The Laryngeal Mask Airway in the Scenario of Cannot Intubate-Cannot Ventilate

The importance of the laryngeal mask airway in the cannot intubate-cannot ventilate scenario begins with the ASA difficult airway algorithm which was first introduced in 1993. The algorithm divided airways into anticipated and unanticipated difficult airways. The anticipated arm suggests awake intubation or possibly spontaneous ventilation techniques of securing the airway. The unanticipated arm of the algorithm was focused on direct laryngoscopy. The algorithm suggested, as is clinical practice, that when direct laryngoscopy fails, the clinician should first attempt facemask ventilation and if this is successful, a non-emergency pathway was suggested. If facemask ventilation was unsuccessful, then the clinician enters the emergency pathway where four techniques were suggested to be employed including the laryngeal mask airway, the combitube, transtracheal jet ventilation and the use of a surgical airway. In 2003, the practice guidelines for the management for the difficult airway were updated. (Anesthesiology 2003, 98,pp 1269-77). These guidelines made a significant change in the algorithmic approach to the unanticipated difficult airway. In this case, if laryngoscopy and facemask ventilation failed, instead of moving the clinician towards the emergency pathway, the laryngeal mask airway was the next tool of choice. If the LMA was successful, the clinician was considered to be in a non-emergency situation and followed the non-emergency pathway that was described in 1993. Only if LMA ventilation failed was the emergency pathway entered which now includes the combitube, transtracheal jet ventilation and use of the surgical airway. In essence, the unanticipated arm of the algorithm was changed so that the LMA was no longer in the emergency pathway, nor the non-emergency pathway but in fact was placed among the routine airway techniques.

Why add the LMA to the routine pathway? The reasons include familiarity, availability, success rate for both the experienced and novice user, and rescue rates. All anesthesiologists are familiar with the use of the laryngoscope and the facemask and in fact, these have been long held as standards of care. As of 1995, the laryngeal mask airway was used in 23% to 35% of all surgical cases in the United States making it the next most familiar device in the routine armamentarium of the anesthesiologist. Availability: again the availability of the direct laryngoscope and the facemask are standards of care but the LMA is also ubiquitous, not only in the operating room, but also becoming so in emergency medicine. Success rates for the experienced clinician are as high as 99.7% with the laryngoscope, 99.85% with the facemask and approach similar numbers of 80 to 99.8% with the use of the LMA among experienced users. Among novice users the LMA has even higher success rates than the direct laryngoscopy and the facemask ventilation. In terms of rescue, the facemask has an approximate success rate of 85% when laryngoscopy fails. Rescue rates for use of an LMA at this time are unknown, though extrapolated data from studies such as Parmet et al in Anesthesia & Analgesia, 1995, show success rates of up to 94% and possibly higher depending on the stratification of patients.

The incidence of cannot-intubate in general anesthesia has been repeatedly shown to be approximately 3 cases per 1,000 patients, cannot facemask ventilate, 1 in 1,500 patients which will be discussed later, cannot LMA ventilate, 2-4 cases in 1,000 patients. The overlap of the cannot intubate-cannot ventilate patient has likewise been shown to occur in approximately 1 in 10,000.
operating room patients. Combining this with the cannot ventilate with the LMA, should reduce the number of unmanageable airways, but to what fraction is unknown.

Why should the LMA add rescue potential? We will first look at each technique in turn and examine why they fail in the unanticipated situation. The primary reason for unanticipated failure of direct laryngoscopy was described by Ovassapian et al in 2002 in a paper entitled, “The Expected Difficult Airway in Lingual tonsilar Hyperplasia”. These authors found that hyperplasia of the lymphoid tissue at the base of the tongue was the chief reason for failed laryngoscopy. Risk factors for difficult mask ventilation include ages 56, BMIs 26, facial hair, the patient who is edentulous and the patient with a history of snoring. If we examine each one of these factors, we see that there are both external and internal reasons that facemask ventilation may fail. Facial hair or poor dentition to provide a seal against the facemask may hinder adequate facemask ventilation. Patients with a history of snoring who have high collapsible pharyngeal tissues and older patients who may have similarly lax tissues may be difficult to mask ventilate as well as patients with a high BMI where increased airway pressure is needed. Langeron et al found that having two of these five risk factors increased the risk of difficult mask ventilation.

With the Laryngeal Mask Airway there has been little delineation of what patients failed unexpectedly. This is best looked at by what reported failures there are, which include one tracheal thrombosis, reported by Parmet et al in 1995, two cases of tracheal stenosis reported by Kokkinis et al in 1985, one laryngeal carcinoma reported by Patel, 1998, one patient with Hunter Syndrome, reported by Busoni et al, 1999, four obstetric cases reported by McClune et al, and Gataure et al, 1995, a case of rheumatoid arthritis reported by Ishumura et al, 1995, a case of medialization of the superior cornu of the thyroid and a severe meconium aspiration case reported by Brimacombe. These cases can be divided into distinct classes which include inability to align the oral and pharyngeal axis's, space-occupying lesions in the hypopharynx and lesions below the hypopharynx including high airway pressure.

If we return to the ASA Difficult Airway Algorithm, and how the LMA may provide an airway as failed techniques lead one down the branches, we see that during direct laryngoscopy, where lingual tonsilar hyperplasia may interfere with intubation, the LMA functions by moving beneath the epiglottis and therefore should overcome this problem. In the case of the facemask failure, the LMA will bypass the external factors such as facial hair and the edentulous patient. We also note that the LMA occupies the same tissues that are problematic in the snoring patient and therefore compensates both for the history of snoring and for age factors related to laxity of pharyngeal tissues. Though the LMA only seals the airway to 20-25 cm of water pressure, the Proseal LMA is helpful in the patient who requires larger pressure in its ability to seal the airway to 40cm of water pressures or more.

In summary, the inclusion of the LMA into the routine pathway of the difficult airway algorithm is a recognition of the LMA’s ability to compensate for many of the factors which are causative in unanticipated difficult intubation and unanticipated difficult mask ventilation. In theory, the inclusion of the LMA should move the incident of cannot-ventilate, cannot-intubate from 1 in 10,000 patients to 1 in several hundred thousand patients.

**SELECTED CITATIONS**


Takenaka I, Kadoya T, Aoyama K. Is awake intubation necessary when the laryngeal mask airway is feasible? Anest Analg. 91(1) 2000.


