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## REVIEW ARTICLE

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# The laryngeal tube

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The laryngeal tube (VBM Medizintechnik, Sulz, Germany) is a relatively new extraglottic airway, designed to secure a patent airway during either spontaneous breathing or controlled ventilation. In this review article, we have assessed the potential role of the laryngeal tube during anaesthesia and during cardiopulmonary resuscitation. There are four variations of the laryngeal tube: standard laryngeal tube, disposable laryngeal tube, laryngeal tube-Suction II and disposable laryngeal tube-Suction II. The design of the device has been revised several times. Insertion of the standard laryngeal tube is as easy as with the laryngeal mask airway classic. The laryngeal tube may provide a better sealing effect than the laryngeal mask. The incidence of complications with the two devices is similar, although the laryngeal tube may require more re-adjustments of its position to obtain a clear airway. Compared with the ProSeal™ laryngeal mask, the laryngeal tube may be less effective. The efficacy of the standard laryngeal tube is unclear, particularly in patients breathing spontaneously or in children. The efficacy of the laryngeal tube Suction-II and disposable devices is also not clear. From the limited number of studies and reports available, it can be concluded that the laryngeal tube is potentially useful in maintaining a clear airway during anaesthesia and cardiopulmonary resuscitation. In addition, the device may be useful as an aid to tracheal intubation.

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**Keywords:** airway; complications, difficult intubation; equipment, laryngeal tube

The laryngeal tube (VBM Medizintechnik, Sulz, Germany) is one of several new extraglottic (supraglottic) airways that have become available since the introduction of the laryngeal mask airway into clinical practice in 1988. Each device may have theoretical advantages or disadvantages over other devices. However, it is necessary to study the efficacy and safety of each device to determine whether the new device performs to an acceptable standard<sup>29</sup> and to establish which airway device is more appropriate for different clinical circumstances. We have reviewed the current knowledge of the laryngeal tube's performance and its role during anaesthesia and during cardiopulmonary resuscitation.

### *Standard laryngeal tube*

The initial design of the laryngeal tube has been modified. The current device consists of an airway tube with a small cuff attached at the tip (distal cuff) and a larger balloon cuff at the middle part of the tube (proximal cuff) (Figs 1 and 2). The cuffs are inflated through a single pilot tube and balloon, through which cuff pressure can be monitored. There are three black lines on the tube near a standard 15-mm connector, which indicate adequate depth of insertion when

aligned with the teeth. The device is made of silicone (latex free) and is re-usable, after sterilization in an autoclave, up to 50 times. There are six sizes, suitable for neonates up to large adults (Table 1).

### *Other types of laryngeal tube*

There are three other modified versions of the laryngeal tube: single-use laryngeal tube, laryngeal tube-Suction II and single-use laryngeal tube-Suction II (Fig. 2). The laryngeal tube-Suction is a further development of the laryngeal tube, which aims to separate the respiratory and alimentary tracts. This device has two lumens: one for ventilation and the other for the passage of a gastric tube. Recently, the design of the laryngeal tube-Suction has been revised (laryngeal tube-Suction II).

### **Anatomical position**

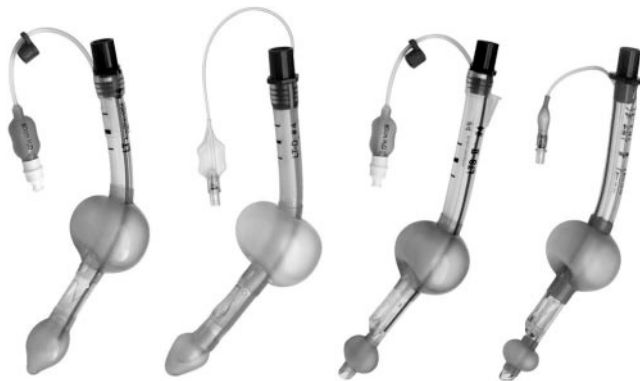
When inserted, the laryngeal tube lies along the length of the tongue and the distal tip is positioned in the hypopharynx

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<sup>†</sup>*Declaration of interest:* Dr Asai has undertaken some studies with the laryngeal tube in which the airways were supplied by the manufacturer at no charge.



**Fig 1** The laryngeal tube (VBM Medizintechnik, Sulz, Germany). The current device has two distal apertures (instead of one in the prototype) and indentation is made to the proximal cuff around the second distal orifice, and two side holes are added near the distal orifice.

