: Endotracheal Tube (ETT) and Laryngeal Mask Airway (LMA) groups. For each group, the vital parameters were recorded pre-surgery, immediately after the insertion of the airway, at 1, 3 and 5 minutes, and after the extubation process was completed. The collected data were analyzed using SPSS version 23. For data analysis, Independent Sample T Test and Fishers Exact test were done, and a p value of less than 0.05 was taken as statistically significant.

Results: In the ETT group, the hemodynamic responses seen were markedly elevated compared to the LMA group. Following the insertion of the airway, the ETT group had a significantly higher average heart rate than the LMA group (115.61 ± 6.50 vs. 98.76 ± 3.83, $p < 0.001$). Systolic blood pressure, diastolic blood pressure, and mean blood pressures all showed a similar pattern of increase. In the ETT group there were 4 patients (15.4%) that had arrhythmias, and there were 0 cases in the LMA group.

Conclusion: LMA insertion gives better hemodynamic stability and less cardiovascular complications than ETT intubation for select burn patients who are undergoing short procedures with general anesthesia.

Keywords: Burn patients; Hemodynamic responses; Endotracheal tube intubation; Laryngeal mask airway insertion; General anesthesia; Heart rate; Blood pressure; Arrhythmias

* Corresponding author: Israr Muhammad

1. Introduction

Airway management is key in maintaining patient safety during general anesthesia. Because of the drugs used, airway protective reflexes are often depressed and airway obstruction becomes more likely. It is vital to ensure the airway is unobstructed in order to supply adequate ventilation and oxygen as well as to prevent pulmonary aspiration and to provide anesthetic gas [1]. If the airway is not effectively managed, there is the potential for serious effects including pulmonary aspiration, hyperventilation, hypo section, some of which may result in life threatening cardiorespiratory events [2]. There are also significant effects on the cardiovascular system from general anesthesia, including bradycardia, tachycardia, hypotension, hypertension, and arrhythmias, which may be especially dangerous in patients with a limited physiological reserve [3]. For this reason, the type of airway device used becomes a major focus of anesthetic practice, especially for patients with heightened perioperative risk [4]. There are many different devices used for securing airways in patients under general anesthesia, but the endotracheal tube (ETT) and laryngeal mask airway (LMA) are the most commonly used devices. Intubation is typically the preferred option for securing an airway due to its excellent control and reduced risk for aspiration [5,6,7]. It is considered the gold standard in most surgical situations where ventilation is expected to prolong and there is a high demand to protect the airway for high levels of pressure. However, laryngoscopy to facilitate tracheal intubation is a highly stimulating procedure. Direct laryngeal and tracheal manipulation cause sympathetic nervous system activation, which may result in tachycardia and increases in systolic, diastolic and mean arterial blood pressure, as well as arrhythmias [6,10,11]. These responses are principally caused by airway stimulation with a resultant release of catecholamines and are especially concerning in patients with compromised cardiovascular status and low physiological reserve [12-14]. Laryngeal Mask Airways (LMA) have a significant advantage over Endotracheal Tubes (ETT) because several recent studies have shown that hemodynamic responses after LMA insertion are significantly lower than those observed with ETT. Although ETT is a necessary option in cases where the airway is highly at risk, the use of ETT is highly likely to lead to cardiovascular problems, as well as coughing, laryngospasm, hypoxia and airway irritability [16].

The LMA is a popular supraglottic airway device that has become an alternative to ETT for many patients undergoing general anesthesia [17]. The LMA sits above the glottis and does not need an ETT-style direct instrument to the trachea, making LMA insertion less invasive and easier [18]. Less stimulation of the larynx and trachea means that LMA insertion produces less laryngeal reflex and is associated with a smaller increase in heart rate and blood pressure, with a faster return of hemodynamic parameters to baseline values compared with ETT insertion [19]. Several studies showed that the LMA is associated with a lower pressor response with a better hemodynamic stability compared with ETT [20,21]. More recent studies have also shown that LMA insertion is associated with a smaller increase in heart rate and blood pressure compared with endotracheal intubation [22]. Because of the ease, less airway stimulation, and the positive hemodynamic profile, LMA is preferred more often for short anesthesia cases, especially for patients requiring stable hemodynamics [23]. From a clinical perspective, how the body responds hemodynamically to manipulation of the airway is very relevant due to the demand for myocardial oxygen that is provoked by the sudden increase of heart rate, blood pressure, and mean arterial pressure, causing a strong potential for risk of developing serious cardiovascular issues for susceptible patients [24]. Both endotracheal tubes (ETTs) and laryngeal masks (LMAs) can incur some degree of hemodynamic response, but manipulation of ETTs tends to incur a greater response with longer duration and greater magnitude [25]. Studies comparing the two devices report a statistically significant greater magnitude of response with endotracheal tube insertion compared to laryngeal mask insertion for heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and for the presence of arrhythmias [26,27]. ETTs sustain the greater response with laryngeal masks tending to be transient and stabilizing faster [28].

This is particularly relevant in the case of burn patients, who represent a greater risk due to their state of being. Typically, the release of catecholamines with fluid shifts from hypovolemia and a leakage of plasma among tachycardia and a shift in the dynamics of the cardiovascular system induces an inflammatory and hypermetabolic state [29,30]. These alterations in physiology contribute to the risk of hemodynamic instability during a surgical procedure. For these patients, laryngoscopy and tracheal intubation can result in greater cardiovascular system stress and greater variability in the heart rate and blood pressure. Due to the greater degree of sympathetic stimulation associated with ETTs compared to LMAs, LMAs can be a safer airway alternative for some burn patients [31,32]. The hemodynamic benefits of LMA over ETT for general surgical populations are supported by the literature. One study involving 90 adult patients undergoing elective surgery found LMA implantation to be associated with lower heart rate, fewer systolic pressure peaks, and lower mean arterial pressure compared with ETT, and also reported fewer postoperative complications, such as sore throat and cough [33]. In agreement, a different ETT versus LMA study in 110 patients found complications in the ETT group and reported that hemodynamic responses after ETT reached a higher level and a longer duration, while LMA group responses returned to baseline and showed shorter duration [34]. Another study involving 384 patients reported higher airway trauma, a higher risk of aspiration, longer insertion and recovery time in the ETT group compared with LMA, and suggested a safer perioperative profile for LMA in selected cases [22].

