

# Cardiothoracic Anesthesia, Respiration and Airway

## Poor Man's LMA: achieving adequate ven- tilation with a poor mask seal

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**Purpose:** This report describes a technique of ventilation prior to laryngoscopy and intubation that proved to be simple, inexpensive and effective for a patient whose airway evaluation suggested difficult mask ventilation. The technique is called Poor Man's LMA.

**Clinical features:** A 60-yr-old male, measuring 170 cm, weighing 117 kg, edentulous and with a full beard, was to undergo uvulopalatopharyngoplasty. After induction of general anesthesia with a hypnotic, analgesic and non-depolarizing muscle relaxant, it was soon determined that mask bag ventilation was difficult due to an inadequate seal between the mask and the patient's full beard. To improve ventilation, an endotracheal tube was placed into the oropharynx, the lips and nose compressed by a colleague in order to prevent gas egress, and effective manual ventilation established by connecting the circle system to the endotracheal tube. Subsequent direct laryngoscopy and intubation were accomplished without incident.

**Conclusion:** The patient's clinical features made conventional mask bag ventilation difficult and inadequate. The Poor Man's LMA technique improved oxygenation and ventilation in preparation for intubation. Further investigations on the usefulness of this technique are warranted.

**Objectif :** Décrire une technique de ventilation, utilisée avant la laryngoscopie et l'intubation, qui s'est révélée simple, peu coûteuse et efficace chez un patient dont l'évaluation des voies aériennes laissait présager des difficultés de ventilation au masque. C'est la technique du ML improvisé.

**Éléments cliniques :** Un homme de 60 ans, mesurant 170 cm, pesant 117 kg, édenté et portant sa barbe entière devait subir une uvulopalatopharyngoplastie. Après l'induction de l'anesthésie générale avec un hypnotique, un analgésique et un myorelaxant non dépolarisant, on s'est vite rendu compte que la ventilation au masque serait difficile étant donné le manque d'étanchéité entre le masque et la barbe du patient. Un tube endotrachéal a été introduit dans l'oropharynx, les lèvres et le nez ont été compressés par un collègue pour éviter toute fuite de gaz et la ventilation manuelle effective a été établie en raccordant le système circulaire au tube endotrachéal. Par la suite, la laryngoscopie et l'intubation ont été réalisées sans incident.

**Conclusion :** Les caractéristiques cliniques du patient ont rendu difficile et incomplète la ventilation au masque traditionnelle. La technique du ML improvisé a permis d'améliorer l'oxygénation et la ventilation en vue de l'intubation. D'autres recherches sur l'utilité de cette technique sont donc à faire.

**O**CCASIONALLY during induction of general anesthesia, the anesthesiologist discovers that the patient is very difficult to ventilate with mask and bag. In the absence of any obstructive supraglottic pathology and with adequate neuromuscular blockade eliminating the possibility of laryngospasm, the difficulty often is due to a poor mask fit and inadequate seal. In spite of oral and nasal pharyngeal airways, optimal oxygen saturations are not achieved because of insufficient tidal volumes. The following case illustrates the use of a

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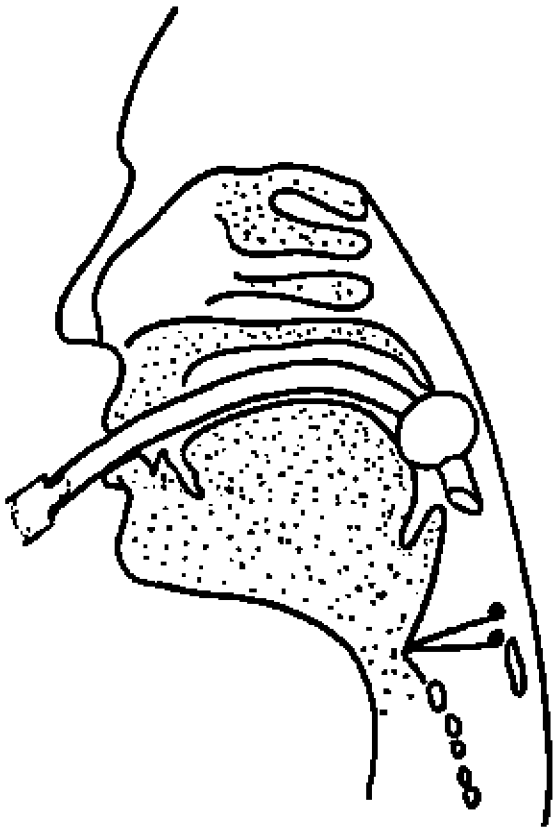


FIGURE 1 The cuffed endotracheal tube is placed in the oropharynx behind the tongue. The distal end of the tube is above the glottic opening.

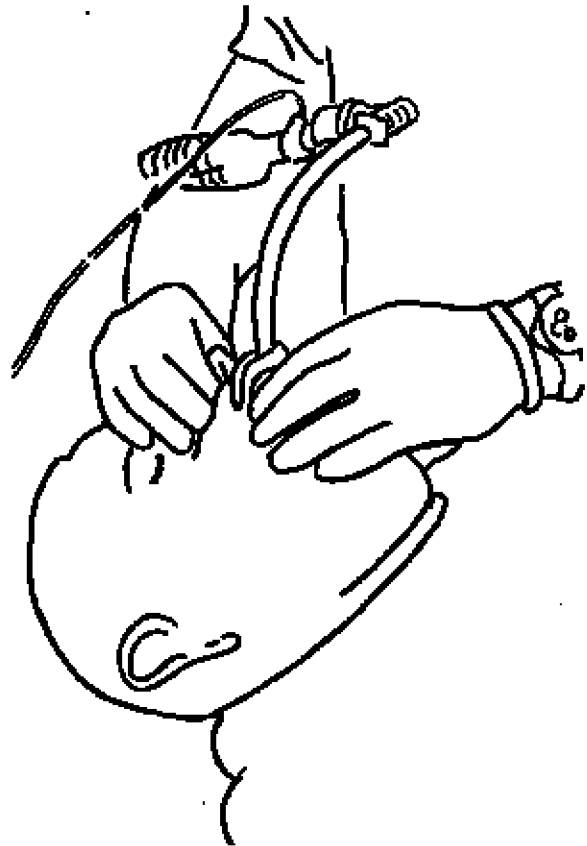


FIGURE 2 The patient's alae nasae are compressed and the lips opposed to make a seal around the endotracheal tube. Egress is prevented with positive pressure from the circle system and ventilation is established.

