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Comparitive Study of Intubating Laryngeal Mask Airway and Macintosh Laryngoscope for Intubation

[1]Amrita Nandi, [2]Rakesh singh and [3]Deepika sathe
[1-3]Department of MGM medical collage kamothe, Navi Mumbai, MH. India

Abstract

Airway management is critical during general anesthesia as anesthetized patients cannot maintain an adequate airway independently. Traditional methods like direct laryngoscopy (DLS) and endotracheal intubation, though effective, are associated with significant hemodynamic responses and potential complications. The Intubating Laryngeal Mask Airway (ILMA) offers a promising alternative, potentially minimizing these adverse effects. This randomized, prospective, double-blinded study included 60 patients aged 18-60 years, ASA grade 1 and 2, scheduled for surgery under general anesthesia. Patients were divided into two groups: one intubated using ILMA and the other using DLS with a Portex cuffed endotracheal tube. The ease of intubation, intubation time, success rate, hemodynamic responses upper airway morbidity were assessed. Hemodynamic parameters, including systolic and diastolic blood pressure (SBP, DBP) and heart rate (HR), were recorded at baseline, post-intubationat 1, 35 minutes intervals. Upper airway morbidity was evaluated postoperatively at 2 and 24 hours. The mean age was 32.23 years in the ILMA group and 34.3 years in the DLS group. The groups were comparable in demographic characteristics. Tracheal intubation success rates were 100% in both groups, with 90% first-attempt success in the DLS group and 83.3% in the ILMA group. The mean intubation time was significantly longer for the ILMA group (63.66±14.10 seconds) compared to the DLS group (21.63±3.61 seconds). Both groups exhibited increased SBP, DBPHR immediately post-intubation, with no significant differences between groups. However, MAP and DBP were significantly higher in the DLS group at 5 minutes post-intubation. The ILMA group showed a higher incidence of swallowing difficulty postoperatively, but other complications such as sore throat and hoarseness were similar between groups. The ILMA offers comparable ease of intubation and success rates to DLS but requires a longer intubation time and is associated with higher incidences of certain postoperative complications. While ILMA may be advantageous in minimizing hemodynamic responses, further studies are needed to optimize its use and reduce associated morbidity.

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Key Words
Airway management, intubating laryngeal mask airway, direct laryngoscopy, hemodynamic response, postoperative complications

Corresponding Author
Rakesh singh,
Department of MGM medical collage kamothe, Navi Mumbai, MH. India

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INTRODUCTION

Effective airway management is crucial during general anesthesia as anesthetized patients cannot maintain an adequate airway independently. Traditional methods like laryngoscopy and endotracheal intubation ensure airway patency, prevent aspiration deliver anesthetic gases, but they are associated with complications such as airway trauma, hypoxia, tachycardia, hypertension, laryngos pasmnegative pressure pulmonary edema[1,2]. These procedures provoke a sympathetic response, leading to transient hypertension and tachycardia, potentially causing severe issues like ventricular failure, arrhythmias, myocardial ischemia, cerebral hemorrhage aneurysm rupture in susceptible patients[3,4,5,6].

Various methods to mitigate these hemodynamic changes include minimizing laryngoscopy duration, using intravenous narcotics, lidocaine, vasodilatorsbeta-blockers, though results vary[6]. The Intubating Laryngeal Mask Airway (ILMA) offers a high success rate for tracheal intubation without laryngoscopy, causing fewer cardiovascular effects[7,8,9]. However, studies comparing the hemodynamic and endocrine stress responses of ILMA and direct laryngoscopy (DL) are conflicting[10,11].

Airway management is vital for safe anesthesia delivery. The primary method in our setting is laryngoscopy and endotracheal intubation, which can cause hypertension and tachycardia, potentially dangerous for patients with cardiovascular or cerebrovascular issues, leading to complications such as ventricular failure, arrhythmias, myocardial ischemia, cerebral hemorrhage aneurysm rupture[3,4,5]. Although ILMA has gained global popularity for causing less hemodynamic disturbance and easier insertion compared to endotracheal tubes[6,7], it is not widely used in our setting.

Despite numerous studies comparing the hemodynamic changes associated with laryngoscopy and intubation versus laryngeal mask airway insertion, no such study has been conducted at MGM Medical College, Navi Mumbai. Laryngoscopy and endotracheal intubation remain the primary methods for airway management, despite their complications in patients with cardiovascular and cerebrovascular diseases[3,4,5]. ILMA, though not commonly used here, has shown positive effects on hemodynamic stability and ease of insertion in other populations.

This study aims to improve patient care quality by comparing the hemodynamic responses of laryngoscopy and endotracheal intubation versus laryngeal mask insertion in our population, focusing on ease of intubation, intubation time, hemodynamic responses upper airway morbidity.