ETT and LMA have been analyzed in most surgical patients. However, research comparing ETT and LMA in burn patients is absent. This gap in research is clinically relevant, as burn patients, given their hypermetabolism, inflammation, and fluid and catecholamine imbalances, may respond to airway management very differently than most patients. For this reason, studying the hemodynamic impact of ETT and LMA on this patient population is likely to help inform safer airway management practices. This study was designed to assess the impact of endotracheal intubation and laryngeal mask airway placement on heart rate, blood pressure, mean arterial pressure, the presence of arrhythmias and airway management related hemodynamic variations in patients with burns who are undergoing anesthesia.

2. Materials and Methods

The Burns and Plastic Surgery Center, Lady Reading Hospital, MTI, Peshawar was where this observational, cross-sectional study was conducted. This study was completed with a duration of 3 to 4 months. 52 patients in total were selected and were equally divided with 26 patients in the Endotracheal Tube (ETT) group and 26 patients in the Laryngeal Mask Airway (LMA) group. The sample size was taken from the study of Md. Belal Uddin and his colleagues (2022), where the same sample size and allocation ratio were taken to hemodynamic responses to ETT and LMA groups (36). The patients were selected using a non-probability consecutive sampling method.

2.1. Eligibility Criteria

Included patients of both genders were 18-60 years of age, ASA physical status I or II, had a Mallampati class I or II, and were scheduled for elective minor surgical procedures that lasted no longer than 90 minutes. Excluded patients were pregnant or lactating women, patients who had a history of difficult intubation and/or had a known problematic airway, and patients with hypertension.

2.2. Statistics

Before data collection, ethical approval for this study was obtained from both the School of Health Sciences Research and the Ethics Review Board at Lady Reading Hospital, MTI, in Peshawar. Participants provided written, informed consent prior to participating. Data collection was performed using a pre-designed proforma. From the collection of hemodynamic data, heart rate, blood pressure (systolic, diastolic, and mean), and the presence of arrhythmias were recorded at designated time intervals both prior to, and following, the insertion of the airway device. Data were analyzed through the Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics were used to outline the demographics and characteristics of the sample population. For continuous data, statistical measures of central tendency (mean) and measures of dispersion (standard deviation) were utilized. For categorical data, frequency and percentage were calculated. For each group, the relevant statistical tests were performed, and a p-value of less than 0.05 was deemed statistically significant.

3. Results

A total of 52 (100%) elective burn surgical patients were included in the study, with complete participation of all selected patients. The age of the patients ranged from 18 to 60 years. The mean age of the patients was 39.1 years, as shown in Figure 1.

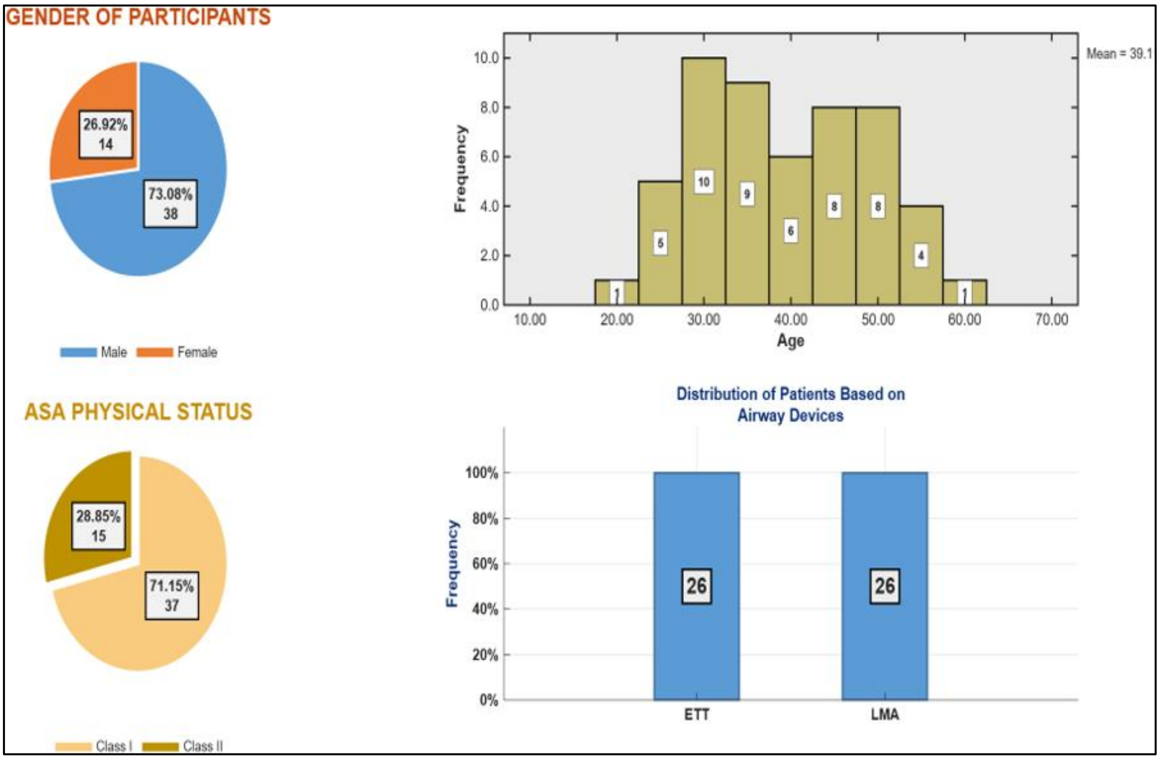

Figure 1 Age of the patients in years, Gender of participants, Patients ASA Physical Status, Distribution of patients based on the type of airway devices used (ETT versus LMA) (n = 26 in each group)

Out of the total (n=52) participants, Gender Analysis shows that 73.08% (n=38) were males and 26.92% (n=14) were females. Out of the total (n=52), Patients were classified based on their ASA Physical Status. Figure 4.3 shows that most of them were in ASA physical Class I - 71.15% (n=37), while 28.85% (n=15) were in ASA physical Class II. Among all (n=52), patients were equally assigned to two groups, each of which had (n=26) patients. The first is called Endotracheal tube, while the other one is called Laryngeal mask airway. For the first group, namely the endotracheal tube group, the process of endotracheal intubation was performed with the Macintosh laryngoscope. On the other hand, for the second group, the insertion of the laryngeal mask airway was done according to the manufacturer's instruction in Figure 1.

The Preoperative (Baseline) Heart rate was remained slightly higher in ETT Group (94.34 ± 7.51 bpm) compared to the LMA Group (90.92 ± 3.74 bpm). On analysis it was found that there was a significant statistical difference ($P < 0.05$).

