COMPARISON OF THE USE OF THE LARYNGEAL MASK AND FACE MASK BY INEXPERIENCED PERSONNEL

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SUMMARY

Ten junior doctors with no postgraduate anaesthetic experience attempted to ventilate the lungs of 50 anaesthetized patients, using either a laryngeal mask or a Guedel airway and face mask. Success was defined as the production of two successive tidal volumes exceeding 800 ml within 40 s. The failure rate was significantly greater using the laryngeal mask compared with the face mask (P < 0.05) and the average time was significantly longer with the laryngeal mask than with the face mask (P < 0.01). The results from this investigation suggest the laryngeal mask airway cannot be recommended as a resuscitation device for use by inexperienced operators.

KEY WORDS


Successful cardiopulmonary resuscitation requires a clear airway, allowing intermittent positive pressure ventilation (IPPV). A cuffed tracheal tube provides these conditions, in addition to protection against aspiration. However, intubation skills are difficult to teach and proficiency is retained poorly without regular practice [1]. When utilizing bag and face mask ventilation, inexperienced operators may have difficulty maintaining a clear airway and a tight seal simultaneously, and often do not achieve adequate tidal volumes. The laryngeal mask airway (LMA) [2] is a possible alternative and has been shown to be easy to insert by both anaesthetists and inexperienced personnel [3,4], and also allows IPPV [5]. The LMA has been used in emergency situations and a previous study has compared the LMA with tracheal intubation when used by inexperienced operators [4]. It would seem appropriate to compare the face mask and LMA, particularly because both devices provide no protection against aspiration.

The aim of this study was to determine whether or not the LMA is a better alternative to bag and face mask ventilation when used by inexperienced operators for cardiopulmonary resuscitation.

METHODS AND RESULTS

We studied 10 operators and 50 patients. Each operator attempted to ventilate the lungs of five patients using both techniques. All the operators were junior hospital doctors with no postgraduate anaesthetic experience. Patients were ASA I–III, undergoing elective surgery requiring tracheal intubation and muscle relaxation. Patients who were obese, had a risk of oesophageal reflux, had loose teeth or crowns or were likely to present difficulties for tracheal intubation were excluded. Written and informed consent was obtained from each patient, and hospital Ethics Committee approval was obtained before the start of the trial.

Operators were shown a video recording that demonstrated the technique of LMA insertion (The Laryngeal Mask—An Instructional Video, Intavent/AMC video productions, Sevenoaks, Kent), or had the technique demonstrated to them. They were also shown how to use a Guedel airway and CIG face mask, and an “AirViva” self-inflating resuscitation bag.

Patients were pre-medicated with temazepam 10–20 mg. Monitoring with ECG, non-invasive arterial pressure and pulse oximetry were begun before induction of anaesthesia with thiopentone or propofol, followed by an intratracheal dose of vecuronium. The lungs were then ventilated with 1–3% enflurane in oxygen by the investigator until the patient was thought to be relaxed.

The operators then attempted to ventilate the lungs using each of the two methods in random order. If present, dentures were removed during the first attempt and not replaced for the second. Appropriate sized laryngeal masks and face masks were chosen by the investigator. A Wright's spirometer was connected in series to measure expired tidal volumes. The LMA was inserted as described in the video, with the cuff fully deflated.

Successful ventilation was defined as the recording of an expired tidal volume of 800 ml for two successive breaths within 40 s. The volume chosen is that recommended by the American Heart Association [6]. The time from the start of the attempt to the achievement of successful ventilation was measured using a stopwatch. Attempts to ventilate the lungs were abandoned if \( SpO_2 \) decreased to less than 95%, if it took longer than 40 s or if injury to the
patient seemed imminent. The only assistance given was to inflate the cuff of the LMA. Times of 40 s or greater were recorded as 41 s. After the operator had attempted ventilation with one technique, the investigator would ventilate the lungs with enfurane-oxygen for 1 min before the operator attempted the second technique. All observations were made by one of the investigators.

After the operator had made two attempts at ventilation, a tracheal tube was inserted and the operation proceeded.

Results were analysed using a commercially available statistics software package (SPSS/PC+ V2.0, SPSS Chicago). Two-way analysis of variance (ANOVA) was used for mean times and analysis of operator-method interactions, and chi-square analysis for failure rates.

We studied 50 patients (24 male) aged 18-84 yr (mean 49.6 yr). Mean times and failure rates for the two techniques are shown in table I, with SEM where appropriate. There were 13 failures in the LMA group and four failures in the face mask group \( P < 0.05 \). The mean time to success was greater using the LMA (29.9 \( \text{SEM} 1.26 \) s) compared with the face mask (24.6 (1.13) s) \( P < 0.01 \). There was no significant difference between operators, and no association between operator and technique was demonstrated.

**COMMENT**

It is essential during cardiopulmonary resuscitation to achieve rapid control of the airway and initiate IPPV. Patient movement may be considerable when external cardiac massage is being performed during cardiopulmonary resuscitation, whereas in this study the patients were anaesthetized and paralysed. It is not possible to compare techniques in a controlled manner at real emergencies, and anaesthetized patients provide the most reasonable alternative.

In this study, control of the airway was defined as the production of only two tidal breaths of 800 ml. Longer term ventilation with the face mask may be difficult during cardiac massage, and for this reason the secure "hands free" airway provided by the LMA is likely to be an advantage. This aspect of the LMA was not examined in our study.

The major drawback of the LMA was the low success rate (74%) compared with that achieved using the face mask (92%). An earlier study found a success rate of 98% for anaesthetists who were using the LMA for the first time after brief instruction [5]. Another study of inexperienced non-medical personnel showed a success rate of 94% after a thorough course of instruction, including training with mannikins [4]. The poor success rate in our study may reflect the brief instruction given or the actual technique of insertion that was demonstrated.

The reason for failure in each case was noted; with the LMA it was invariably caused by jamming against the posterior pharyngeal wall, despite the fact that this problem was described in the instructional video, and techniques to overcome it were described.

We conclude that the LMA cannot be recommended as a first line technique for inexperienced users during cardiopulmonary resuscitation. An alternative insertion technique, such as slight inflation of the LMA cuff, might be more appropriate for inexperienced users, and result in greater success.

**REFERENCES**