MATERIALS AND METHODS

Approval was obtained from the hospital's academic and ethics committee informed consent was secured from 60 patients enrolled in the study. Participants were aged 18-70 years, ASA grade 1 and 2scheduled for surgery under general anesthesia. They were divided into two groups: the study group, intubated using the Intubating Laryngeal Mask Airway (ILMA)the control group, intubated using a Portex cuffed endotracheal tube with direct laryngoscopy. This randomized, prospective, double-blinded study included patients aged 18-70 years, ASA grade 1 and 2, while excluding those who did not give consent, were ASA grade 3 and 4, had severe respiratory disease, were at risk of regurgitation/aspiration, or were pregnant. Patients were randomly assigned to one of the two groups using a standard randomization code. On arrival in the anesthetic room, an 18-G intravenous access was secured patients were premedicated with Midazolam 0.01 mg/kg IV, Ranitidine 50 mg IVOndansetron 4 mg IV. Baseline values were recorded using automated monitors for blood pressure, pulse rate, oxygen saturation electrocardiograph. Fentanyl 2 µg/kg was administered 4 minutes before induction, followed by Propofol 2 mg/kg and Vecuronium 0.08 mg/kg for induction and intubation. In the ILMA group, an appropriately sized ILMA (size 4 for men >75 kg, size 3 for women and men <75 kg) was inserted using a one-handed rotational movement with the head supported by a pillow. The mask was fully deflated, lubricated inserted following the arc of the palate and the posterior pharyngeal wall, with the cuff inflated with 20-30 ml of air. Ventilatory ability was confirmed by chest wall movement and capnography. If necessary, adjustments were made. A lubricated endotracheal tube (sizes 7.0, 7.5, or 8.0 mm) was then inserted through the ILMA, with placement confirmed by capnography. If resistance was encountered or esophageal intubation occurred, adjustments were made. If intubation failed after three attempts, conventional laryngoscopy was used. In the DLS group, direct laryngoscopy was performed with a Macintosh laryngoscopeintubation was done with a cuffed endotracheal tube of appropriate size with the head and neck in a neutral position. In both groups, anesthesia was maintained with nitrous oxide, oxygen, isofluraneve curonium, with supplemental analgesia provided by IV paracetamol 1000 mg over 15 minutes. At the end of the surgery, neuromuscular blockade was reversed with glycopyrrolate (0.008 mg/kg) and neostigmine (0.05 mg/kg)extubation was performed.

RESULTS AND DISCUSSIONS

The study included patients aged 18-60 years. The mean age in the ILMA group was 32.23 years, while in the DLS group, it was 34.3 years. Out of 60 patients, 27 were males and 33 were females. The groups were comparable as indicated by the student 't' test p-value.

Mallampati Class Distribution: The distribution of patients into the four Mallampati classes showed no statistical difference between the two groups (P>0.05).

Tracheal intubation was successful in all patients in both ILMA and DLS groups. In the DLS group, 27 patients (90%) were intubated on the first attempt3 patients (10%) on the second attempt. In the ILMA group, 25 patients (83.3%) were intubated on the first attempt5 patients (16.7%) on the second attempt. Statistical analysis showed no significant difference (Pearson Chi-Square p = .448, Fisher's Exact Test p = .706).

Heart Rate: The incidence of postoperative palatopharyngeal morbidity was assessed on five parameters at 2 and 24 hours postoperatively. The p-values for each complication were calculated based on the total number of patients experiencing each complication:

The results indicate some differences in postoperative complications, with specific statistical significances highlighted.

Tracheal intubation remains the gold standard for securing the airway and providing oxygenation and ventilation. The laryngeal mask represents a significant advancement in airway management the relatively recent introduction of the Intubating Laryngeal Mask Airway (ILMA) addresses limitations of the LMA by acting as both a ventilatory device and a guide for blind intubation[3,9].

Laryngoscopic stimulation of or opharyngolaryngeal structures significantly contributes to the hemodynamic stress response associated with tracheal intubation, potentially precipitating adverse cardiovascular events in patients with and without cardiovascular conditions[10,11]. The ILMA offers a new approach for or otracheal intubation, expected to produce less cardiovascular response[11,12].

Both direct laryngoscopy and endotracheal intubation induce cardiovascular reactions due to reflexive responses and the physiological presence of the endotracheal tube[11,12]. However, controlled studies on ILMA regarding hemodynamic responses are limited due to its relatively recent introduction[13,14].

Our study assessed the ease of intubation by recording the number of attempts and manipulation degree needed. Intubation on the first attempt was successful in 90% of patients in the DLS group and 83.3% in the ILMA group. Four patients in the ILMA group and three in the DLS group required a second attempt, with one patient in the ILMA group needing a third attempt. These results show comparable ease of intubation between both groups.

Manipulation of the ILMA handle directly affects the inflatable cuff's position in the airway, consistent with previous studies assessing ILMA alignment fiber optically before intubation[14]. The success rate was 100% in both groups, comparable to previous studies reporting success rates ranging from 93% to 97%[3,8,10,14].

The mean intubation time was 63.66±14.10 seconds for the ILMA group and 21.63±3.61 seconds for the DLS group, indicating longer intubation times with ILMA. This longer time can be attributed to the multi-step ILMA-guided intubation process and less familiarity with the device compared to DLS[12]. Similar studies have also concluded that DLS is faster for securing endotracheal intubation in the absence of difficulties[12].

