Controlled ventilation with Brain laryngeal mask

Anthony Francis Miranda. FFARCS
Consultant in Anaesthesia and Intensive Care, General Hospital,Kota Bharu

Venu Gopal Reddy.S. MD
Lecturer in Anaesthesia
Hospital University Sains Malaysia
15590 Kubang Kerian, Kelantan

Summary

A Brain laryngeal mask was assessed in fifty patients undergoing general anaesthesia who required controlled ventilation. The mask was inserted in all patients without any difficulty and the satisfactory seal obtained enabled ventilation in all patients in a wide range of positions. Airway obstruction occurred in seven patients secondary to downfolding of the epiglottis and this was rectified by reinsertion. The incidence of sore throat was 10%. The Brain laryngeal mask is a safe alternative to the tracheal tube for controlled ventilation during general anaesthesia.

Key Words: Laryngeal mask, controlled ventilation ,positive pressure,complication : airway

Introduction

When faced with prolonged ventilation the anaesthetist until now had two choices; either to intubate using an endotracheal tube or hold the mask and manually ventilate. The introduction of the Brain laryngeal mask (BLM) provided an alternative to tracheal intubation [1-6] (Fig 1). The first report of its use was in 1983 and prototype described subsequently [1-3]. The newer version of BLM is claimed to accept airway pressure upto 3.0 K Pa without a leak [4]. Using three induction agents, the suitability of the BLM in terms of insertion, maintenance of unobstructed airway and ventilation in various positions was assessed. Post-operatively the maintenance of unobstructed airway

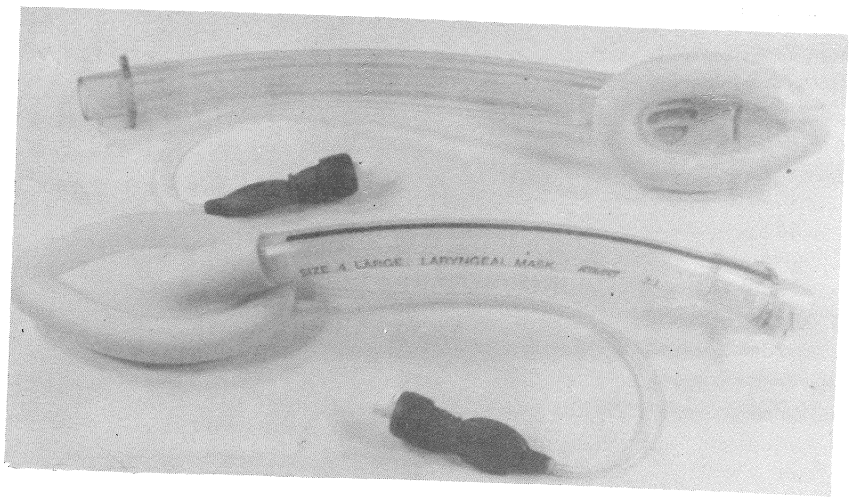

Figure 1: Photograph of laryngeal musk Size 3 and 4

Table 1: Demographic details of patients

	Number	Range	Mean	SD
Number of patients	50			
Male	16			
Female	34			
Age (Years)		20 - 72	38.9	14.12
Weight (kg)		34 - 88	52.36	10.26
Nature of problem :				
Surgical	17			
Obstetric	23			
Orthopedic	8			
ENT	1			
Dental	1			

Table 2: Induction agents and duration of anaesthesia

Induction Agents	Number of patients	Range mg/kg	Mean mg/kg
Propofol	25	1.5 - 2.0	1.9
Thiopentone	15	4.0 - 5.2	5.0
Methohexitone	10	1-0 - 1.3	1.1
Duration of anaesthesia in minutes		30 - 240	79

Table 3 :Volume of air and airway pressure with the BLM

	Number	Mean	Range	SD
Volume of air for Size 3 (ml)	40	20.52	18 - 25	1.75
Volume of air for Size 3 (ml)	10	31.80	26.35	2.82
Air Way Pressure (cms of water)	50	17.62	14 - 20	1.76

Materials and Method

Fifty healthy adult patients (ASA Gr 1 & 2) who presented for elective surgery and required artificial ventilation were studied (Table 1). Ventilation was achieved successfully using either size 3 or 4 with a Manley ventilator. Adequacy of ventilation was assessed by chest expansion, expired tidal volume, and blood gas analysis. All patients were premedicated with midazolam orally, 7.5 mg for body weight less than 50 kg and 15 mg for body weight of more than 50 Kg one hour before operation.