The heart rate of all groups was compared after airway insertion. A marked increase in heart rate was observed in all groups. The rise in heart rate was more significant in ETT Group (115.61 ± 6.50 bpm) than the LMA group (98.76 ± 3.83 bpm). On the analysis it was found that the heart rate after airway insertion in all the groups was highly significant statistically ($P < 0.001$). On comparison, the heart rate at 1 minute post insertion was remained higher in the ETT Group (108.34 ± 6.01 bpm) than in the LMA group (94.84 ± 3.86 bpm) which is statistically highly significant ($P < 0.001$).

The Similar Difference was remained in Heart rate of the both group at 3 minutes post insertion, where the ETT group (101.00 ± 4.72 bpm) show higher values compared to the LMA group (92.88 ± 3.85 bpm) which is highly Significant statistically ($P < 0.001$). After 5 minutes declined in heart rate were observed in all groups and returned to preoperative values, but still higher in the ETT group (95.34 ± 5.05 bpm) compared to the LMA group (90.88 ± 3.89 bpm) which is statistically significant ($P < 0.01$). When Heart rate was compared after Airway Estuation, it was recorded (89.00 ± 5.46 bpm) in ETT Group and (88.80 ± 3.88 bpm) in the LMA Group. On analysis, no statistically significant were observed ($P = 0.884$). These results indicated that LMA group has better hemodynamic stability (lower rise in heart rate) in comparison to ETT group as can be seen in Table 1.

Table 1 Mean Heart rate at different times among LMA and ETT Study Participants

Time of Recording of Heart Rate	Airway Device	N	Mean	Std. Deviation	Std. Error Mean	P-Value
Pre-Operative Heart Rate	ETT	26	94.3462	7.51501	1.47381	0.043
	LMA	26	90.9231	3.74083	0.73364	
After Insertion HR	ETT	26	115.6154	6.50586	1.27590	0.000
	LMA	26	98.7692	3.83987	0.75306	
After 1 minute HR	ETT	26	108.3462	6.01958	1.18054	0.000
	LMA	26	94.8462	3.86463	0.75792	
After 3 minutes HR	ETT	26	101.0000	4.72440	0.92653	0.000
	LMA	26	92.8846	3.85047	0.75514	
After 5 minutes HR	ETT	26	95.3462	5.05128	0.99064	0.001
	LMA	26	90.8846	3.89181	0.76325	
After Extubation HR	ETT	26	89.0000	5.46260	1.07130	0.884
	LMA	26	88.8077	3.88864	0.76263	

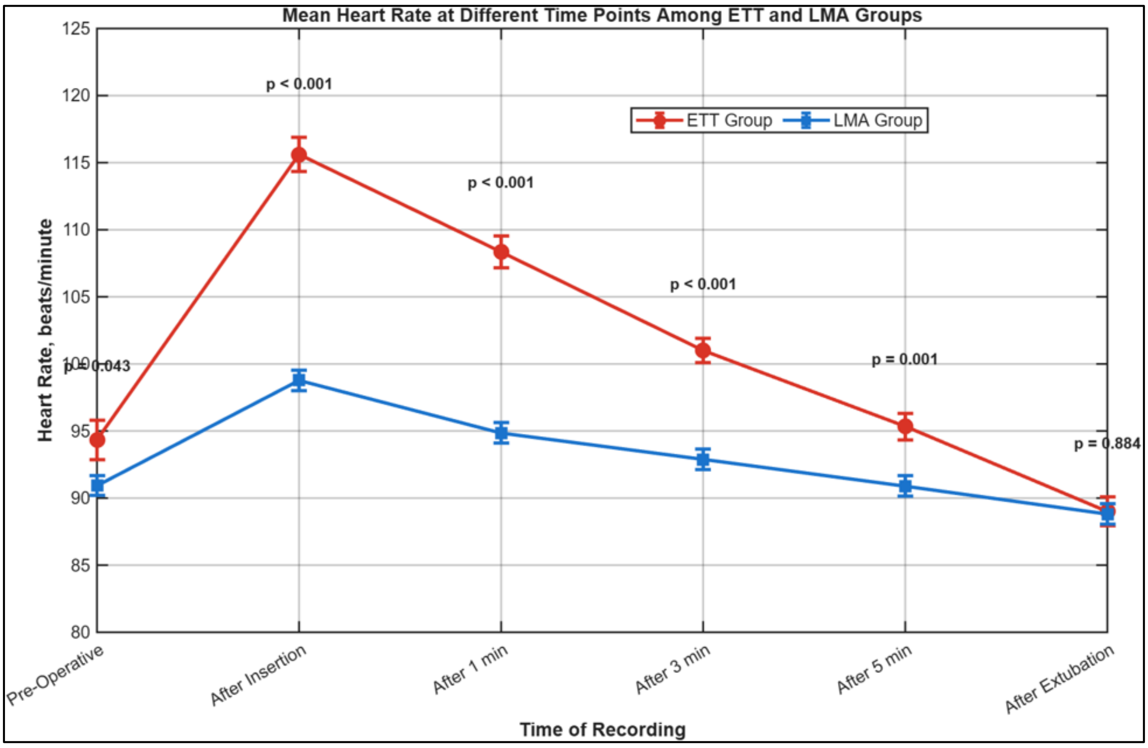

Figure 2 Mean Heart rate of different time points among ETT and LMA groups

The Baseline Systolic blood pressure was almost the same for both groups, with a slight increase in the ETT group (129.50 ± 6.29 mmHg) in comparison to the LMA group (128.73 ± 3.16 mmHg). There were no statistically significant differences (P = 0.580). Post airway insertion, an increase in systolic blood pressure were observed in both the groups but increased more in the ETT group (170.03 ± 11.18 mmHg) than the LMA group (136.96 ± 3.16 mmHg), which is highly significant statistically (P < 0.001). At 1 min post airway insertion, systolic blood pressure was still higher in all the groups, with a higher level in ETT group (148.88 ± 9.17 mmHg) in comparison to the LMA group (133.03 ± 3.18 mmHg), which is highly significant statistically (P < 0.001). After 3 minutes airway insertion, there was a decrease in systolic blood pressure in all groups, but at a higher level in the ETT group (136.57 ± 8.75 mmHg) in comparison to the LMA group (130.92 ± 3.16 mmHg). The differences were statistically significant (P < 0.01). At 5 minutes after airway insertion, the systolic blood pressure in both groups approached their baseline levels; however, there were slightly higher levels in the ETT group (130.46 ± 4.81 mmHg) than in the LMA group (129.07 ± 3.32 mmHg), but without any statistical significance (P = 0.233).