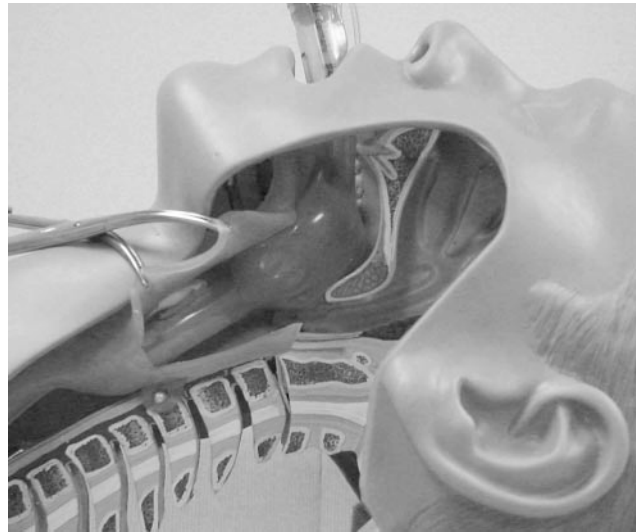


**Fig 2** Standard, disposable laryngeal tube, laryngeal tube-Suction II, and disposable laryngeal tube-Suction II.

(Fig. 3). The proximal cuff provides a seal in the upper pharynx and the distal cuff seals the oesophageal inlet. The distal aperture should face the glottic aperture, although fiberoptic bronchoscopy has shown that this may not be so.<sup>32,37</sup> However, similar to the laryngeal mask airway,<sup>17,51</sup> ventilation through the laryngeal tube may often be adequate even if the distal aperture is not facing the glottis directly.<sup>31</sup>

**Table 1** Size selection and recommended cuff volumes

Size	Patients	Body size	Recommended cuff volumes (ml)	Connector colour
0	Newborn	<5 kg	10	Clear
1	Infants	5–12 kg	20	White
2	Children	12–25 kg	35	Green
3	Adults: small	<155 cm	60	Yellow
4	Adults: medium	155–180 cm	80	Red
5	Adults: large	>180 cm	90	Purple



**Fig 3** The laryngeal tube in place. When correctly inserted, the laryngeal tube should lie along the length of the tongue and the distal tip should be positioned in the hypopharynx or the laryngeal part of the pharynx.

Initial recommendations suggested selection of airway size based on the patient's weight. However, in an early study, it was found that, by the weight-based selection, ventilation was often not adequate when the patient's height was <155 cm.<sup>18</sup> Therefore, guidance is now based on the patient's height: a size 5 when the patient's height is >180 cm; size 4 when 155–180 cm; and a size 3 when <155 cm. Since then, the success rate of ventilation through the laryngeal tube has been increased even in patients of short stature.<sup>24</sup>

## Insertion and removal of the laryngeal tube

### Insertion

The device should be inserted while the patient's head and neck are placed either in the sniffing position (Magill<sup>48</sup> position) or in the neutral position. The tip of a well-lubricated laryngeal tube is placed against the hard palate behind the upper incisors. The device is then slid down the centre of the mouth until resistance is felt or the device is almost fully inserted. Care should be taken not to push the tongue towards the posterior pharynx, to minimize a possible obstruction of the airway. When the laryngeal tube is



**Fig 4** (A) A cuff inflator (VBM Medizintechnik, Sulz, Germany). The cuff can be inflated by squeezing the bag and deflated by pressing the red side bottom. (B) A 100-ml syringe with the marks for the recommended cuff volumes for the different sizes of the laryngeal tube.

inserted properly, the second bold black line on the tube should have just passed between upper and lower teeth, but this has not been studied formally. When ventilation is adequate, a bite block provided is inserted, the laryngeal tube snagged into its wedge and both are fixed in place.

#### *Inflation of the cuffs*

The cuff should be inflated to a pressure of 60 cm H<sub>2</sub>O.<sup>18</sup> It may be easier to inflate the cuffs to a higher pressure and then adjust them to 60–70 cm H<sub>2</sub>O. This can be done either with a cuff inflator or a 100 ml syringe with the marks for the recommended volumes for each size of the laryngeal tube (Fig. 4; Table 1).

