Original Article

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General Anesthesia in Day-Case Surgery by Laryngeal Mask Airway

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ABSTRACT

Background: *In the recent few years some unwanted catastrophic complications developed in day-case surgery due to uneven airway management. Most of them fail to maintain proper airways. Laryngeal Mask Airway (LMA) provides a reliable airway during general anesthesia without serious complications and in some cases may not need muscle relaxants for insertion and may thus be considered a suitable alternative for tracheal tubes. The difficult airway is a nightmare situation for anesthesiologists and the scenario has changed with the introduction of LMA. To assess the outcome of General Anesthesia in day-case surgery by LMA (Laryngeal Mask Airway) this study was done.*

Materials and methods: *150 patients were randomly selected for day case surgery in Institute of Applied Health and Sciences (IAHS) Hospital and Chevron Eye Hospital and Research Center, Chattogram during the period April 2018 to May 2024. The number of attempts and time taken for successful placement to achieve effective ventilation were recorded. Hemodynamic parameters, quality of recovery score and ventilation (Regarding the audible leak, chest movement, tidal volume loss, requirement of manipulation) and complications were recorded.*

Results: *150 patients were selected for the study. It was observed that LMA could be successfully placed in the first attempt in 83.33% and 2nd attempt in 15.3% cases. Failed insertion was recorded in 1.3% cases due to the inappropriate size of LMA and the deformity of the patient's face. The overall time of insertion of LMA was within 20 to 25 seconds in 93% of cases and 25 to 30 seconds in 2nd attempt to compare of quality of ventilation in terms of audible air leak over the mouth after achieving a cuff pressure of 60 cm of H_2O with the recommended volume of air. It was found that the audible leak was found in some cases which was corrected by a little more pressure from the recommended pressure. Qualities of ventilation in terms of chest movement were found good in most of the cases, 96% were statistically insignificant. Tidal volume loss was found in only a few patients which was found due to lower inspiration pressure. The sore throat was found in 5 cases , Gastric insufflation was noted in 4 cases, regurgitation in 1 case. Hoarseness was not found in this study.*

Conclusion: *After considering satisfactory first-attempt insertion success rate, easy diagnosis of misplacement, less hemodynamic changes, better quality of ventilation and less postoperative morbidity, it can be concluded that LMA is a better option for airway management in day-case surgery.*

Key words: Day-case surgery; General anesthesia; Laryngeal mask airway.

Introduction

The Laryngeal Mask Airway (LMA) is an effective replacement for the tracheal tube as it offers a dependable airway during general anesthesia without the requirement for major problems. In certain cases, muscle relaxants may not even be necessary for insertion. LMA and the spontaneous breathing technique have also been demonstrated to be safe when used for general anesthesia while being monitored by a capnograph.[1] Except for one instance of regurgitation without aspiration right before LMA extraction, no incidences of stomach regurgitation were documented. The anesthesiologist still faces challenges when it comes to safe airway management.[2] Direct laryngoscopy and endotracheal intubation are considered to be the safest way to safeguard the airway but life-threatening situations like failure to intubate, difficult to intubate and inability to ventilate situations may occur to anyone, anywhere and anytime. LMA has been introduced since 1981 and has changed these scenarios from cannot intubate, and cannot ventilate to can't intubate, and cannot ventilate.[3] Aptly named Supraglottic airway device it is placed in the hypopharynx above the vocal cords and can be successfully positioned without a direct view of the

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glottis opening, making it useful in challenging intubation scenarios.[4,5] Due to the lower seal pressure, increased frequency of gastric insufflations and increased risk of aspirating gastric contents, classical LMA is not as beneficial as the tracheal tube. As a result, modified LMA designs have been developed to allow for the separation of the respiratory and gastrointestinal tracts, enhance the airway seal, enable controlled ventilation and identify mask misplacement. There were no reports of nausea, laryngospasm, dysphasia or hoarseness.[6,7,8]

