CRICOID PRESSURE MAY PREVENT INSERTION OF THE LARYNGEAL MASK AIRWAY

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SUMMARY
We have studied 42 female patients undergoing elective day-case surgery allocated randomly to two groups. After induction of anaesthesia an attempt was made to insert a laryngeal mask airway after application of cricoid pressure in one group or with no cricoid pressure in the other. The anaesthetist was unaware of the application, or not, of cricoid pressure. Successful insertion was achieved at the first or second attempt in 19 of the 22 patients in the non-cricoid pressure group, but in only three of the 20 patients in the cricoid pressure group ($\chi^2 = 18.62, P < 0.001$). The laryngeal mask airway was then inserted successfully in all 17 patients after removal of cricoid pressure. The implications of having to remove cricoid pressure if a laryngeal mask airway is to be inserted are discussed. (Br. J. Anaesth. 1992; 69: 465-467)

KEY WORDS
Equipment: laryngeal mask airway Larynx: cricoid pressure.

The laryngeal mask airway (LMA) has proved to be an effective alternative for achieving a clear airway in cases of difficult or impossible tracheal intubation [1]. It has also been used successfully in obstetric anaesthesia in cases of failed intubation [2-4]. However, a major concern is that the LMA does not provide protection against aspiration of gastric contents [5] and is not recommended for use when there is a significant risk of regurgitation and aspiration. Nevertheless, in some circumstances use of the LMA may offer the best hope of achieving a patent airway if conventional tracheal intubation is not possible.

The application of pressure to the cricoid cartilage is used routinely during induction of anaesthesia in any patient who is at risk of aspiration of gastric contents. Backward pressure applied dorsally on the cricoid cartilage occludes the upper oesophagus against the bodies of the cervical vertebrae and prevents regurgitation [6]. It has been recommended, but without any evidence, that cricoid pressure be maintained during insertion of the LMA in the event of a failed intubation [7].

The purpose of the study was to assess the effect of the application of cricoid pressure on the ability to insert the LMA correctly in a group of female patients of child bearing age.
system and gentle manual ventilation with satisfactory compliance. Chest wall movement was not assessed visually because of the presence of the screen. The number of attempts and time taken for successful insertion were recorded.

If insertion proved not to be possible after the second attempt, the screen was removed and the assistant stopped applying or mimicking cricoid pressure. Anaesthesia was deepened with administration of i.v. propofol if required, and another attempt at insertion was made.

The data were analysed using the unpaired Student's t test to compare age and weight, while chi-square analyses were used to compare successful insertion in the two groups.

**RESULTS**

Forty-two patients were studied. The ages and weights of the two groups were similar (table I). Cricoid pressure was not applied in 22 patients, in whom the LMA was inserted successfully on the first attempt in 16 patients. A second attempt was required in three. In the remaining three patients, the LMA was inserted successfully only after the removal of the screen. Two of these patients had developed laryngospasm and required additional i.v. propofol before the LMA was easily inserted. The remaining patient required the use of a laryngoscope to insert the LMA (fig. 1).

The LMA was inserted successfully at the first attempt in only two of the 20 patients in whom cricoid pressure was applied. (One successful insertion was achieved on the second attempt.) This was significantly different from the patients in whom cricoid pressure was not applied ($\chi^2$ 18.62; $P$ < 0.001). However, after removal of both the screen and cricoid pressure, the LMA was inserted at the first attempt in all 17 of the remaining patients. The time for insertion and the adequacy of the seal could not be compared statistically because of the small number of successful insertions in the cricoid pressure group.

**DISCUSSION**

There are no studies to date on the effect of the LMA on the competence of the upper oesophageal sphincter and the effectiveness of cricoid pressure after insertion of the LMA. When positioned correctly, the elliptical cuff of the LMA projects downwards into the hypopharynx below the level of the cricoid cartilage. If cricoid pressure is maintained during insertion of the LMA, it would seem possible that cricoid pressure could prevent correct placement of the LMA. We did not investigate the effectiveness of cricoid pressure subsequent to insertion of the LMA.