Asai and Shingu<sup>21</sup> sought adequate cuff volume by measuring the volume of air with which there was no gas leak around the cuffs at the intracuff pressure of 60 cm H<sub>2</sub>O and the airway pressure of 18 cm H<sub>2</sub>O. The mean volume was 62 ml for size 3 and 84 ml for size 4. These results are in agreement with the manufacturer's recommended cuff volumes (60 ml for size 3, 80 ml for size 4).<sup>21</sup> They<sup>21</sup> also found that, although the cuff volume was correlated with both the patient's height and weight, the height was a better indicator, as the variability of the predicted cuff volume was narrower for the height than the weight (Table 2).

When nitrous oxide is used during anaesthesia, the intracuff pressure of the laryngeal tube increases

**Table 2** The fitted values, 95% confidence intervals and 95% reference intervals (which include intracuff volumes of 95% of future subjects), of the intracuff volumes of the laryngeal tube, at several different patients' heights.<sup>21</sup> \*There was only one patient whose height was 180 cm

Height (cm)	Fitted value (ml)	95% confidence intervals (ml)	95% reference intervals (ml)
140	57	51–62	34–79
150	67	63–70	45–88
160	77	75–79	55–98
170	87	84–90	66–109
180*	97	92–103	75–119

progressively over time<sup>22,36,44</sup> and may increase up to 120 cm H<sub>2</sub>O within 2 h.<sup>22</sup> In contrast, when nitrous oxide is not used, the intracuff pressure remains stable.<sup>22</sup>

Concern has been expressed that the intracuff pressure of 60 cm H<sub>2</sub>O is too high and could cause ischaemic changes to the pharynx.<sup>4</sup> Nevertheless, what is important is the pressure exerted by the cuff on the oropharyngeal tissues, because the exerted pressure may be unrelated to the intracuff pressure.<sup>5</sup>

Asai and Kawachi<sup>8</sup> studied the exerted pressure by calculating the difference between intracuff pressures measured with the device in place in the patient and held in air, with the cuffs inflated with the same volume of air. The exerted pressure was 29 (range 24–36) cm H<sub>2</sub>O at an intracuff pressure of 60 cm H<sub>2</sub>O.<sup>8</sup> Brimacombe and colleagues<sup>28</sup> directly measured the exerted pressure, by applying gauge microchip sensors to the cuffs of a size 4 laryngeal tube. At the recommended cuff volume of 80 ml, the intracuff pressure was 70 (range 55–93) cm H<sub>2</sub>O, and the exerted pressure to the posterior pharynx was 37 (26–60) cm H<sub>2</sub>O.

Using the cuffed oropharyngeal airway (COPA), Brimacombe and colleagues<sup>27</sup> have shown that blood vessels in the pharyngeal mucosa started to be compressed when the exerted pressure on the pharynx exceeded 34 cm H<sub>2</sub>O and collapsed when the exerted pressure reached 73 cm H<sub>2</sub>O. Because the exerted pressure by the cuffs of the laryngeal tube is somewhere ~30–35 cm H<sub>2</sub>O (with an intracuff pressure of 60 cm H<sub>2</sub>O) the perfusion of the pharynx would not be reduced markedly. When nitrous oxide is used, the intracuff pressure may increase up to 120 cm H<sub>2</sub>O during 2 h of anaesthesia,<sup>22</sup> and at this pressure, the exerted pressure can reach ~50 cm H<sub>2</sub>O.<sup>28</sup> Therefore, when nitrous oxide is used, the pressure on the pharynx may be high enough to compress, if not collapse, the blood vessels in the pharynx. Nevertheless, factors other than the cuff pressure, such as the shape, material and compliance of the cuff, have an important effect on the incidence of ischaemia of oropharyngeal tissues.<sup>5</sup> As with any other airway device, vigilance is required during the use of the laryngeal tube, and excessive gas should be regularly removed from the cuffs.

#### *Adjustment of the device position*

If it is not possible to ventilate the lungs after insertion of the laryngeal tube, the following adjustments may enable

ventilation: lifting the angle of the mandible vertically upwards, further extension of the patient's head on the neck, turning the patient's head to the side and a gentle push or pull of the device.<sup>12 18 31</sup> If insertion or ventilation fails after two to three attempts, the laryngeal tube should be abandoned and an alternative airway used.