Materials and methods

This study was conducted in Institute of Applied Health Sciences Hospital Chattogram and Chevron Eye Hospital and Research Center, Chattogram during the period from April 2018 to May 2024. After all proper clearance, randomly selected 150 patients were included for the study, patients aged 6 months (.5yrs) to 50 years and above. American Society of Anesthesiology (ASA) status I and II. Those excluded were of ASA grade > 2, most of them were routine and few were emergency cases. Pre-anesthetic checkup was done before the day of surgery. All patients were found within ASA grades I and II, a few patients had H/O Upper Respiratory Tract Infection (URTI) and lower respiratory tract infection. But it was corrected by proper premedication by the respective physician. Few patients were found with Ventricular septal defect (VSD) but clinically were normal. Among the selected 150 patients, 70 patients were in Ophthalmic surgery, 25 in pediatric surgery, 15 ENT, General surgery 8, Orthopedic surgery -15, Gynaee and Obs - 9 and Urology- 8 casese.

Type of Surgery

Ophthalmic Surgery: Pediatric cataract, congenital cataract with rubella syndrome, cataract with Down syndrome, probing due to nasolacrimal duct block, squint correction, Trabeculectomy, Tab and Tab for Glaucoma and adult cataract surgery with psychological imbalance patient.

Pediatric Surgery: Circumcision, Rectal polyp excision, Inguinal herniaand hydrocyl, tongue tie, Examination (EUA)

Gynaee and Obs: Excision of cervical polyp/ biopsy, EUA with cauterizations, Bartholine cyst and abcess, secondary suture.

ENT: Tongue tie, impacted foreign body in ear and nose.

Orthopedic Surgery: Close reduction and immobilization, nail and plate removal, amputation, small skin grafting.

General Surgery: EUA, Rectal Polyp, fibro adenoma of breast, breast abcess and drainage of glutealabcess, anal sinus.

Urology: Dilatation of stricture urethra, removal of urethral stone, bladder stone and cystoscopy.

On the day of the operation, patients were shifted to the operation theatre and standard routine monitors were attached like continuous electrocardiography, noninvasive blood pressure and oxygen saturation with pulse oximetry and baseline values were recorded. Intravenous access was established and Baby saline or Heart man solution was started. All patients received premedication of injection Glycopyrrolate 0.2mg IV, injection Midazolam (Except extreme age) Induction agent- most of the pediatric patients inducted by inhalation method by Savofluthane / Halothane mostly, rest of the patient by IV induction agent propofol and thiopental sodium.

Method of LMA insertion- following four methods applied for insertion of LMA-

i) Induction with Inhalation agent + suxamethonium (1-1.5mg) then insertion of LMA is the most useful method. It provides sufficient time to secure LMA in position for all patients.

ii) Induction with inhalation agent then uses of propofol (2.5 to 3.5mg) /thiopental sodium (5mg/kg). Here need quick insertion of LMA for ages more than 10 years to adult.

iii) Induction by IV Induction agent IV propofol /thiopental (Normal induction dose) plus IV Fentanyl .3 Micro gm and without suxamethonium. Here need quick insertion of LMA.

iv) Induction by IV Induction agent propofol /thiopental sodium with normal induction dose with suxamethonium. It provides sufficient time to secure LMA in position.

Type of Breathing-

i) Spontaneous ventilation.

ii) Control ventilation – a. Volume control.

b. Pressure control.

Spontaneous breathing applied most of the short case in short duration of operation.

Patients were pre-oxygenated for 3-5 minutes and then induced with intravenous propofol 1.5 to 2.5 mg/kg or Inj. Thiopental sodium @ 5 mg/kg body weight or induced byinhalation technique by Savofluthane or Halothane followed by inj. Suxamethonium 1.0 to 1.5 mg/kg.Then patients were ventilated with 100% oxygen for 2 to 3 minutes via facemask using a close circle system at 14-16 breaths per minute. LMA devices were introduced in a supine position in a standardized manner. This was introduced by using a digital method following successful insertion of the device. Patients were maintained with 66% N_2O in oxygen and

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Savofluthane 2 to 4% vol or Halothane 1 to 1.5% of vol with closed circle system at 14-16 breaths per minute and tidal volume 6 to 10 ml/kg. After the return of spontaneous circulation, some patients were maintained by spontaneous breathing Bain Circuit.

