Oesophageal Vent-Laryngeal Mask to prevent aspiration of gastric contents

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SUMMARY
The use is described of a prototype device to prevent regurgitation of gastric contents in 16 patients, three of whom appeared to have been at risk of regurgitation. The "Oesophageal Vent-Laryngeal Mask" consists of a laryngeal mask attached to an oesophageal tube that has a balloon at the distal end, allowing drainage of any fluid in the oesophagus. (Br. J. Anaesth. 1994; 72: 52-54)

KEY WORDS
Equipment: oesophageal vent-laryngeal mask.

The laryngeal mask airway is a useful device; it maintains a clear airway and frees the anaesthetist's hands. It has been found useful in the management of failed tracheal intubation, but it does not protect the airway in patients at high risk of gastric content regurgitation and this limits its use in emergency anaesthesia. Prevention of gastric content aspiration could greatly improve the safety of the laryngeal mask airway. An oesophageal obturator decreases gastric contents regurgitation and aspiration [1]. A balloon at the distal end of a hollow oesophageal tube could provide adequate oesophageal seal while allowing drainage of fluid present distally. This may also diminish pressure distal to the inflated balloon and may prevent leakage into the upper oesophagus. A combination of a hollow oesophageal tube that prevents regurgitation and a laryngeal mask could, theoretically, provide a clear airway without the risk of aspiration of gastric content.

The aim of the present study was to evaluate a prototype device—the "Oesophageal Vent-Laryngeal Mask" in patients having surgery under general anaesthesia.

EQUIPMENT
The prototype of the Oesophageal Vent-Laryngeal Mask consists of a size 10-mm i.d. Portex disposable tracheal tube, fixed to the dorsum of a standard laryngeal mask (fig. 1). Because of the sharp edges of its bevel, the standard tracheal tube was considered too traumatic for blind oesophageal insertion. The bevel of the tube was therefore cut to make it circular and its edges heat-polished to render them smooth and atraumatic. A size 10 tracheal tube was chosen as the oesophageal obturator because it has a cuff capacity of 30 ml, similar to the commercially available oesophageal obturator airway [2]. The oesophageal balloon may be inflated through a non-return valve. A transparent heat-shrink sleeve envelops the entire length of the laryngeal mask tube and 75% of the length of the oesophageal tube and holds them together.

METHODS
The study was approved by the Hospital Ethics Committee. After obtaining informed written consent, I used the Oesophageal Vent-Laryngeal Mask in 17 patients (ASA I or II only) undergoing body surface surgery. Patients with gross obesity, hiatus hernia, oesophageal disease or allergy to methylene blue, and those having intra-abdominal operations were excluded. All patients were fasted for at least 6 h before operation and were premedicated with approximately 0.3 mg kg⁻¹ of oral temazepam, about 90 min before induction of anaesthesia. A gelatin capsule containing 50 mg of methylene blue powder in lactose was taken orally by the patients while they were in the sitting position, 10 min before induction of anaesthesia. Gastric acid dissolves the gelatin capsule within 10 min, releasing methylene blue and rendering all gastric contents blue. This method has been reported previously to identify regurgitation of gastric contents [3]. There should be no staining of the mouth, pharynx or larynx unless the capsule accidentally opens in the mouth. After the methylene blue capsule had been ingested, blue staining of the pharynx and the larynx was taken as an evidence of regurgitation.

The author administered the anaesthetics and placed the Oesophageal Vent-Laryngeal Mask in all patients and an anaesthetic nurse acted as an independent observer to confirm presence of dye. In all patients, anaesthesia was induced with propofol 2.5 mg kg⁻¹ and direct laryngoscopy was carried out to identify any dye in the pharynx. Additional increments of propofol were given if required. The Oesophageal Vent-Laryngeal Mask was then placed and the number of attempts required for satisfactory placement of this equipment recorded. The oesophageal cuff was inflated with 20 ml of air to seal the oesophageal lumen then the laryngeal mask cuff was inflated with 20 ml of air to seal the oesophageal lumen then the laryngeal mask cuff was...
inflated to secure a clear airway. Manual ventilation was carried out to confirm correct positioning of the Oesophageal Vent-Laryngeal Mask. When in place, it was secured by adhesive tape. Anaesthesia was maintained with 1.5–4.0% enflurane and 65% nitrous oxide in oxygen. All the patients were allowed to breathe spontaneously throughout the duration of general anaesthesia. Intraoperative analgesia was produced with increments of i.v. fentanyl. At the end of surgery, the Oesophageal Vent-Laryngeal Mask was removed and examined for blue stains. Direct laryngoscopy was carried out to visualize the presence of methylene blue in the pharynx. All patients were questioned next day about their anaesthetic experience.