### *Removal of the laryngeal tube*

The laryngeal tube may be removed while the patient is still deeply anesthetized or after the patient has regained consciousness and has responded to verbal command to open the mouth.<sup>18 31</sup> The cuffs of the laryngeal tube should be deflated before removal.

## **Efficacy**

In this section, studies of the efficacy of the standard laryngeal tube and the laryngeal tube-Suction will be reviewed separately. The efficacy of the single-use device will not be reviewed here, as there are insufficient studies from which to draw any conclusions. The use in adults and in children will also be discussed separately.

### *The standard laryngeal tube*

The insertion of the standard laryngeal tube is generally easy. The reported success rate of insertion of, and ventilation through, the laryngeal tube ranges 92–100% for the earlier prototype<sup>10 12 18 26 33 35 37 53</sup> and 97–100% for the newest type.<sup>22 24 31 32</sup>

Three studies reported that the laryngeal tube provided a clear airway during controlled ventilation in a majority of patients.<sup>18 24 33</sup>

There have been four studies comparing the standard laryngeal tube and laryngeal mask airway classic during controlled ventilation.<sup>12 31 53 58</sup> These studies are in agreement on a number of points: the ease of insertion of the laryngeal tube is similar to that of the laryngeal mask airway classic and may provide a better seal and the peak airway pressure generated in the laryngeal tube is higher than that for the laryngeal mask airway,<sup>31 53</sup> due probably to a narrower breathing tube and smaller distal apertures. However, the difference between the two devices is ~2 cm H<sub>2</sub>O and thus may not be clinically relevant.<sup>31</sup> The incidence of complications associated with the use of the laryngeal tube is similar to that for the laryngeal mask, although the laryngeal tube may require more re-adjustments of its position to obtain a clear airway. Lastly, similar to the laryngeal mask airway, the laryngeal tube can be left in place until the patient has regained consciousness, without major respiratory complications.<sup>12 31 53 58</sup> Therefore, it can be concluded that the laryngeal tube is generally as effective as the laryngeal mask airway classic.

There have been two studies comparing the efficacy of the laryngeal tube and the ProSeal™ laryngeal mask.<sup>26 32</sup> Brimacombe and colleagues studied 120 patients and

reported that the success rate for the insertion of the laryngeal tube at the first attempt was similar to that for the ProSeal, but the success rate after three attempts was lower for the laryngeal tube (55 of 60 patients) than for the ProSeal (all 60 patients). The leak pressure was similar, but the expiratory tidal volume was lower, and the end-tidal carbon dioxide concentration was higher, for the laryngeal tube. More adjustments of the device position, inspiratory oxygen concentration and respiratory rate, were required for the laryngeal tube. The incidence of postoperative complications was similar. Cook and colleagues<sup>32</sup> reported that the success rate of insertion within two attempts was similar between the laryngeal tube and ProSeal, but insertion of the laryngeal tube took longer. The leak pressure and the number of adjustments of position were similar, but the peak airway pressure was higher for the laryngeal tube. In addition, airway patency was better with the ProSeal. From these results, it appears that the laryngeal tube is less effective than the ProSeal during controlled ventilation under general anaesthesia.

There are only a few reports of the efficacy of the laryngeal tube during spontaneous ventilation. Miller and colleagues<sup>50</sup> assessed the efficacy of a prototype laryngeal tube and had to abandon its use in 25 of 27 occasions. Figueredo and colleagues<sup>35</sup> studied 35 patients and reported that insertion of a prototype laryngeal tube was successful at the first attempt in only 18 patients (51%). These reports could simply indicate that the laryngeal tube is not useful during spontaneous breathing, but other interpretations may be made. One possibility is that as the device that Miller and colleagues used was a prototype<sup>7</sup> its efficacy was not satisfactory. A subsequent study by Miller found that the success rate of adequate ventilation through the new laryngeal tube was higher than that for the prototype.<sup>31</sup> Another possibility is that the high failure rates in their study were due to technical problems.<sup>50</sup> This may be a more likely reason, because even when ventilation was controlled, insertion of, and ventilation through, the laryngeal tube, failed far more frequently in their studies compared with other studies.<sup>18 22 31 32</sup> In addition, in these other studies, the airway did not obstruct even when the patient started to breathe spontaneously (after controlled ventilation) during emergence from anaesthesia.<sup>31 32</sup>

There have been only three studies of the use of the laryngeal tube in children, and all are available only as abstracts.<sup>41 42 56</sup> These reports indicate that repeated attempts may be required for successful insertion, and the device may be less effective in children than in adults.

