CASE REPORT

The laryngeal mask airway—a possible new solution to airway problems in the emergency situation

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INTRODUCTION

The obturator airway (Greenbaum *et al.*, 1974) has gained some acceptance in the United States for use by paramedics in emergencies, but has disadvantages (Carlson *et al.*, 1979; Yancay *et al.*, 1980), not least of which is the need to flex the neck to facilitate blind insertion. If there is a fracture or dislocation of the cervical spine, the result could be disastrous.

An alternative device has recently been described (Brain, 1983) which is also introduced blindly but otherwise bears no resemblance to the obturator airway.

The laryngeal mask airway consists of a tube opening at one end into the lumen of a miniature mask (Fig. 1). The mask opens substantially at right angles to the tube so that when in position it forms an oval seal around the laryngeal inlet (Fig. 2). The mask has an inflatable cuff to increase the pressure of the seal. It is inserted by a special introducing tool which is then withdrawn. On withdrawal, an aperture in the distal end of the introducer engages with the epiglottis, which is thus pulled into its upright position. In adult patients in whom the distance between the lower border of the cricoid ring and the upper border of the thyroid prominence (CT distance) was between 2.5 and 4.5 cm, the 8-cm masks used in preliminary trials formed a seal which would permit IPPV up to 2 kPa (20 cm H₂O) without injecting additional air into the cuff.

As it was not known whether this limited seal pressure would protect the lungs from aspiration in the case of regurgitation, insertion of the device has until recently been confined to routine cases presenting for elective surgery.

However, three new developments have now made it possible to consider the laryngeal mask as an appropriate tool for emergency use.

The first of these was the adaptation of the mask to permit passage of a 9-mm endotracheal tube through it. Using this adapted version, blind intubation has been performed successfully through the laryngeal mask even in patients presenting known intubation problems (Brain *et al.*, 1984).

Fig. 1 The laryngeal mask airway mounted on its introducer.

Fig. 2 The laryngeal mask in position.

The second improvement was concerned with increasing the seal area and the elasticity of the inflatable cuff. This has substantially increased the inflation pressure which can be achieved without leaks developing.

The third improvement was the incorporation of a central groove running posteriorly in the mask, providing a lumen which connects the pharynx with the upper end of the oesophagus. This groove acts as a guide to facilitate insertion of a nasogastric tube. More importantly, it allows any regurgitated fluid from the stomach to pass upwards into the pharynx.

CASE REPORT

An 86-year-old male weighing 60 kg was scheduled for a transurethral resection of prostate. A laryngeal mask incorporating the above features was inserted after thiopentone 100 mg and alcuronium 15 mg. The cuff was inflated with 20 ml of air and the patient connected to a Manley-Blease volume divider. Inflation at up to 3 kPa (30 cm H₂O) did not produce audible leaks and the end-tidal CO₂ was maintained at 3.5% with a tidal volume of 0.5 l and a minute volume of 6.5 l. Regurgitation of approximately 30 ml bile occurred during the operation. A nasogastric tube (16 gauge) was inserted through the groove in the dorsum of the mask to empty the stomach. Auscultation of the lungs did not reveal any signs of aspiration. However, as a precaution an 8-mm endotracheal tube was inserted blindly through the LM and was felt to pass easily and smoothly through the cords at the first attempt. A suction catheter was passed through the endotracheal tube into the trachea but did not produce any evidence of aspiration. The peak airway pressure and expired tidal volume after insertion of the endotracheal tube remained unaltered. The endotracheal tube was removed and the operation concluded with the laryngeal mask in place. The laryngeal mask was removed in the recovery room when protective reflexes had returned and the patient was able to open his mouth on command.

DISCUSSION

Although the device is still in a developmental stage this case indicates several potential advantages which may favour its use in the emergency situation.

- Insertion in adults has been easily achieved, albeit under operating theatre conditions. However, it may be possible to insert it in the unconscious accident victim with relative ease and when other methods are impracticable.
- A laryngoscope is not required.
- The common error of intubation of the right or left main bronchus cannot occur, nor is intubation of the oesophagus likely.
- Should the mask-larynx seal be inadequate, intubation can be performed blindly as an unskilled procedure simply by passing an uncut endotracheal tube down the tube of the laryngeal mask. Intubation through the laryngeal mask in this way avoids the hazards mentioned immediately above.

- Should regurgitation occur, it may be possible to ensure protection of the larynx as well as of the trachea and lungs. The groove in the dorsum of the mask provides a channel for regurgitated fluid to pass up behind the larynx to the upper pharynx, thus avoiding any build-up of fluid pressure below the mask.
- The dorsal groove can be used as a guide channel for insertion of a nasogastric tube if required. This eliminates the risk of accidental intubation of the trachea by the nasogastric tube.

Some problems remain to be solved however. It is important that the laryngeal mask is inserted to the correct depth in order to 'mask' the larynx effectively. As the mask is too broad to penetrate the normal oesophagus, unless excessive force is used, its tip will normally come to rest just below the level of the cricoid cartilage. The mask will thus automatically lie opposite the laryngeal inlet in the majority of cases. However, if the larynx is small (less than 2.5 cm C-T distance) the upper edge of the epiglottis may lie within the mask lumen where it can cause obstruction, while in a large larynx (more than 4.5 cm C-T distance) the laryngeal inlet may be at a high enough level to be occluded by the upper rim of the mask. These observations apply to use of a single size of laryngeal mask and the solution to the problem is obviously to make the laryngeal mask available in a range of sizes and to advocate measurement of the C-T distance in case of doubt.

CONCLUSIONS

The prototype laryngeal mask shows great promise as an emergency airway. The case described above indicates that it may be capable of protecting the lungs from gastric aspiration. No firm conclusions can be drawn, however, until the results of large-scale clinical trials become available.

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