But in the case of control ventilation, inj-Atacuranium .5 mg/kg body weight or inj. Vecuronium bromide 0.1 mg/kg for a neuromuscular blockade and close or semi-close circuit in mechanical ventilation. In spontaneous respiration, no reversal is needed and patient may extubated deeply (Mostly ophthalmic surgery) or awake away. In case of the use of macule relaxation reversal drugs, inj-neostigmine and atropine were used.

Heart rate, noninvasive blood pressure, Saturated pressure of oxygen (SpO_2) and any complication if found were recorded intraoperatively. Hemodynamic parameters like pulse rate and systolic and diastolic blood pressure were recorded immediately before induction (Control) and subsequently at 1 min, 3 min, 5 min, 7 min and 10 min following successful device placement. Ventilation was considered adequate if there were no leaks and the preset tidal volume of 10 ml/kg with 33% oxygen achieves good chest movement, SpO_2>98%. Tidal volume loss was detected by inspiratory expiratory volume on the ventilator display screen. Manipulation like an increase in cuff volume for the achievement of effective seal pressure was also recorded. Any intra-operative and postoperative complications like sore throat, hoarseness or dysphasia were recorded. Statistical analysis was done.

Table I LMA Sizes Children[9]

	LMA Sizes Children	
LMA Size	Appropriate weight (Kg)	Cuff Volume (mL)
1	<5	2-5
1.5	5-10	3-8
2	10-20	5-10
2.5	20-30	10-15
3	30-50	15-20
4	50-70	25-30

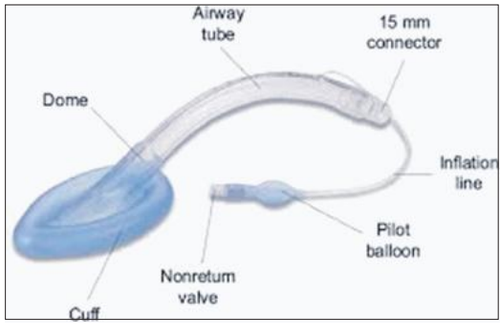

Figure 1 The Shiley™ laryngeal mask with integrated inflation tube and airway shaft[10]

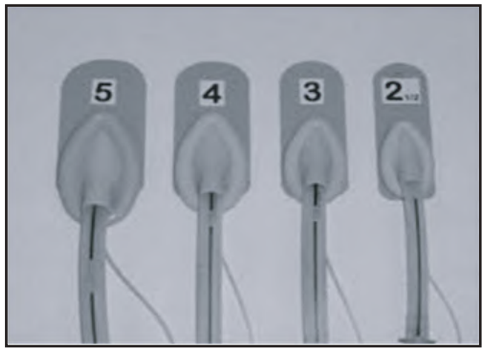

Figure 2 The four rulers and the corresponding classic laryngeal mask airways with minimal cuff inflation[11]

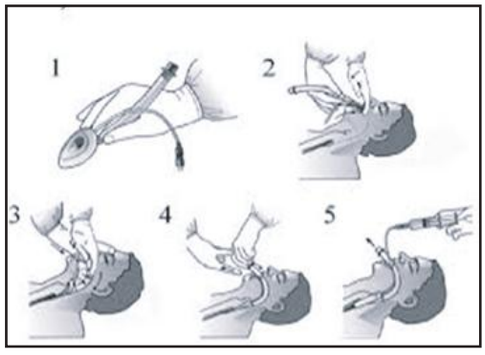

Figure 3 Insertion of Laryngeal mask airway[12]

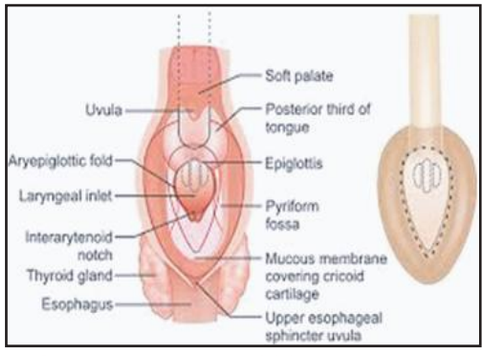

Figure 4 Posterior view of the LMA in the proper position in the pharynx (The Laryngeal Mask Company Limited, 2008-Image courtesy of LMA North America, Inc)