After recording the initial heart rate and blood pressure, patients were given 1 mcg/kg fentanyl intravenously followed by one of the following induction agents: propofol (diprivan), thiopentone or methohexitone (brietal). The dose was titrated so as to obtain disappearence of eyelash reflex (Table 2). The subjects were manually hyperventilated for a brief period through a closed system with 66% nitrous oxide, 33% oxygen and 1.5% enflurane.

The laryngeal mask was inserted as per instructions[2] and the cuff inflated with 20 ml of air for size 3 and 30 ml of air for size 4 (Table 3). Further inflation or deflation of the cuff depended on the presence or absence of an air leak, detected by placing a stethoscope over the trachea. Inflation of the cuff was carried out if the air leak could not be stopped by rocking the larynx or turning the position of the head. If the airleak persisted with poor chest expansion, partial airway obstruction secondary to downfolding of the epiglottis was considered to be the cause. In such cases reinsertion under deep anaesthesia was performed.

The problem encountered during insertion and immediately after insertion as well as the duration of anaesthesia was recorded. Anaesthesia was maintained with 66% nitrous oxide, 33% oxygen and 0.5% enflurane. Additional doses of fentanyl were given as and when required. Ventilation was controlled using Pancuronium as the relaxant. In all cases a Manley ventilator was used. Any air leak as a result of excessive airway pressure was overcome by decreasing the tidal volume and increasing the respiratory rate so as to maintain the same minute volume. After 20 minutes of induction of anaesthesia arterial blood was sampled for blood gas.

Following surgery the BLM was left in situ until the patient regained protective reflexes and was subsequently removed either in the operation room or in the recovery room. During removal of the mask information concerning the following aspects was collected: difficulty in removal, vomiting, excessive salivation, bleeding, laryngospasm.

Post operatively after 24 hours patients were asked whether they had any problem in terms of anaesthesia. When they failed to mention about sorethroat they were asked ''do you have a sore throat ? '' and graded as mild, moderate, and severe if they answered yes.

Results

There were 16 males and 34 females. Seven patients had an active medical problem which was well controlled. BLM size 3 was used in 40 and size 4 in 10 patients.

In all cases the device was inserted without the aid of the introducer. Insertion was successful at the first attempt to 38 (76 %), second attempt in 11 (22%), and third attempt in one case. Difficulty was experienced during insertion in five. Propofol was found to be the prefered anaesthetic agent (ease of insertion, relaxation, coughing) followed by thiopentone and methohexitone.

During insertion three patients coughed, and three were found to be inadequately relaxed needing further incremental doses of induction agents. In seven patients airway obstruction occurred as a result of downfolding of the epiglottis. Blood gas analysis revealed that 30 were in respiratory alkalosis and three in metabolic acidosis None of the patients were in hypoxemia or hypercapnia. The peak airway pressure ranged between 14 to 20 cm of water with a mean airway pressure of 17.62 cm of water. The peak airway pressure increased in the Trendelenburg position particularly during insufflation of carbon dioxide for laporoscopic procedures. In three cases this resulted in an airleak which was rectified by measures as outlined earlier.

After the insertion of BLM the rise in the blood pressure was mild in seven patients compared to fall in 43 patients. The fall was greater in the diprivan group[9]. There was increase in the heart rate in 10 patients of whom six had received methohexitone, two thiopentone and two propofol.

