EXPERIENCE WITH THE LARYNGEAL MASK AIRWAY IN ANAESTHESIA

Lt Col PM VELANKAR*, Col P PAI+,
Surg Lcdr A DUTTA#, Dr MARY SAMUEL**

(Departments of Anaesthesiology, Armed Forces Medical College & Command Hospital (Southern Command), Pune).

ABSTRACT

Laryngeal mask airway was used in 100 adult patients of either sex (ASA I/II) undergoing various surgical procedures. The duration of surgery varied from 17 to 145 minutes. The course of anaesthesia was smooth and uneventful in all cases. The failure rate of insertion of LMA was 7%. The overall incidence of complications was 12%. LMA insertion was associated with statistically insignificant change in haemodynamic parameters.

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KEY WORDS : Anaesthesia; Equipment; Laryngeal mask airway.

Introduction

The laryngeal mask airway (LMA) was invented by the British anaesthesiologist Dr Archie Brain in 1981 and was made available commercially in 1988 [1]. It is the most significant advance in airway management since the endotracheal tube (ETT). Now it has been accepted as an alternative to the face mask, the oropharyngeal airway, and the ETT, during anaesthesia as well as resuscitation. It is inserted blindly into the pharynx and, when the cuff is inflated, forms a seal around the laryngeal inlet to provide airway continuity. It can be used 100-250 times [2] and can be autoclaved upto 50 times.

The LMA has been used as a substitute for the ETT during anaesthesia in various branches of surgery [3-8]. The advantages of LMA are ease of insertion (without the need of a laryngoscope), less haemodynamic response to its insertion as compared to that following intubation [9, 10], and no chance of oesophageal or endobronchial insertion. It is safer than the face mask in securing the airway. It is also useful in cases of difficult or failed intubation [11, 12]. However, it does not protect the lower airway against aspiration.

We have been using the LMA (size 4) for anaesthesia in adult patients for various surgical procedures for the last 2 years and our experience of 100

cases is presented here.

Material and Methods

This study was done in 100 adult patients of either sex selected randomly for various operations under general anaesthesia (GA) using LMA. All the patients belonged to ASA grade I or II. Informed consent was obtained from all the patients. They were premedicated with glycopyrrolate 0.2 mg and pethidine 50 mg intramuscularly 45 minutes prior to operation. In all patients except 3, anaesthesia was induced with thiopentone 4 mg/kg body weight followed by suxamethonium 100 mg intravenously to facilitate insertion of LMA. In 3 patients with post-burn contracture of the neck, anaesthesia was induced with inhalation technique using a mixture of nitrous oxide, oxygen, and halothane or ether with the patient breathing spontaneously. These patients required a deeper plane of anaesthesia (Guedel surgical stage plane 2/3) to obtund the cough reflex and facilitate adequate relaxation of jaw muscles. The standard insertion technique was used for LMA insertion in all the cases [13]. The position of the patient was same as for tracheal intubation. After insertion, the LMA cuff was inflated with air to its full capacity (25-30 mL). The LMA was then secured in place using a tape, so that the black line on its tube rested against the upper incisor teeth. The LMA was then connected to a Boyle's anaesthesia

*Reader in Anaesthesiology, AFMC Pune; +Senior Adviser in Anaesthesiology, MH Jabalpur; #Senior Trainee in Anaesthesiology Command Hospital Southern Command Pune; **Anaesthesiologist, AFMC Pune.

machine through Bain's breathing system and correct placement of the LMA was confirmed by applying positive pressure to the breathing bag while observing chest movement and auscultating for bilaterally equal vesicular breath sounds.

Anaesthesia was maintained with nitrous oxide, oxygen (4 and 2 L/min respectively) and small doses of pethidine (5-10 mg) intravenously as and when required. Respiratory rate was controlled manually at 12-14 times/min by applying gentle pressure on the breathing bag. Pancuronium, a non-depolarizing muscle relaxant, was used to facilitate controlled ventilation.