ventilation technique called the Poor Man's LMA that improved pre-intubation oxygenation by more than doubling the tidal volumes.

#### Case presentation

A 60-yr-old male measuring 170 cm, with a body mass index (BMI) of 40.4, a full beard and a history of nocturnal snoring, was scheduled for uvulopalatopharyngoplasty under general endotracheal anesthesia. He was edentulous and, on religious grounds, preferred to keep his full beard intact. His Mallampati classification of I, head extension of 40, and hyomental distance of three fingerbreadths, suggested easy endotracheal intubation. He had no stridor or any physical findings suggestive of upper airway obstruction. After appropriate monitor placement and oxygenation, the OR table was placed in 20 reverse Trendelenburg tilt and anesthesia was induced with sodium thiopental 500 mg, fentanyl 250  $\mu$ g, and

rocuronium 50 mg, administered intravenously. Attempts at mask and bag ventilation were unsuccessful because of the air leak due to the beard and facial deformities seen in patients without teeth. Maximum tidal volumes were 235 ml in spite of liberal use of the oxygen flush. Oxygen saturations declined from pre-induction values of 100% to the low 90's in two to three minutes.

A 7.5 cuffed endotracheal tube was placed into the patient's mouth and advanced into the oropharynx so the cuffed portion of the tube was between the tongue and the posterior pharyngeal wall (Figure 1). The cuff was inflated and the 15 mm connector attached to the circle system. As shown in Figure 2, the patient's alae nasae were compressed and lips opposed to make a seal around the tube. A colleague squeezed the bag as if the patient were intubated, expanding the chest. End tidal  $\text{CO}_2$ , measured tidal

volumes of 700 ml to 900 ml and a return of O<sub>2</sub> saturation to 100% all indicated optimal ventilation. The patient was easily intubated and the case concluded without further incident.

#### Discussion

Most of the anesthetic literature addressing the problem of the difficult airway has featured clinical findings that would complicate successful direct laryngoscopy and intubation. The problems encountered during difficult mask ventilation have not been adequately delineated even though the use of the laryngeal mask airway and the combitube are well-published techniques to solve the problem of inadequate bag mask ventilation.<sup>1,2</sup> Recently,<sup>3</sup> such factors as the presence of a beard, absence of teeth, age greater than 55 yr, BMI greater than 26, and a history of snoring were identified as predictors of patients difficult to ventilate by mask. However, recommendations to improve ventilation in these patients were not presented.

The consequences of inadequate ventilation by mask prior to intubation are grave since dangerously low levels of oxygen saturation can quickly occur. Furthermore, if attempts at intubation are difficult and unsuccessful, the clinical scenario of 'cannot ventilate cannot intubate' becomes exigent demanding rescue manoeuvres to include laryngeal mask airway, combitube insertion, transtracheal jet ventilation, or establishment of a surgical airway as recommended by the updated ASA algorithm for the management of the difficult airway.<sup>4</sup> These procedures, particularly transtracheal jet ventilation and a surgical airway are not without their own risks, particularly in the setting of a clinical crisis.

The key to avoiding adverse outcomes that begin on induction with inadequate ventilation by mask is to have alternative techniques of ventilation immediately available. In addition to the laryngeal mask airway and combitube, the technique described in this case report offers an additional solution to failed mask and bag ventilation when the failure is due to problems of maintaining a seal. The presence of a beard, or altered facial anatomy can hinder a proper mask fit mandating another mode of ventilation to offset the declining oxygen saturation.

Before the Poor Man's LMA is considered as an option, it is important to distinguish two separate categories of difficult mask ventilation. One category consists of anatomical variations that prevent good application of the mask to the face to establish an effective seal. This case presentation is such an example, and the use of the Poor Man's LMA technique may be appropriate. The other category consists of

patients determined to be difficult to ventilate by mask due to significant glottic or supraglottic pathology that obstructs or potentially obstructs airflow. Often these patients manifest stridor and supraclavicular-intercostal indrawing. In these patients who have obstruction or even potential obstruction, the Poor Man's LMA technique would be contraindicated and preemptive placement of a cricothyrotomy catheter<sup>6</sup> or awake fiberoptic intubation would be preferable procedures of choice.

The use of intermediate acting non-depolarizing muscle relaxants warrants discussion. In cases where direct laryngoscopy and intubation are predicted to be a challenge but not impossible, successful intubation is sometimes complicated because extra time is required to secure the airway. The longer time afforded by use of intermediate acting non-depolarizing muscle relaxants, compared to succinylcholine, optimizes conditions for successful airway management particularly when intermittent ventilation is required to maintain safe levels of oxygenation during multiple intubation attempts.

In summary, this report describes the use of an oropharyngeally placed endotracheal tube to allow, with the assistance of a colleague, manual ventilation of the lungs in a patient who proved to be impossible to ventilate with a conventional face mask during induction of anesthesia. The technique, nicknamed "Poor Man's LMA," may be used when specific devices such as the LMA or Combitube are not available and warrants further investigation.

#### References

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