Ease of placement of the laryngeal mask during manual in-line neck stabilization

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Summary
We studied 20 patients, in a randomized, cross-over study, to determine if manual in-line stabilization of the head and neck altered the ease of insertion of the laryngeal mask and its correct positioning. After induction of anaesthesia and neuromuscular block, the laryngeal mask was inserted and adequacy of ventilation assessed while the patient’s head and neck were placed in the Magill and manual in-line positions, in turn. Ease of insertion of the mask was assessed using a 10-cm visual analogue scale (VAS) and position using a fibrescope. Time for insertion of the mask was measured. The laryngeal mask was inserted and adequate ventilation obtained at the first attempt in all 20 patients in the Magill position and in 19 of 20 patients in the manual in-line position. Insertion was always more difficult (P << 0.001; 95% CI for difference in VAS 20–55 mm) and time for insertion longer (P << 0.001; 95% CI for difference 4.9–11.9 s) in the manual in-line position compared with the Magill position. The incidence of a suboptimal position was significantly higher for the manual in-line position (seven patients) than for the Magill position (15 patients) (P < 0.005). We conclude that in paralysed patients, manual in-line stabilization of the head and neck made insertion of the laryngeal mask and its correct positioning more difficult. (Br. J. Anaesth. 1998; 80: 617–620)

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The laryngeal mask has a potential role in patients with difficult airways, because it has been used successfully in those in whom tracheal intubation, ventilation via a face mask, or both, has failed. However, the success rate of insertion of the laryngeal mask is low when cricoid pressure is applied and the neck is stabilized using the manual in-line method. Cricoid pressure may often impede insertion of the laryngeal mask, but it is not clear if insertion is more difficult when the neck is stabilized in the neutral position (without application of cricoid pressure) than when the neck is flexed and the head extended (Magill position). One study showed that in non-paralysed patients, there was no significant difference in the ease of insertion or correct positioning of the mask between the Magill and manual in-line positions. Another study showed a high success rate of insertion of the laryngeal mask even when a neck collar was applied in paralysed patients. However, we found that in paralysed patients, insertion of the laryngeal mask was sometimes difficult when the patient’s head was placed directly on the trolley (without neck stabilization). In none of these studies was the ease or success rate of insertion of the laryngeal mask compared between the Magill and manual in-line positions in paralysed patients.

In this study, we determined if manual in-line stabilization of the head and neck altered the ease of insertion of the laryngeal mask and its correct positioning in patients in whom a neuromuscular blocking agent was given.

Patients and methods
We studied 20 patients (ASA I or II) undergoing elective surgery, in whom neuromuscular block was used as part of the anaesthetic procedure. Patients were not included if they had any pathology of the neck, upper respiratory tract or upper alimentary tracts, or were at risk of pulmonary aspiration of gastric contents. Patients with Mallampati class 3 or 4 were also excluded. The local Research Ethics Committee approved the study and written informed consent was obtained from all patients.

Temazepam 20 mg orally was given as premedication. In the anaesthetic room, an electrocardiograph, pulse oximeter and arterial pressure cuff were attached. After preoxygenation of the patient, anaesthesia was induced with propofol, and neuromuscular block was produced with either vecuronium or atracurium, and was confirmed using a peripheral nerve stimulator. Anaesthesia was maintained with a volatile agent and nitrous oxide in oxygen.

In a randomized, cross-over manner, the laryngeal mask was inserted while the patient’s head and neck were placed in the Magill position and the manual in-line position, in turn. The order was randomized by tossing a coin (the Magill position followed by manual in-line position in 11 patients; manual in-line position followed by the Magill position in nine patients). On one occasion, a laryngeal mask was inserted while a pillow was placed under the patient’s occiput, the head was extended on the neck and the
lower neck flexed, as described by Magill. On the other occasion, insertion was attempted after the pillows had been removed and the patient’s head and neck were stabilized using the manual in-line method. All insertion attempts were made by the authors (J. N. or M. S.) who were not involved in a previous study. We did not attempt to blind the investigators from patient allocation, as the position of the patient’s head and neck and the assistant’s hands stabilizing the head and neck were often apparent, even if they were covered by a cloth.