Following the Extubation period, when the systolic blood pressure was compared, a rise in systolic blood pressure in both groups was observed; nonetheless, a more significant increase in systolic blood pressure were noted in ETT group (141.11 ± 8.06 mmHg) when compared to the LMA group (131.03 ± 3.19 mmHg), and this increase was highly significant statistically (P < 0.001). In overall, these results show that the LMA group is more stable hemodynamically, having smaller fluctuations in terms of systolic blood pressure as compared to ETT group as mentioned below in table 2.

Table 2 Mean SBP at different times among LMA and ETT Study Participants

Time of Recording of SBP	Airway Device	N	Mean	Std. Deviation	Std. Error Mean	P-Value
Pre-Operative SBP	ETT	26	129.5000	6.29444	1.23444	0.580
	LMA	26	128.7308	3.16932	0.62156	
After Insertion SBP	ETT	26	170.0385	11.18385	2.19333	0.000
	LMA	26	136.9615	3.16835	0.62137	
After 1 minute SBP	ETT	26	148.8846	9.17530	1.79942	0.000
	LMA	26	133.0385	3.18095	0.62384	
After 3 minutes SBP	ETT	26	136.5769	8.75522	1.71704	0.003
	LMA	26	130.9231	3.16130	0.61998	
After 5 minutes SBP	ETT	26	130.4615	4.81855	0.94500	0.233
	LMA	26	129.0769	3.32172	0.65144	
After Extubation SBP	ETT	26	141.1154	8.06140	1.58097	0.000

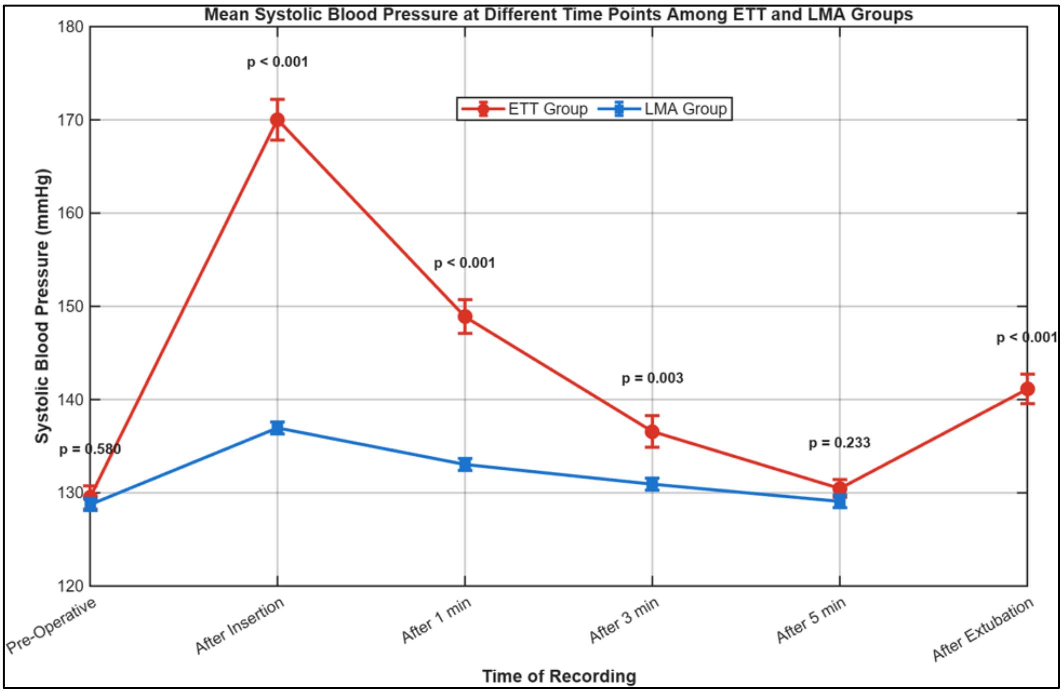

Figure 3 Mean systolic blood pressure at different time points among ETT and LMA groups

The Preoperative Diastolic blood pressure, there was no significant difference between these two groups, as the mean value in the ETT group was (82.07 ± 4.64 mmHg), while in the LMA group, it was (82.03 ± 2.56 mmHg) (P = 0.971). Immediately after insertion of the tube, diastolic blood pressure was increased in all the groups; however, there were a marked rise in ETT group (99.38 ± 6.36 mmHg) as compared to LMA group (87.92 ± 2.63 mmHg), and the difference was statistically highly significant (P < 0.001). At 1 minute after insertion, the increase in diastolic blood pressure was still apparent in the ETT group (90.42 ± 8.98 mmHg) compared to the LMA group (84.11 ± 2.56 mmHg); the difference was significant statistically (P < 0.01). After 3 minutes from insertion, a declining pattern was observed in both groups regarding diastolic blood pressure; however, diastolic blood pressure was much more in the ETT group (84.96 ± 5.18 mmHg) as compared to LMA group (82.50 ± 2.15 mmHg), with a significant difference statistically (P < 0.05). At 5 minutes post insertion, diastolic blood pressure in all groups reached close to baseline levels, without any statistical difference between the ETT group (81.69 ± 4.60 mmHg) and the LMA group (81.96 ± 2.73 mmHg) (P = 0.799). After Extubation, diastolic blood pressure levels in the all groups were similar, and there were no significant statistical differences between the ETT group (83.50 ± 4.53 mm Hg) and the LMA group (83.96 ± 2.42 mm Hg) (P = 0.649). On the whole, the LMA group was found to be more hemodynamically stable than the ETT group because of low variations in diastolic blood pressure levels as presented below in the table 3.

Table 3 Mean DBP at different times among LMA and ETT Study Participants

Time of Recording of DBP	Airway Device	N	Mean	Std. Deviation	Std. Error Mean	P-Value
Pre-Operative DBP	ETT	26	82.0769	4..64692	0.91134	0.971
	LMA	26	82.0385	2.56875	0.50377	
After Insertion DBP	ETT	26	99.3846	6.36916	1.24909	0.000
	LMA	26	87.9231	2.63701	0.51716	
After 1 minute DBP	ETT	26	90.4231	8.98965	1.76302	0.001
	LMA	26	84.1154	2.56635	0.50330	
After 3 minutes DBP	ETT	26	84.9615	5.18830	1.01751	0.030
	LMA	26	82.5000	2.15870	0.42336	
After 5 minutes DBP	ETT	26	81.6923	4.60234	0.90259	0.799
	LMA	26	81.9615	2.73468	0.53631	
After Extubation DBP	ETT	26	83.5000	4.53652	0.88968	0.649
	LMA	26	83.9615	2.42455	0.47549	