### *The laryngeal tube-Suction*

The efficacy of the laryngeal tube-Suction II is yet to be determined, because there have been only a few reports on the first type of this device with inconsistent results.<sup>30 38 57</sup> Gaitini and colleagues<sup>38</sup> studied 150 patients and found that the success rate of insertion, leak pressure and the number of adjustments of the device position were similar to those for

the laryngeal tube-Suction and the ProSeal laryngeal mask. In addition, the success rate of passing a gastric tube through the laryngeal tube-Suction into the stomach (96%) was similar to that for the ProSeal. Roth and colleagues<sup>57</sup> studied 50 patients and concluded that the laryngeal tube Suction was as effective as the ProSeal laryngeal mask. In contrast, in 32 patients, Cook and colleagues<sup>30</sup> concluded that the quality of airway maintenance and the ability to ventilate the patient's lungs through the laryngeal tube-Suction was inferior to that through the ProSeal. The laryngeal tube-Suction required more time to insert and more frequent adjustments of the device position and was associated with a higher incidence of respiratory complications.<sup>30</sup>

## Complications

There is a theoretical risk that anaesthesia gas leaks around the laryngeal tube or is insufflated into the stomach. Nevertheless, the reported airway pressure at which gas starts to leak around the device is 24 cm H<sub>2</sub>O or higher,<sup>12 24 31–33 37 53</sup> and thus the laryngeal tube would usually provide an airtight seal during controlled ventilation. No gastric insufflation was detected in 322 patients reported so far by several researchers (Table 3).<sup>12 26 33 35 37</sup>

There have been no reports of pulmonary aspiration during the use of the laryngeal tube (Table 3). The distal cuff of the standard laryngeal tube may reduce reflux of gastric contents into the pharynx by occupying the oesophageal inlet, but if the distal cuff has failed to prevent reflux, there is a theoretical danger that the proximal cuff may push materials back into the larynx. Because the laryngeal tube-Suction II may allow gastric contents to bypass the pharynx, this new device has the potential to reduce the incidence of aspiration during cardiopulmonary resuscitation.

The laryngeal tube may be displaced during repositioning the patient's head and neck for operation. One study showed that the tidal volume decreased more frequently during repositioning the head and neck with the laryngeal tube (24%) than with the ProSeal (7%).<sup>2</sup> In contrast, another study has reported that airway obstruction did not occur

when the patient's head and neck were extended for mastectomy or rotated to the side for operation on the clavicle.<sup>24</sup>

One major drawback of the laryngeal tube is airway obstruction,<sup>31 32</sup> occurring 2–40%.<sup>24 26 31 32 35</sup> Compared with the laryngeal mask airway classic or ProSeal, adjustments of the position of the laryngeal tube may be required more frequently during anaesthesia.<sup>26 35</sup>

In one study, apparent ischaemic changes to the tongue were found in 2 of 36 patients during the use of the laryngeal tube, and in these patients, ischaemia disappeared after deflating the cuffs.<sup>31</sup> Another study also reported an incidence of 3% (1 of 35 patients).<sup>35</sup> Therefore, the cuff volume should be kept minimum, and when nitrous oxide is used, the cuff volume should be re-adjusted during maintenance of anaesthesia.

The laryngeal tube may cause injury to the pharynx. Blood was detected on the device at removal in 0–7% of cases.<sup>24 26 31 35 37</sup> This range is similar to, or possibly lower than, the incidence caused by the laryngeal mask airway (0.4–50%)<sup>25</sup> (Table 3).

The reported incidence of postoperative airway complications, such as sore throat, dysphagia, dysphonia or numb mouth, ranges from 0 to 34%. The incidence and the degree of postoperative complications are similar to those after the use of the classic laryngeal mask airway or the ProSeal laryngeal mask airway.<sup>31 32</sup>