RESULTS

Nine males and eight females were recruited; their mean age was 36.7 yr (range 17–81 yr) and weight 70.8 kg (range 55–100 kg). The administration of methylene blue capsules was uneventful. The Oesophageal Vent-Laryngeal Mask remained in situ for a mean duration of 33.8 min (range 15–80 min). Insertion was accomplished at a single attempt in 13 patients; in four patients, two attempts were required for correct placement. Insertion of the laryngeal mask obturator in one patient with a small mouth resulted in the forward folding of the laryngeal mask, causing airway obstruction. It was recognized immediately, as manual ventilation of the lungs was not possible. The Oesophageal Vent-Laryngeal Mask was removed and successfully re-inserted. Two patients developed hiccup and two mild laryngospasm on insertion of the mask. One patient was excluded from the study because there was regurgitation of blue dye into the pharynx immediately after induction of anaesthesia. Intraoperative reflux of gastric contents was confirmed by staining of the external surface of oesophageal obturator distal to the oesophageal balloon in three patients. However, staining of the inner surfaces of these obturators extended proximal to the oesophageal balloon. Dye was not found in the pharynx or larynx of any patient. There was no leakage of the dye past the oesophageal balloon into the upper oesophagus in any patient. Six patients complained of sore throat after operation.

DISCUSSION

The laryngeal mask does not protect against regurgitated gastric contents and aspiration pneumonitis is possible [4, 5]. The present study supports the findings of Barker and colleagues [3] that a quarter of all patients may regurgitate if the laryngeal mask is used during general anaesthesia. The use of Guedel's airway and face mask may be associated with regurgitation less frequently [3]. It could be postulated that inflation of the laryngeal mask cuff (by exerting pressure on the pharyngeal walls) may simulate a bolus of food and initiate a deglutition reflex, causing relaxation of the oesophageal sphincters. This may allow gastric contents to enter the oesophagus. A correctly positioned laryngeal mask may cover both the oesophageal and the laryngeal inlet in 8% of the patients [6] and its smooth convex inner surface may direct regurgitated gastric contents towards the larynx.

The safety of the laryngeal mask could greatly be improved if regurgitation is prevented. The patient at high risk of aspiration and failed tracheal intubation could benefit from the marriage of an oesophageal obturator to a laryngeal mask. In 1968, Don Michael, Lambert and Mehran described an oesophageal obturator for resuscitation [7]. It has been in use since 1972, has undergone more than 2 million insertions [8] and prevents aspiration of gastric contents in the unconscious patient [1]. Its use was endorsed by the American National Conference of Standards for Cardiopulmonary Resuscitation in Emergency Care [8]. It has been found useful after failed tracheal intubation in obstetrics [10]. However, the oesophageal obturator may cause trauma to the pharynx or the oesophagus, although this can be prevented by proper positioning of the
patient before insertion of the obturator and avoiding tugging movements on the tube when it is in place [8]. Experience in the use of the oesophageal obturator airway suggests that trauma occurs mostly in the lower oesophagus, perhaps as a result of overinflation of the oesophageal balloon (20 ml of air is sufficient to seal the oesophagus) [11]. Experience from the use of the oesophageal obturator was taken into account in the present study, and a short oesophageal tube and cuff inflation with 20 ml of air was chosen for the Oesophageal Vent-Laryngeal Mask, to minimize trauma to the oesophagus. A hollow oesophageal tube in the Oesophageal Vent-Laryngeal mask, unlike conventional obturators, also allows fluid contents to escape and thus prevents development of pressure distal to it. This should decrease the force exerted by the fluids in the distal oesophagus on the cuff and may prevent leakage into the upper oesophagus.

Each sample of prototype could be used once only because sterilization proved difficult. High temperatures reached during autoclaving caused the sleeve to shrink severely, occluding the tube lumen. Chemical sterilization was not considered suitable because of the slight risk of inhalation of the residual chemicals entrapped in the sleeve. This problem may be overcome by manufacturing the article as a single, twin-lumen tube (with a laryngeal mask) that can be autoclaved.

The use of a conventional laryngeal mask in patients with a full stomach requiring emergency anaesthesia is dangerous. The Oesophageal Vent-Laryngeal Mask provided an adequate seal and may prevent escape of refluxed gastric contents into the pharynx.

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REFERENCES