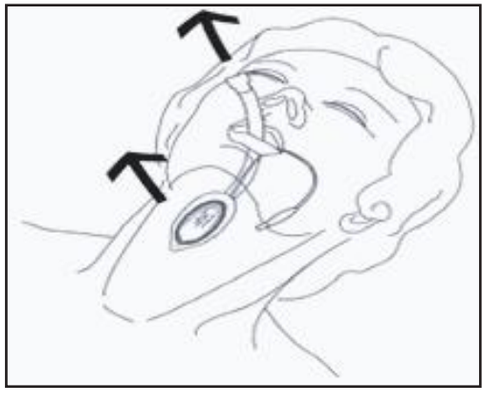

Figure 5 Inserting a Classic LMA, finger position matters[13]

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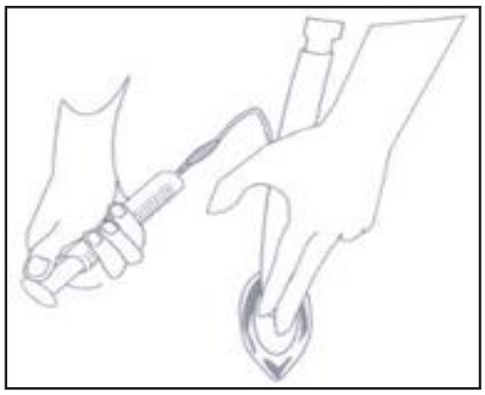

Figure 6 Deflate the LMA cuff by pressing against a firm surface, avoiding the formation of wrinkles that can cause malpositioning[13]

Results

Table I Demographic profile (n=150)

Demographic profile		n (150)	p Value
Age Distribution (Year)			
	>5	30	> 0.05
	5-10	32	
	10-20	38	
	20+	50	
Gender Distribution			
	Male	95	p > 0.05
	Female	55	
Weight (Mean±SD) Kg		24.97 ± 4.1	p > 0.05
ASA			
	Grade 1	85	p > 0.05
	Grade 2	65	
Mallampati grade			
	Class 1	85	>p.05
	Class 2	65	

Table I shows that 150 patients were taken according to the study and demographic profile like gender distribution, ASA physical status and Mallampatti grading of patients were considered.

Table II Quality of insertion of LMA (n =150)

Quality of insertion:		LMA
Attempts needed for the successful placement of LMA:		
	1st attempt	125 (83.33%)
	2ndattempt	23(15.33%)
	Failed	2 (1.33%)

Table II shows that LMA could be successfully placed in the first attempt in 83.3% and 2nd attempt in 23(15.33%) cases. It was noted that 3rd attempt was necessary for device insertion in 3.3%. Failed insertion was recorded in2(1.33%) (Table II). It was observed that the mean time to place the airway device in LMA was 20.78 seconds.

Table III Quality of ventilation (n=150)

Quality of ventilation	n(%)	%
Audible leak present	7	4.66%
Inadequate chest movement	4	2.66%
Tidal volume loss > 30%	5	3.33%
Adequate quality of ventilation	130	86.67%
Inadequate quality of ventilation	4	2.66%

Table III shows that on comparison of the quality of ventilation in terms of audible air leak over the mouth after achieving a cuff pressure of 60 cm of H_2O with the recommended volume of air. It was found that the audible leak was significantly higher (4.66%, 7 patients). Qualities of ventilation in terms of chest movement were found good in most of the cases 130(86.6%). Inadequate chest movementwas 4 cases (2.66%) statistically insignificant. Tidal volume loss was found 5 casess (3.33%) respectively. These entire problem corrected by proper re-positioning of LMA, increasing air pressure and volume. After considering all the parameters of ventilation in this study, it was found that ventilation was adequate and satisfactory for any of the procedures.

There was a significant change in heart rate and blood pressure immediately after insertion of LMA .It was found when induction dose was not adequate and mostly when LMA insertion was done without suxamethonium macule reluctant.