Because the cuffs are thin and relatively large, they may be torn during use. One study reported that 2 of 18 laryngeal tubes broke during a study involving 36 patients. The damage was caused either by teeth during insertion or by sterilization.<sup>31</sup> In another study by the same authors, the incidence of the damage was 2 of 18 laryngeal tubes during use in 32 patients<sup>32</sup> and 4 of 32 patients for the laryngeal tube Suction.<sup>30</sup> Recently, a worrying case has been reported for a single-use laryngeal tube.<sup>52</sup> In a female patient, a size 4 was inserted and the cuffs were inflated with 80 ml of air. Ten minutes after the start of anaesthesia with sevoflurane, 66% nitrous oxide in oxygen, the proximal cuff ruptured, due possibly to expansion of the cuff by diffusion of nitrous oxide, causing a haematoma in the tongue and some damage to the pharyngeal mucosa. Full recovery took 7 days.<sup>52</sup>

**Table 3** Reported incidence of airway complications for the laryngeal tube and laryngeal mask airway classic in adults. \*Incidence at the airway pressure of 20 cm H<sub>2</sub>O. †Mean values from previously published studies, calculated by Brimacombe<sup>25</sup>

Complications	Laryngeal tube (%)	Laryngeal mask airway (%)
During anaesthesia		
Airway obstruction	2–40 <sup>24 27 31 32 35</sup>	0–24 <sup>25</sup>
Gastric insufflation	0 <sup>12 27 33 37</sup>	0–8 <sup>25 34*</sup>
Pulmonary aspiration	0 <sup>24 27 38</sup>	<0.1 <sup>25</sup>
Ischaemic change to the tongue	3–6 <sup>31 35</sup>	<0.1 <sup>25</sup>
Blood on the device	0–7 <sup>10 24 27 35 37</sup>	5 (0.4–20) <sup>25†</sup>
Postoperative period		
Sore throat	0–34 <sup>24 31 35 37</sup>	13 (0–56) <sup>25†</sup>
Dysphagia	0–17 <sup>24 31 35</sup>	11.5 (4–23) <sup>25†</sup>
Hoarseness	0–7 <sup>31 35 37</sup>	5 (0–30) <sup>25†</sup>

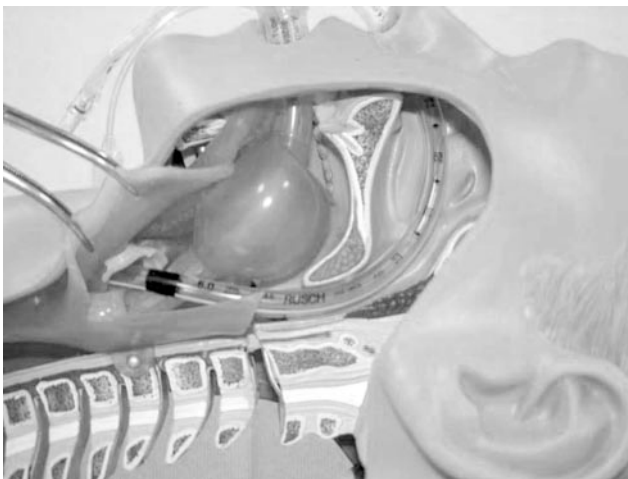
## Indications and uses

The indications (and contraindications) of the laryngeal tube is generally the same as for the laryngeal mask airway or a facemask. These include anaesthesia for operations on the extremities, minor urological and gynaecological procedures, and surface operations on the trunk. In addition, there may be several circumstances where the laryngeal tube can be useful.

There have been several reports of the successful use of the laryngeal tube in patients with a difficult airway,<sup>11 15 49</sup> including patients in whom insertion of the laryngeal mask had failed.<sup>15 49</sup> Insertion of a laryngeal mask or a laryngeal tube may be difficult in some circumstances.<sup>4 14 25</sup> An

understanding of the causes of difficult insertion of the laryngeal mask and of laryngeal tube would help establish the role of these devices in patients with a difficult airway. One possible factor which may differentiate the ease of insertion between these devices is the pharyngeal space. If the pharyngeal space is narrowed by, for example, swollen tonsils, insertion of the laryngeal tube may be easier than of the laryngeal mask airway, because the width of the laryngeal tube is narrower than that of the laryngeal mask airway.<sup>15</sup>