It is difficult to standardize the force required for effective cricoid pressure. Although a yoke was designed (similar to that described previously [10]) for this study in order to apply a standard pressure to the cricoid, the device proved to have too much lateral instability. Thus, to reproduce the clinical situation, cricoid pressure was applied in a standard manner by an experienced assistant.

Three assistants were used during the course of the study, but only one assistant at any time. They were given careful instructions and ample time to identify the cricoid cartilage and apply a firm two-handed cricoid pressure.

The number of unsuccessful insertions in the group without cricoid pressure applied is perhaps greater than that reported in routine practice when a prototype was used [11]. However, because observation of chest movement was prevented by the screen and strict criteria were used for successful insertion of the LMA, reduced success was anticipated.

Others have studied the effects of cricoid pressure on the correct positioning of the laryngeal mask airway [12, 13], with contrasting success. Heath and Allagain [12], in an unblinded consecutive study of patients with normal anatomy, failed to place a tracheal tube through an LMA in 22 of 50 patients without releasing cricoid pressure. Those patients had also received neuromuscular blocking agents. It was suggested that the cricoid pressure should be released momentarily during placement of the LMA and again during insertion of the tracheal tube. This was accepted as a compromise between protection against regurgitation and rapid, successful intubation. In contrast, in the correspondence which followed, Brimacombe [13] suggested from the results of another unblinded, consecutive study that application of cricoid pressure did not significantly reduce the ease of insertion of the LMA; nevertheless, he found that the oesophagus was seen in four of 40 patients who had prior cricoid pressure applied and in three of 40 who did not. The increased difficulty in placing a tracheal tube [12] with cricoid pressure can be explained by the increased anterior...
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...tilt of the laryngeal aperture of between 10° and 40° in every patient [13]. Our findings of a success rate of only three in 20 patients for correct insertion of an LMA at first attempt without release of cricoid pressure may be explained by the use of very stringent criteria for accurate placement, applied by an observer blinded to both the application of cricoid pressure and chest movement, in patients who had not been given neuromuscular blocking drugs. Both investigators in the present study have had considerable experience of insertion of the LMA (one (C.E.B.) having achieved 648 successful insertions in 10 months) and lack of skill in insertion of the LMA is thus unlikely to have been a factor in the low success rate whilst cricoid pressure was applied.

The precise role of the LMA in the failed intubation drill requires elucidation. The major disadvantage of the LMA is that it does not reliably protect against aspiration of gastric contents. The potential benefit of maintaining a patent airway with the LMA needs to be weighed against a potentially increased risk of aspiration and the possibility that it may even direct regurgitated material towards the larynx [14]. Further, prolonged failure to intubate the trachea after repeated attempts may allow sufficient time for the effect of the induction agent and shorter-acting neuromuscular blocking drugs to abate. Inability to deepen inhalation anaesthesia during this period may result in a lightly anaesthetized patient in whom the insertion of a LMA could promote vomiting or laryngospasm.

Our data suggest that, in the event of a failed intubation, in a patient in whom there is a significant risk of regurgitation and for whom ventilation can be maintained with a face mask whilst cricoid pressure is applied, it would be safer to continue with face mask anaesthesia rather than try to insert an LMA. If maintenance of a clear airway is impossible, the insertion of the LMA may be an alternative to cricothyroid puncture. Cricothyrotomy or insertion of a LMA each require transient removal of cricoid pressure, thus increasing the risk of aspiration. However, the consequences of aspiration are likely to be treatable and are preferred to the inevitable fatal progression to anoxia. The transient release of cricoid pressure to facilitate insertion of the LMA may carry only a small increased risk, but the effect of the LMA on the integrity of the upper oesophageal sphincter and on the efficacy of cricoid pressure after correct placement of the LMA is not known.

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**REFERENCES**