Both groups exhibited increased systolic and diastolic blood pressure (SBP, DBP) and heart rate (HR) immediately and at 1 and 3 minutes post-intubation. This variation was statistically insignificant between

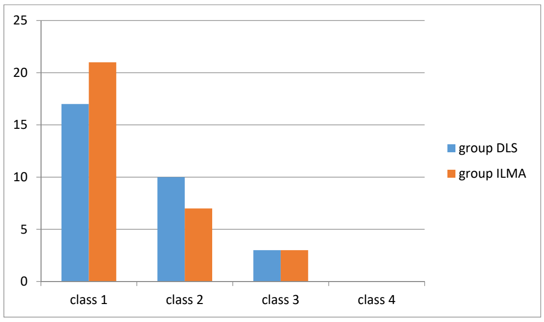

Fig: 1: Mallampati Class Distribution

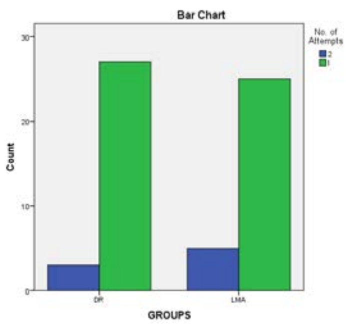

Fig: 2: Bar diagram showing number of attempts of intubation in both groups

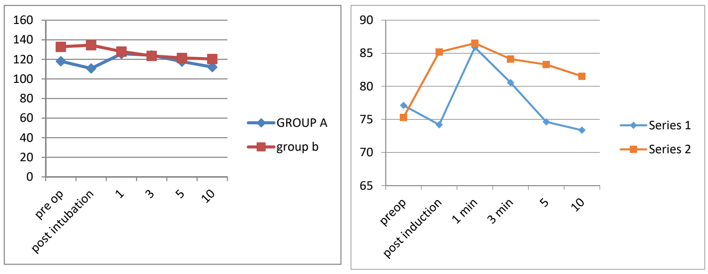

Fig. 3: Row diagram showing Diastolic and systolic blood pressure change with respect to time

Table 1: Association of number of attempts of intubation in both groups.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.577[a]	1	.448		
Continuity Correctionb	.144	1	.704		
Likelihood Ratio	.582	1	.445		
Fisher's Exact Test				.706	.353
N of Valid Cases	60				

Table 2: The mean heart rate (HR) changes over various time intervals are shown below

Time Interval	Pre-op HR	After Sedation HR	HR 1	HR 3	HR 5	HR 10
Mean (N = 30)	76.93	85.80	89.70	85.03	81.90	77.23
Standard Deviation	8.626	8.240	8.103	7.650	7.531	6.951

Table 3 : Upper Airway Morbidity and its association in both groups

Complication	Time (hours)	ILMA	DLS	p-value
Sore throat	2	10	11	.02962
	24	2	4	
Hoarseness	2	9	10	.5541
	24	3	4	
Sore mouth	2	6	8	.3173
	24	1	2	
Sore jaw	2	4	2	.25
	24	0	0	
Swallowing difficulty	2	10	19	.019
	24	9	13	

groups, aligning with other studies[15]. However, our study demonstrated significantly higher mean arterial pressure (MAP) and DBP at 5 minutes in the DLS group compared to the ILMA group.

Previous research has shown that ILMA intubation results in less hemodynamic stress response compared to direct laryngoscopy[10]. Similar to our findings, these studies observed a more significant increase in mean blood pressure at 5 minutes between ILMA and tracheal intubation.

In our study, upper airway morbidity, assessed postoperatively at 2 and 24 hours, showed a higher incidence of swallowing difficulty in the ILMA group, likely due to higher mucosal pressure from the ILMA cuff. Incidences of sore throat and hoarseness were similar between groups, with no correlation between intubation attempts and mucosal injury in the ILMA group. Overall, airway injury was more common with ILMA, possibly due to high mucosal pressures or easier detection of bleeding.

CONCLUSION

This study compared the Intubating Laryngeal Mask Airway (ILMA) with direct laryngoscopy (DLS) in terms of ease of intubation, intubation time, success rate, hemodynamic responses upper airway morbidity. The ILMA provided comparable success rates and ease of intubation to DLS but required a longer intubation time. Both techniques resulted in similar hemodynamic responses, although the ILMA showed slightly better performance in minimizing hemodynamic stress at the 5-minute mark post-intubation. The incidence of certain postoperative complications, such as swallowing difficulty, was higher with the ILMA, likely due to higher mucosal pressure.

The study's limitations include its relatively small sample size, which may limit the generalizability of the findings. Larger studies are needed to confirm these results. Conducted at a single institution, the findings may not be applicable to all clinical settings multi center trials would provide more comprehensive data. The study focused on immediate and short-term outcomes post-intubation, with long-term effects and complications not assessed.

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