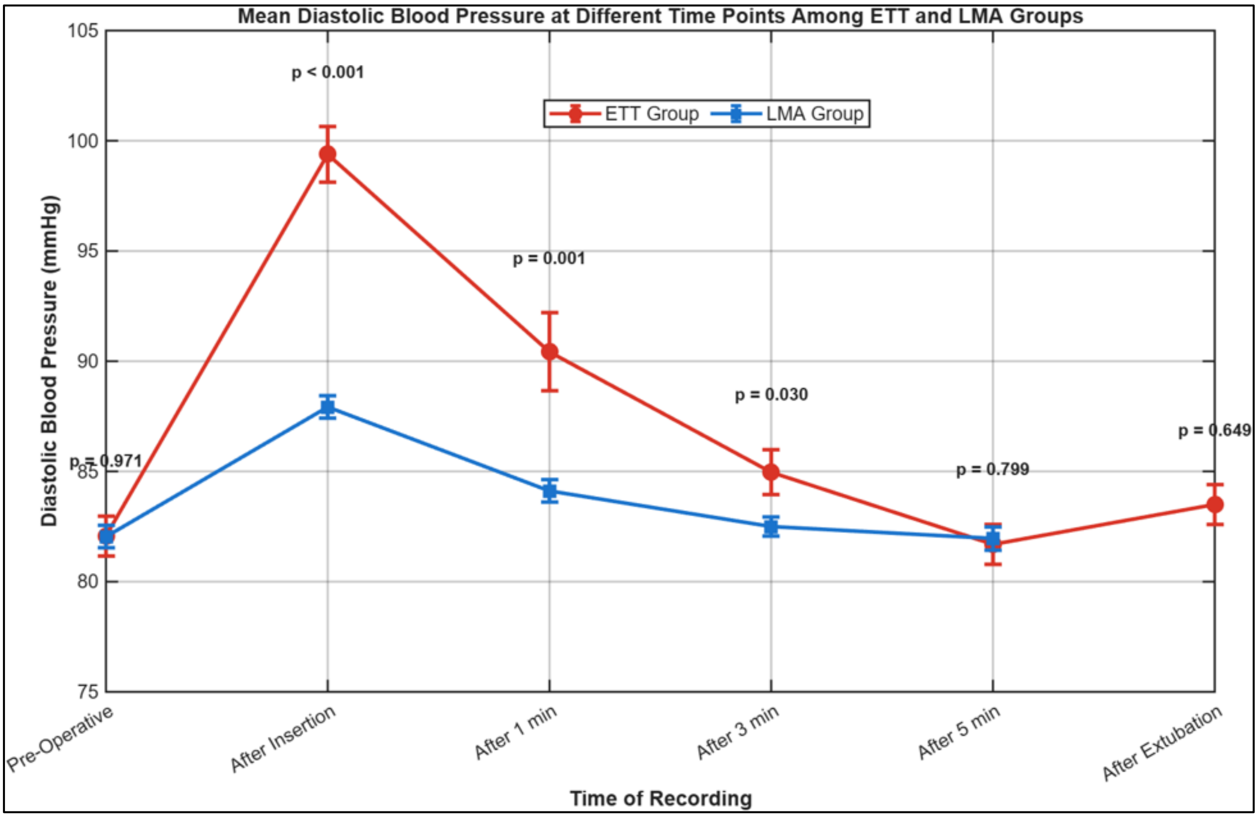

Figure 4 Mean diastolic blood pressure at different time points among ETT and LMA groups

At Baseline, the Mean arterial pressure values were similar in all groups, with no significant difference statistically between ETT group (97.69 ± 5.25 mmHg) and LMA group (97.30 ± 2.78 mmHg) (P = 0.743). After airway insertion, there were a marked rise in mean arterial pressure values in all groups. However, a larger increase was seen in the ETT group (123.03 ± 9.85 mmHg) than the LMA group (103.11 ± 2.71 mmHg), which was highly significant statistically (P < 0.001). However, 1 minute post insertion of the airway, there was elevation in mean arterial pressure values in the ETT group (109.73 ± 7.92 mmHg) more than the LMA group (100.26 ± 2.53 mmHg), and the difference were highly significant statistically (P < 0.001). After 3 minutes post insertion of airway, mean arterial pressure revealed a steady decrease in all groups; however, mean arterial pressure values were still higher in ETT group (101.57 ± 7.46 mmHg) more than the LMA group (98.38 ± 2.29 mmHg), and the difference were significant statistically (P < 0.05). However, 5 minutes post insertion, mean arterial pressure values were restored to baseline values for all groups, and there was no significant difference statistically between ETT group (97.53 ± 5.21 mmHg) and LMA group (97.34 ± 2.72 mmHg) (P = 0.868). Post Extubation, the mean arterial pressure increased once more in all groups, but mean arterial pressure was still much more in the ETT group at (102.80 ± 4.63 mm Hg) when compared to LMA group at (99.11 ± 2.71 mm Hg). However, this difference was significant statistically (P < 0.01). In general, the LMA group was relatively stable hemodynamically compared to the ETT group, according to table 4 below.

Table 4 MAP at different times among LMA and ETT Study Participants

Time of Recording of MAP	Airway Device	N	Mean	Std. Deviation	Std. Error Mean	P-Value
Pre-Operative MAP	ETT	26	97.6923	5.25181	1.02997	0.743
	LMA	26	97.3077	2.78236	0.54567	
After Insertion MAP	ETT	26	123.0385	9.85690	1.93310	0.000
	LMA	26	103.1154	2.71775	0.53299	
After 1 minute MAP	ETT	26	109.7308	7.92241	1.55371	0.000
	LMA	26	100.2692	2.53862	0.49787	

After 3 minutes MAP	ETT	26	101.5769	7.46283	1.46358	0.042
	LMA	26	98.3846	2.29916	0.45090	
After 5 minutes MAP	ETT	26	97.5385	5.21713	1.02316	0.868
	LMA	26	97.3462	2.72679	0.53477	
After Extubation MAP	ETT	26	102.8077	4.63913	0.90981	0.001
	LMA	26	99.1154	2.71775	0.53299	