During operation, blood pressure (BP) was monitored every 5-10 minutes and pulse rate, arterial oxygen saturation (SaO₂) and end-tidal carbon dioxide (ETCO₂) were monitored continuously. At the end of the operation, neuromuscular block due to pancuronium was reversed with glycopyrrolate 0.4 mg and neostigmine 2.5 mg intravenously. Oro-pharyngeal suction was done and LMA was kept in position until the patient was able to open his mouth fully on verbal command. The cuff was then deflated and LMA removed gently.

Out of these 100 cases under study, in 50 randomly selected cases (LMA group), haemodynamic response to insertion of LMA was studied by monitoring pulse rate, systolic, diastolic, and mean arterial pressure (PR, SBP, DBP, MAP) before and for 5 minutes following LMA insertion. These values were compared statistically with those recorded before and after tracheal intubation in another 50 patients of comparable demographic profile (ETT group).

Results

Demographic profile

Mean age and weight of the patients under study was 38.05 ± 7.37 years and 52.50 ± 8.23 kg respectively with a male to female ratio of 1:3. The mean age and weight of patients in ETT group was 35.05 ± 5.40 years and 55.30 ± 6.45 kg respectively with a male to female ratio of 2:3.

Surgical procedures performed

Table 1 shows the types of operations performed and their mean duration in minutes. There were 96 elective cases and 4 emergency cases.

TABLE 1

Types of operations and duration using LMA

Operation	No. of cases	Mean duration (min)
MTP/Tubectomy	30	21
Pelvic laparoscopy	27	17
Abdominal hysterectomy	5	95
Vaginal hysterectomy	6	98
Fibroadenoma breast-excision	3	35
Axillary lymph nodes-excision	5	24
Postburn contracture neck-release and skin grafting	3	145
Subtotal thyroidectomy	1	142
Soft tissue tumours of extremities-excision	3	115
Appendicectomy	4	48
Amputation (BK/AK)	6	44
Miscellaneous	7	32
Total	100	68

Positioning of patients during operations

The operations were performed in different positions. MTP, pelvic laparoscopy, and vaginal hysterectomy were performed in a lithotomy position with 5-10° Trendelenburg tilt. One case of subtotal thyroidectomy was done in the thyroid position. Two cases of soft tissue tumour of right thigh were performed in the left lateral position. All other patients were operated upon in the supine position.

Use of LMA in associated medical conditions

One patient undergoing abdominal hysterectomy was a known case of chronic bronchial asthma. In this patient, there was no bronchospasm during LMA insertion or removal. There was no difficulty in positive pressure ventilation. Intra-operative and post-operative course was uneventful.

Failure to insert or remove LMA

We failed to insert LMA in 7 patients inspite of repeated attempts in each case. In these patients, operations were performed using ETT. There was no difficulty in removing LMA in any patient. The pulse rate, BP, SaO₂ and ETCO₂ remained steady and within normal range throughout the period of anaesthesia period. Table 2 shows the summary of results.

TABLE 2
Summary of results : Use of LMA (n=100)

Age (years)	38.05 ± 7.37
Weight (kg)	52.50 ± 8.23
Anaesthesia time (min) *	68 (17-145)
Elective/Emergency	96/4
Use of relaxant for insertion	97
Spontaneous breathing for insertion	3
Lateral position for operation	2
Oxygen saturation (%) *	96 (93-99)
End tidal CO ₂ (mm Hg) *	36 (32-40)
LMA failure	7
Overall complications	12

* Average (range)

Complications

Six patients had trauma to either the soft palate, uvula, posterior pharyngeal wall, or epiglottis and 5 patients complained of sore throat lasting for 2-3 days postoperatively. None of the patients had vomiting or regurgitation intra-operatively. Only 1 patient developed laryngospasm during removal of the LMA which was relieved with oropharyngeal suction and administration of 100% oxygen via a face mask. None of the other patients required any form of active therapy to treat the complications. There was no difficulty in removal of the LMA in any patient.

Haemodynamic response

It is seen from Table 3 that following LMA insertion, there was a marginal increase in PR, SBP, DBP and MAP which was clinically as well as statistically not significant as compared to preinduction values. In ETT group, there was an increase in these values following intubation which were statistically highly significant as compared to preinduction values ($p < 0.001$).