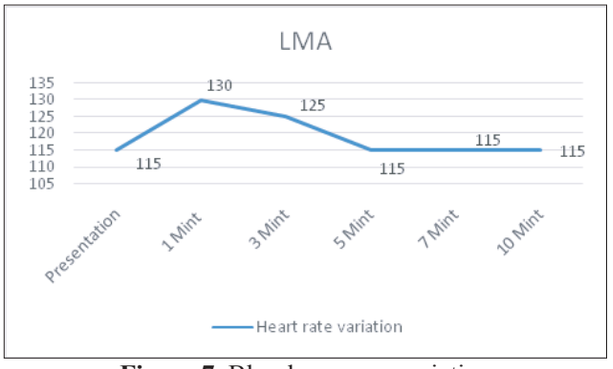

Figure 7 Blood pressure variation

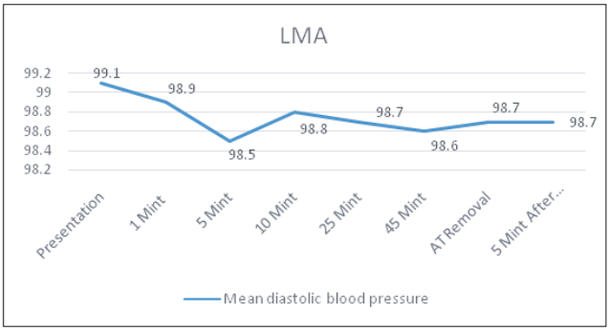

Figure 8 Mean diastolic blood pressure in different times

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Discussion

Laryngeal Mask Airway LMA now is becoming more popular in the world, especially in day-to-day cases of surgery. This Supraglottic airway device has become essential in airway management, filling a niche in the face and tracheal truth in terms of both anatomical position and degree of invasiveness.[14,15] The introduction of LMA improves the airway seal and enables controlled ventilation at higher seal pressure.[11] It was observed that LMA could be successfully placed in the first attempt in 83.3% and 2nd attempt in 23(15.33%). It was noted that 3rd attempt may be needed in some cases. Failed insertion was recorded in 1.33%. It was observed that the mean time to place the airway device in the LMA group was 20.78 seconds.[17-19] LMAs come in many forms and configurations. Failure in LMA placement in 2 patients can be explained by the soft tissue resistance due to falling back of the tongue against the posterior pharyngeal wall and deformity of the face due to some congenital malformation like Down syndrome.[20,21] It was also found first attempt success rate was higher in LMA 91%. There was an extremely significant increase in the heart rate and blood pressure compared to the pre-insertion values, immediately after placement of the device. This increase in heart rate and blood pressure persisted for 1 minute and the increase continued for 3 min after which the heart rate and blood pressure returned to near pre-insertion values. Oxygen saturation was well maintained throughout the procedure.[22,23] It was also observed that hemodynamic responses after the insertion of LMA were minimal.[24] Russo, Sebastian G. et al. observed an increase in heart rate by 9.3±2.3 after insertion of LMA.[25] We observed that despite steady maintenance of SpO_2>98% in some cases, there were leaks that were detected by audible sound over the mouth by the stethoscope. In the LMA, leak was detected in 4.66% (7) patients . In all these cases there was a requirement of manipulation along with an increase in the cuff volume. There were 4 cases of gastric insufflations and 2 cases of regurgitation in the classic LMA. In the present study, sore throat was the most common postoperative morbidity recorded. However, the incidence of sore throat in classic LMA was 16.6%. The incidence of hoarseness in this study was also higher in Classic LMA 6.7%. Nowadays lot of modifications of classic LMA are available like I gel and prosealLMA, all are modified but functionally the same with more safety level.

Conclusion

After considering of satisfactory first-attempt insertion success rate, easy diagnosis of misplacement, less hemodynamic changes, better quality of ventilation, and less postoperative morbidity, it was concluded that anesthesia with LMA is a better option for airway management in experienced hands and especially for day-case surgery.

Disclosure

The authors declared no conflicts of interest.

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