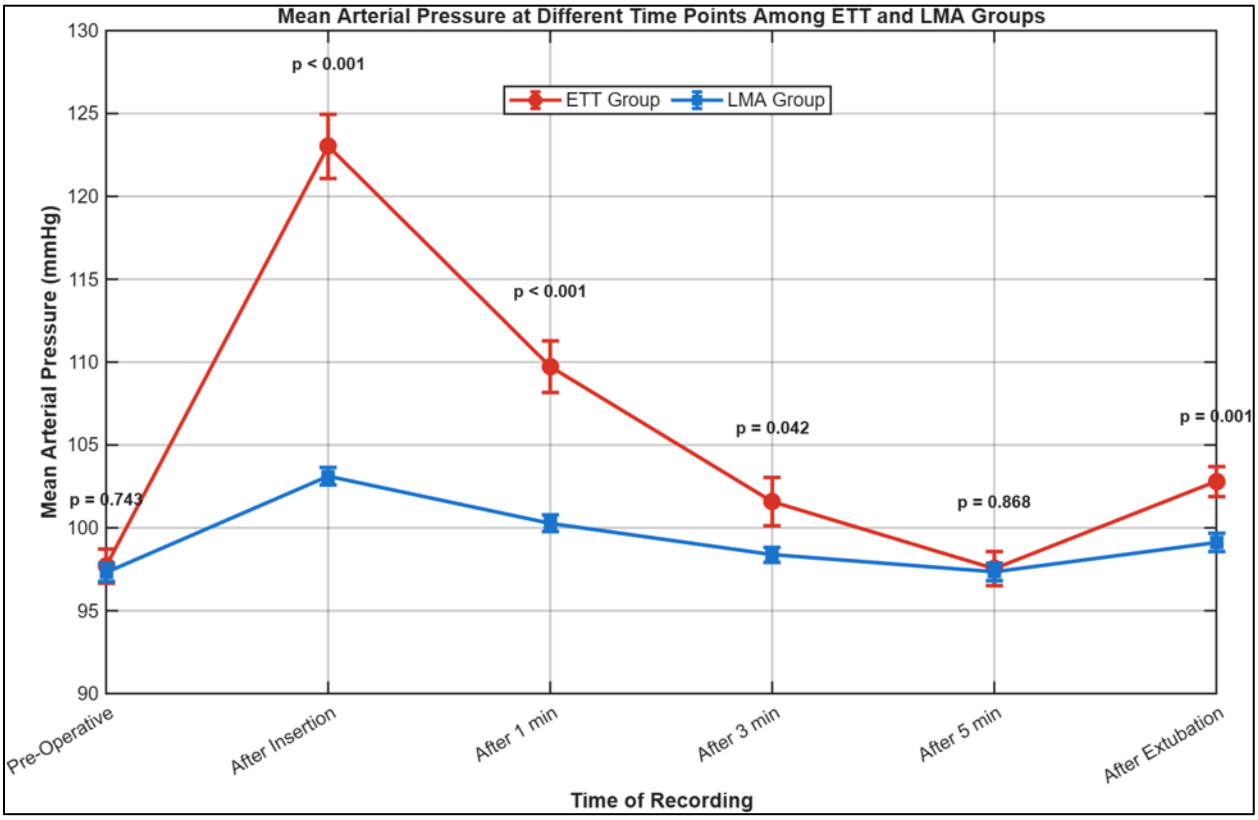

Figure 5 Mean Arterial pressure at different time points among ETT and LMA groups

The Incidence of Arrhythmias was noted in 4 patients (15.4%) in the ETT group, while none of the patients in the LMA group had arrhythmias at any time intervals analyzed. This trend was consistently observed in all evaluation periods, including pre-operative, immediately after the airway insertion, at 1 minute, at 3 minutes, at 5 minutes, and after the Extubation stage. In general, arrhythmias were seen in 4 (7.7%) patients out of the total of 52 patients, while 48 patients (92.3%) showed no evidence of arrhythmias. It is clear from the findings that arrhythmias occur only in patients undergoing surgery with ETT, whereas there were no arrhythmias in the LMA group. The information is shown in Table 5 below.

Table 5 Arrhythmias at different times among LMA and ETT Study Participants

Time of Recording of Arrhythmias	ETT (n=26) n (%)	LMA (n=26) n (%)	Total (n=52) n (%)
Pre-Operative Arrhythmias	4 (15.4%)	0 (0.0%)	4 (7.7%)
After Insertion	4 (15.4%)	0 (0.0%)	4 (7.7%)

Arrhythmias			
After 1 Minute Arrhythmias	4 (15.4%)	0 (0.0%)	4 (7.7%)
After 3 Minutes Arrhythmias	4 (15.4%)	0 (0.0%)	4 (7.7%)
After 5 Minutes Arrhythmias	4 (15.4%)	0 (0.0%)	4 (7.7%)
After Extubation Arrhythmias	4 (15.4%)	0 (0.0%)	4 (7.7%)