The laryngeal mask used in many positions provided satisfactory control of airways at all times (supine, lateral, lithotomy, trendelenburg and prone). In three patients who required Ryles tube insertion it was possible to do so after partially deflating the cuff. The duration of anaesthesia ranged from 30 mins to 240 mins, with an average of 79 mins. Manipulation of the trachea during neck surgery did not dislodge the mask.

Post operative problems were minor in nature (Difficulty in removing the BLM 2, salivation 1, clenching teeth 2, coughing 1, bleeding from posterior pharynx 2). Two patients complained of sore throat when asked indirectly whereas three did so on direct questioning.

Discussion

There have been three published studies of the feasibility of the use of the BLM, two by the inventor, [1,2] and one by Braude et al [5].

The usage of BLM achieved normocapnia or mild hypocapnia without hypoxemia irrespective of the position in all our patients as evidenced by the results of blood gas analysis. Air leak during maintenance of anaesthesia was observed suggestive of muscle relaxant effect wearing off and of the patient trying to breathe. This usually conicided with increased airway pressure. In none of the patients was there any evidence of abdominal distention and the laryngeal mask facilitated the passage of Ryles tube. It should be emphasised that the BLM does not guard against aspiration [6-8].

It has been suggested that the BLM should not be used in patients with respiratory problems [10] for fear of inducing bronchospasm, but we have successfully used BLM in a patient with emphysema after taking adequate precautions [8].

The incidence of sore throat was 10%. As this is a small series, the importance of this observation is uncertain [5]. The reported incidence of sorethroat with the use of laryngeal mask varies from 3.9 % to 21.73 % [1,2,3,5,11]. The use of lignocaine jelly during insertion itself may increase the incidence of sore throat [12].

Conclusion

The BLM is useful as an alternative to intubation and can be used in various positions without the use of a muscle relaxant. The fact that the haemodynamic changes were minor suggest that the BLM may be ideal in patients in whom hypertensive response due to laryngoscopy and intubation

is to be avoided.

Acknowledgement

We thank the Director General of Health, Malaysia for permission to publish this paper, Dr. AIJ Brain for providing the Brain laryngeal mask (BLM)

References

1. Brain AIJ : The laryngeal mask - A new concept in airway management. Br. J. Anaesth 1983;55;801-4

2. Brain AIJ, McGhee TD, McAteer EJ, Thomas A, Abu Saad MAW and Bushman JA : The laryngeal mask airway. Development and preliminary trials of a new type of airway. Anaesthesia 1985;40;356-61

3. Brodrick PM, Webster NR, & Nunn JF : The laryngeal mask airway. A study of 100 patients during spontaneous breathing. Anaesthesia 1989;44;238-41

4. Brain AIJ : Further development of the laryngeal mask. Anaethesia 1989;44;530 (letter)

5. Braude N, Clements AF, Hodges UM, and Andrews BP : The pressor response and the laryngeal mask insertion. A comparison with tracheal intubation. Anaesthesia 1989;44;551-4

6. Alexander CA, Leach AB, Thompson AR, and Lister JB : Use your Brain !. Anaesthesia 1988;43;893-4 (letter)

7. Hammond JE : Controlled ventilation and the laryngeal mask. Anaesthesia 1989;44;616-7 (letter)

8. Brain AIJ : The laryngeal mask in patients with chronic respiratory disesse. Anaesthesia 1989;44; 790-1 (letter)

9. Patrick MR, Blair IJ, Feneck and Sebel PS : A Comparison of the haemodynamic effects of propofol ('Diprivan') and thiopentone in patients with coronary artery disease. Postgraduate Medical Journal 1985;61;23 - 7 (Suppl)

10. Gunawardene RD : Laryngeal mask and patients with chronic respiratory disease. Anaesthesia 1989;44;531 (letter)

11. Alexander CA, Leach AB : Incidence of sore throat with the laryngeal mask. Anaesthesia 1989;44;791 (letter)

12. Klemola UM, Saarnivaara L, Yrjola H : Post operative sore throat : effect of lognocaine jelly & spray with endotracheal intubation. Eur J Anaesthesiology 1988;5;391 - 9