Fibreoptic intubation is useful in patients with a difficult airway, but it may be difficult to locate the glottis, to advance a tracheal tube over the fibroscope, and to ventilate the lungs during the procedure.<sup>23,54</sup> The laryngeal tube may provide a clear airway and enable delivery of oxygen and inhalation anaesthetics during attempts at fibreoptic nasotracheal intubation.<sup>3,19</sup> After insertion of a laryngeal tube, a tracheal tube is inserted through a nostril and the fibroscope is then advanced through the tube into the trachea, and the tube passed over the fibroscope into the trachea, while the lungs are ventilated through the laryngeal tube (Fig. 5). This method may also facilitate location of the glottis through a fibroscope, because the laryngeal tube indicates the centre of the oral cavity, and the distal cuff indicates that the glottis should be just anterior to the cuff. This method was successfully used in a patient in whom laryngoscopy, conventional fibreoptic intubation and insertion of the laryngeal mask airway had failed.<sup>3</sup> This method may also be useful in a patient with an unstable neck, in whom stabilization of the head and neck makes fibreoptic intubation more difficult.<sup>2,23</sup> One possible problem in a patient with an unstable neck is that insertion of the laryngeal tube may be difficult when the patient's head and neck are stabilized by manual in-line method.<sup>14,46</sup> Another possible problem of the use of the laryngeal tube is that inflated cuffs could



**Fig 5** The trachea can be intubated nasally while a laryngeal tube is in place. Alternatively, the laryngeal tube can be inserted orally while a nasotracheal tube is in place. Tracheal extubation afterwards under deep anaesthesia (leaving the laryngeal tube in place) enables smooth emergence from anaesthesia.

damage an unstable neck. Although the cuffs should not exert high pressure on the upper cervical spine, this possible risk should be weighed against the usefulness of the laryngeal tube in this group of patients.

The laryngeal tube may facilitate a smooth recovery from anaesthesia in the patient in whom the trachea is intubated nasally.<sup>20</sup> One possible problem associated with tracheal extubation is straining (or bucking), which may be particularly undesirable if the patient has ischaemic heart disease, asthma or an unstable neck.<sup>13,20</sup> Insertion of the laryngeal tube (in the presence of a nasotracheal tube) and subsequent tracheal extubation during deep anaesthesia, in theory, reduce airway responses, without necessitating manoeuvring of the head and neck position to obtain a clear airway.

### *Cardiopulmonary resuscitation*

Because of the ease of insertion and a good airtight seal, the laryngeal tube may, potentially, have a role in airway management during cardiopulmonary resuscitation. Insertion of the laryngeal tube is easy for paramedical staff.<sup>6,9</sup> In one report,<sup>6</sup> 28 Fire Defence Academy students, who had no experience of the laryngeal tube but had used a laryngeal mask airway, were all able to insert the laryngeal tube at first attempt in mannequins. The majority of the participants stated that its insertion was easier than that of the laryngeal mask.<sup>6</sup>

Genzwuerker and colleagues<sup>39</sup> reported a case of the use of the laryngeal tube by a physician during cardiopulmonary resuscitation. Subsequently, Asai and colleagues<sup>16</sup> reported five cases of the use of the laryngeal tube by paramedical staff. Manual ventilation was possible without airleak around the laryngeal tube in four of five patients. During the transport of the patients to the hospital, cardiac massage was continued, and the laryngeal tube was used for up to 30 min without airway obstruction or vomiting, until the trachea could be intubated. In the remaining patient, in whom ventilation was not satisfactory, there was no improvement in ventilation with tracheal intubation. Kett and colleagues<sup>43</sup> reported the use of the laryngeal tube by nurses during cardiopulmonary resuscitation of 30 patients, and ventilation through the laryngeal tube was successful in 24 patients (80%).

From these reports, it may be concluded that, although the laryngeal tube may share similar possible limitations with the laryngeal mask airway,<sup>17,55</sup> the laryngeal tube has a potential role in providing a clear airway during cardiopulmonary resuscitation. In Japan, since 2002, the laryngeal tube has been licensed for use during cardiopulmonary resuscitation, and paramedical staff has been allowed to use it,<sup>9</sup> along with the laryngeal mask airway and Combitube. It would be useful to study the efficacy of the laryngeal tube-Suction II during cardiopulmonary resuscitation, as this device has a theoretical advantage over the standard laryngeal tube or the laryngeal mask airway classic.

## Conclusions

From the studies and reports published, it can be concluded that the laryngeal tube can perform to an acceptable standard during anaesthesia and cardiopulmonary resuscitation. In addition, the device may be useful as an aid to tracheal intubation and extubation. To establish the role of the laryngeal tube in anaesthesia, further studies are required of its use in patients breathing spontaneously, in children, and the single-use version.

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