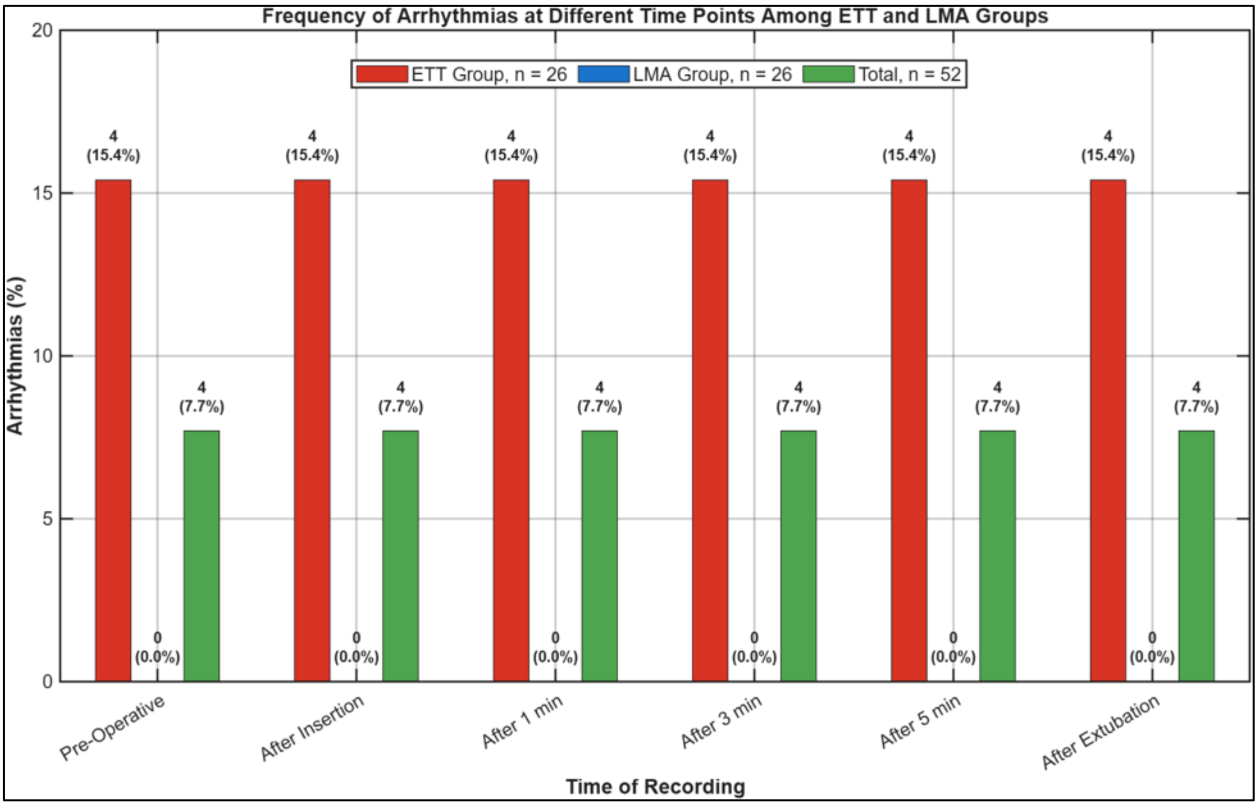

Figure 6 Frequency of Arrhythmias at different time points among ETT and LMA groups

4. Discussion

The purpose of this study is to investigate the changes in the hemodynamic status during ETT intubation or LMA insertion in burn patients under general anesthesia. Exaggerated sympathetic stimulation occurs during the burn and is a major risk for burn patients, due to increased release of catecholamines, hypermetabolism, and instability of the cardiovascular system. As such, it is important clinically to choose an airway device that is as hemodynamically benign as possible [29,32]. In the present study, an increase in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure was observed following the insertion of the airway in both techniques. However, In the ETT group, the change in hemodynamic response was much more obvious compared to the LMA group. There was a significant increase in heart rate following ETT intubation with high heart rates sustained up to 5 minutes post-intubation. The LMA group, on the other hand, demonstrated relatively small increases and earlier return to baseline. These results indicate that LMA insertion does not induce as much sympathetic stimulation to direct laryngoscopy and tracheal intubation [21,24]. The findings of the current study align with the study conducted by Aggarwal et al., in which less changes in HR and BP were recorded for the LMA group compared with the ETT group [33]. Likewise, Thomas et al., showed that LMA insertion during general anesthesia resulted in less hemodynamic fluctuation and cardiovascular stability [34]. Similar to this, Jarineshin et al., saw a significantly improved hemodynamic profile in patients who were managed with LMAs rather than endotracheal intubation [35].

This present study also showed that the LMA group had smaller changes in systolic blood pressure, diastolic blood pressure and mean arterial pressure with earlier stabilization after ETT insertion, while the ETT group had significant changes. Artifacts of exaggerated pressor response that has been observed with ETT can be explained by the sympathetic stimulation induced by laryngoscopy and tracheal irritation. Uddin et al. and Singh et al., also reported significantly higher hemodynamic responses with ETT than with LMA or ILMA technique [15,36]. However, another significant observation of the current study was the appearance of arrhythmias only in the ETT group, no arrhythmias were observed in the LMA group. This suggests that insertion of ETT could create a greater cardiovascular challenge for the burn patient. Previous studies which reported comparable results have found that airway stimulation during laryngoscopy was linked with elevated cardiac irritability and dysrhythmias [31]. From the overall results obtained from the current study, it can be concluded that LMA insertion causes improved hemodynamic stability, reduced cardiovascular fluctuations and reduced incidence of arrhythmias relative to ETT intubation. The findings from this study demonstrate that LMA is a safer airway device in patients with burns who require short-duration, surgical procedures under general anesthesia [35].

5. Conclusion

Concluding from the findings of the current study, it could be stated that insertion of Laryngeal Mask Airway caused significantly less hemodynamic stress response in burn patients under general anesthesia than Endotracheal Tube intubation. Patients who had been treated with LMA had lower increases in heart rate, systolic blood pressure, diastolic blood pressure, and mean arterial pressure, and earlier return to baseline values. Furthermore, arrhythmias were only seen in the ETT group. As such, LMA may be a safer and more hemodynamically stable airway management technique for selected burn patients for short elective surgical procedures

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Mangahas AM, Talugula S, Husain IA. Anesthesia considerations during management of airway stenosis: A systematic review. Am J Otolaryngol. 2023;44(2):23.

[2] Du W, Lv M, Chen T, Sun X, Wang J, Zhang H, et al. The effect of topical airway anesthesia on hemodynamic profiles during the induction period in patients undergoing cardiac surgery: Study protocol for a randomized controlled trial. Front Cardiovasc Med. 2022;9(992534).

[3] Jarineshin H, Kashani S, Vatankhah M, Abdulahzade Baghaee A, Sattari S, Fekrat F. Better Hemodynamic Profile of Laryngeal Mask Airway Insertion Compared to Laryngoscopy and Tracheal Intubation. Iran Red Crescent Med J. 2015;17(8).

[4] Pang N, Pan F, Chen R, Zhang B, Yang Z, Guo M, et al. Laryngeal mask airway versus endotracheal intubation as general anesthesia airway managements for atrial fibrillation catheter ablation: a comparative analysis based on propensity score matching. J Interv Card Electrophysiol. 2024;67(6):1377-90.

[5] Lakhe G, Pradhan S, Dhakal S. Hemodynamic Response to Laryngoscopy and Intubation Using McCoy Laryngoscope: A Descriptive Cross-sectional Study. JNMA J Nepal Med Assoc. 2021;59(238):554-7.

[6] Okyay RD, Küçükosman G, Köksal BG, Pişkin Ö, Ayoğlu H. Effects of Supraglottic Airway Devices on Hemodynamic Response and Optic Nerve Sheath Diameter: Proseal LMA, LMA Supreme, and I-gel LMA. Medicina. 2023;59(4):753.

[7] Bhushan D, Nandkumar S, Butani M. The Comparison Between Supreme Laryngeal Mask Airway and Endotracheal Tube With Respect to Adequacy of Ventilation in Patients Undergoing Laparoscopic Cholecystectomy Under General Anesthesia-A Prospective, Randomized, Double-Blind Study, and Comparative Study. Asian J Anesthesiol. 2022;1(60):1.

[8] Poudel H, Shrestha RS, Bawa S. Comparative Study of Cardiovascular Response to Laryngoscopy With Endotracheal Intubation and Laryngeal Mask Airway Insertion. Medical Journal of Pokhara Academy of Health Sciences. 2019;2(2):197-204.

[9] Buddhathoki C, Sharma RP, Raya PK, Hyoju SP. Hemodynamic Changes to Insertion of Various Airway Devices: A Comparative Study. One Health Journal of Nepal. 2025;5(10):14-22.