A size 4 mask was used for both males and females unless it was judged that the size 4 was too large; the same size of mask was used on both occasions. The cuff was inflated with the recommended maximum volume of air (20 ml for the size 3 and 30 ml for the size 4) and the breathing system was connected to the laryngeal mask. Ventilation via the laryngeal mask was assessed and considered adequate when the chest expanded with satisfactory compliance during inflations, without an audible gas leak around the mask.

A fiberoptic bronchoscope was passed through the laryngeal mask. The view of the larynx through the bronchoscope with its tip positioned at the level of the grille of the mask was scored: A = the glottis, but not the tip of the epiglottis seen; B = glottis and tip of the epiglottis seen; B = epiglottis pressed downward; B = epiglottis not pressed downward, but glottis not seen; F = failure of placement. The laryngeal mask was arbitrarily judged as positioned correctly when the score was A.

Only one attempt at insertion was allowed for each occasion. Ease of insertion of the laryngeal mask was assessed using a visual analogue scale (VAS) (0–100 mm) for each attempt with the word “easy” on the left side of the line and “difficult” on the right. Time for insertion of the laryngeal mask, between removal of the face mask and connection of the laryngeal mask to the breathing system, was measured.

### Results

**SUCCESS RATE AND EASE OF INSERTION**

The laryngeal mask was inserted in all patients and adequate ventilation obtained when the patient’s head and neck were placed in the Magill position, whereas adequate ventilation was obtained in 19 of 20 patients when the manual in-line position was used. Insertion was always more difficult when the manual in-line position was maintained than when the Magill position was used (P < 0.001; 95% CI for difference in VAS 20–30 mm) (fig. 1). In addition,
the time taken for insertion was significantly longer in the manual in-line position than in the Magill position \( (P<<0.001; \text{95}\% \text{CI for difference 4.9–11.9 s}) \) (table 1).

POSITIONING OF THE LARYNGEAL MASK

Fibrescopy confirmed that the position of the laryngeal mask was correct (score A) in 13 of 20 patients (65%) when the mask was inserted in the Magill position, whereas the position was correct in only five patients (25%) when manual in-line stabilization was used (table 2). In all five patients in whom the position of the mask was correct during manual in-line stabilization, the position was also correct in the Magill position. The incidence of a suboptimal position was significantly greater in the manual in-line position than in the Magill position \( (P<0.005; \text{95}\% \text{CI for difference 0.19–0.61}) \).

Discussion

It has been claimed that insertion of the laryngeal mask is best achieved when the neck is flexed and the head extended, as described by Magill (“sniffing position”). In theory, insertion may be more difficult when the head and neck are in the neutral position, because the angle between the oral and pharyngeal axes becomes acute at the back of the tongue (fig. 2). Ishimura and colleagues used curved aluminium plates with several different angles as a model for the oropharyngeal structure, and found that it was difficult to advance the laryngeal mask beyond the angle of the plate when the angle was less than 90°.

In our study, the time for insertion of the laryngeal mask was significantly longer when the patient’s head and neck were placed in the manual in-line position than in the Magill position. This result is in contrast with that of Brimacombe and Berry who reported that the mask was inserted within 10 s in all 40 patients when the head and neck were placed in the Magill position and in 38 of 40 patients in whom manual in-line stabilization was applied. Although Pennant, Pace and Gajraj did not compare the ease of insertion of the laryngeal mask between the two positions, they reported that time for insertion was 22–87 s (mean 32 s) in patients in whom a Philadelphia collar was applied. This suggests that insertion was moderately difficult in their study.

Gabbott and Sasada found that it was often impossible to ventilate via the laryngeal mask when cricoid pressure and the manual in-line method were applied. Our study and previous studies have shown that it is generally possible to insert and ventilate via the laryngeal mask, even when the patient’s head and neck are stabilized. Therefore, it is reasonable to conclude that the main cause of failure in insertion of the laryngeal mask in this circumstance is cricoid pressure.

It has been suggested that in anaesthetized patients who are at risk of pulmonary aspiration and in whom the use of the laryngeal mask is considered to be justifiable, cricoid pressure should be released temporarily during insertion of the mask. However, in patients in whom both stabilization of the neck and cricoid pressure are required, time for insertion of the laryngeal mask and thus time for release of cricoid pressure may be unacceptably long.

In summary, we have shown that in paralysed patients, manual in-line stabilization of the patient’s head and neck made insertion of the laryngeal mask and its correct positioning more difficult.

References

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