Discussion

Only adult patients were included in this study because the LMAs for paediatric patients (sizes 1 and 2) were not available to us. The size 4 LMA is meant for use in adult patients weighing 70 kg and above. Though the mean body weight of patients in this study was only 52.50 kg, we did not experience any difficulty in inserting this largest size LMA except in a few patients. The failure rate of 7% could be because of attempted insertion of a large size LMA in some patients of smaller stature, limited mouth opening, and body weight much below 70 kg. In these 7 patients, the LMA was replaced by the ETT for anaesthetic management. Other workers have reported failure rate of 5% in a series of 152 adult patients [14]. This failure rate is less as compared to that in our study because they had selected LMA size appropriate to the patient. McCrissick et al [3] reported a failure rate of 6-12% in their study

TABLE 3
Changes in pulse rate and BP

	PR/min MeanSD	Systolic	Arterial BP (mm Hg) Diastolic	MAP
LMA Group				
Pre-induction	89.78 ± 7.53	121.58 ± 13.06	75.40 ± 10.18	87.10 ± 8.41
At LMA insertion	92.06 ± 4.3	127.74 ± 3.51	75.31 ± 8.9	88.15 ± 7.62
After 1 min	93.82 ± 5.4	125.21 ± 4.39	76.91 ± 11.3	86.21 ± 6.64
3 min	95.61 ± 6.9	124.41 ± 6.12	77.85 ± 9.4	86.31 ± 7.71
5 min	90.54 ± 7.3	120.43 ± 3.15	74.80 ± 8.6	86.41 ± 8.91
ETT Group				
Pre-induction	81.10 ± 13.66	123.66 ± 10.78	73.78 ± 8.09	94.48 ± 8.62
At intubation	94.40 ± 15.6	129.96 ± 12.50	88.88 ± 7.25	107.52 ± 12.36*
After 1 min	125.80 ± 27.65*	150.68 ± 17.1*	85.74 ± 10.33*	104.16 ± 10.84*
3 min	96.70 ± 14.10	142.44 ± 14.95	79.90 ± 4.60	100.46 ± 10.66*
5 min	88.06 ± 12.68	129.50 ± 12.61	78.16 ± 6.85	94.34 ± 9.55

* $p < 0.001$ - Highly significant

depending on the experience of the anaesthesiologist in using the LMA. They also observed that as the cumulative experience in inserting the LMA increased, the success rate also increased to 100%.

The incidence of trauma and other complications in this study was 12%. This high incidence of complications could also be because of large size LMA. However, these complications were of mild to moderate degree and did not require any active treatment. The incidence of these complications can easily be reduced by using a LMA of appropriate size, employing a gentle technique of insertion and by proper lubrication of the LMA with local anaesthetic jelly.

We have used the LMA for surgical procedures in different patient-positions and found it quite satisfactory in maintaining airway in all these positions. The LMA has been used in paediatric as well as adult patients in prone position [13] but it may be very difficult to relieve airway obstruction intra-operatively in this position. Therefore, we did not use the LMA for surgery in the prone position.

One case of reactive airway disease (bronchial asthma) and 3 cases of difficult airway (post-burn contracture of the neck) were successfully managed with the LMA. Thus, the LMA has a place in anaesthetic management of patients suffering from reactive airway disease and having problems of difficult intubation.

It is not always safe to use the LMA in emergency surgery for fear of inducing vomiting and regurgitation and tracheobronchial aspiration, especially if the patient's stomach is full. We have successfully used the LMA in 4 emergencies (appendicectomy cases). All these patients were fasting for more than 8 hours prior to operation and Ryle's tube aspiration was carried out before induction of anaesthesia.

This study has shown that LMA insertion is associated with less haemodynamic response as com-

pared to that with endotracheal intubation. Other workers have also reported similar observations [9, 10]. It can be concluded that the LMA is a reliable alternative airway during anaesthesia. It is safe and its use is associated with less complications and less haemodynamic response as compared to the endotracheal tube.

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