[10] Vijayarahavan N, Mahilamani P, Paramasivan A. Comparison of changes in haemodynamic parameters in hypertensive patients after laryngoscopic endotracheal intubation or laryngeal mask airway insertion. Indian Journal of Clinical Anaesthesia. 2025;7(1):8-11.

[11] Sant S, Agarwal A, Malhotra R, Dalal V. A Prospective Comparative Study of Hemodynamic Response to Proseal Lma Insertion versus Endotracheal Intubation. International Journal of Pharmacy Research & Technology (IJPRT). 2025;15(1):233-8.

[12] Mizrak A, Kocamer B, Deniz H, Yendi F, Oner U. Cardiovasular changes after placement of a classic endotracheal tube, double-lumen tube, and Laryngeal Mask Airway. Journal of clinical anesthesia. 2011;23(8):616-20.

[13] Shribman AJ, Smith G, Achola KJ. Cardiovascular and catecholamine responses to laryngoscopy with and without tracheal intubation. Br J Anaesth. 1987;59(3):295-9.

[14] Kanchi M, Nair HC, Banakal S, Murthy K, Murugesan C. Haemodynamic response to endotracheal intubation in coronary artery disease: Direct versus video laryngoscopy. Indian Journal of Anaesthesia. 2011;55(3):260-5.

[15] Singh N, Nagaraj A, Kumar S, Singh R. COMPARISON OF HEMODYNAMIC RESPONSES TO ENDOTRACHEAL INTUBATION WITH INTUBATING LARYNGEAL MASK AIRWAY AND DIRECT LARYNGOSCOPE IN ADULTS: A RANDOMIZED, PROSPECTIVE STUDY. Journal of Indira Gandhi Institute Of Medical Science. 2020;6(2):164-8.

[16] Sanatkar M, Goudarzi M, Soltani AE. The comparison of hemodynamic responses following laryngeal mask airway insertion versus tracheal intubation in hypertensive patients scheduled for elective ophthalmic surgery under general anesthesia. Acta Medica Iranica. 2019.

[17] Ranjith H, Pathak A, Warwantkar N, Maheshgauri R. Comparative Evaluation of Haemodynamic Response to Endotracheal Intubation with Intubating Laryngeal Mask Airway and Intubation with Macintosh Blade.

[18] Khan F. Haemodynamic response to tracheal intubation via intubating laryngeal mask airway versus direct laryngoscopic tracheal intubation. Journal of Pakistan Medical Association. 2007.

[19] Zhang G-h, Ping L. Comparative study of hemodynamic responses to orotra-cheal intubation with intubating laryngeal mask airway and direct laryngoscope. Chinese Medical Journal. 2006;119(11):899-904.

[20] Brimacombe J, Berry A. The laryngeal mask airway-anatomical and physiological implications. Acta anaesthesiologica scandinavica. 1996;40(2):201-9.

[21] Wilson I, Fell D, Robinson S, Smith G. Cardiovascular responses to insertion of the laryngeal mask. Anaesthesia. 1992;47(4):300-2.

[22] Abid R, Chaudry T, Abbas G, Majeed M, Shoaib M, Shahbaz A. Comparative Study of Airway Management Devices: ETT vs LMA. Journal of Health, Wellness and Community Research. 2025:e369-e.

[23] Montazari K, Hashemi KNS. Comparison of hemodynamic changes after insertion of laryngeal mask airway, facemask and endotracheal intubation. Acta Medica Iranica. 2004:437-40.

[24] Tabari M, Alipour M, Ahmadi M. Hemodynamic changes occurring with tracheal intubation by direct laryngoscopy compared with intubating laryngeal mask airway in adults: A randomized comparison trial. Egyptian Journal of Anaesthesia. 2013;29(2):103-7.

[25] Uddin SS, Khan MA, e Karim SF. COMPARISON OF HEMODYNAMIC RESPONSES TO USE OF LARYNGEAL MASK AIRWAY VERSUS ENDOTRACHEAL TUBE IN HYPERTENSIVE PATIENTS. Pakistan Armed Forces Medical Journal. 2012(3):51.

[26] Harun-Or-Rashid M, Meftahuzzaman A, Islam M, Aktaruzzaman A. Comparative Study of Haemodynamic Changes between Endotracheal Intubations and LMA Insertion. Journal of the Bangladesh Society of Anaesthesiologists. 2006:28-32.

[27] Saha SC, Islam KS, Seraji SI, Hoque MZ, Hossain AD. Comparison of Laryngeal Mask Airway and Endotracheal Tube for Airway Management in Adults.

[28] Abidin Z, Wadood R, Ahmed N, Abbasi T, Ullah A, Khan I. Comparative study of hemodynamic. 2023.

[29] Williams FN, Herndon DN, Jeschke MG. The hypermetabolic response to burn injury and interventions to modify this response. Clin Plast Surg. 2009;36(4):583-96.

[30] Abu-Sittah GS, Sarhane KA, Dibo SA, Ibrahim A. Cardiovascular dysfunction in burns: review of the literature. Ann Burns Fire Disasters. 2012;25(1):26-37.

[31] Prasad AK. Randomized Comparative Study of Heamodynamic Responses to Insertion of Laryngeal Mask Airway and Endotracheal Tube. Age (in years).20(29):30-9.

[32] Karamchandani K, Khawaja A, Chaney W, Bangalore R, Myatra SN. The Pharmacology of Physiologically Difficult Airway Management and Impact on Hemodynamics: A Review. Indian Journal of Critical Care Medicine. 2026;30(1):68-76.

[33] Aggarwal YK. Comparative Analysis of Laryngeal Mask Airway Versus Endotracheal Intubation on Hemodynamic Response During General Anaesthesia

[34] Thomas JT, Sankaranarayana SP, Manjuladevi M. Comparison of the Hemodynamic Responses with Laryngeal Mask Airway vs Endotracheal Intubation in Adults undergoing General Anesthesia for Elective Surgeries. The Journal of Medical Sciences. 2017;3(3):69-75.

[35] Jarineshin H, Kashani S, Vatankhah M, Baghaee AA, Sattari S, Fekrat F. Better hemodynamic profile of laryngeal mask airway insertion compared to laryngoscopy and tracheal intubation. Iranian Red Crescent Medical Journal. 2015;17(8):e28615.

[36] Uddin B, Talukder MH, Ahmed M, Hossain KS, Ahmed F. Hemodynamic Changes Between Endotracheal Intubation And Laryngeal Mask Airway Insertion. Glob Acad J Med Sci. 2022;4.