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Letter to Editor

Advances in Prehospital Airway Management in Military Emergency Medicine (Our Experience from 1999)

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Abstract

Background: In spite of immense advances in contemporary anesthetic advances, airway management continues to be of incomparable importance to anesthesiologists, especially in military emergency medicine.

Objectives: Compare laryngeal mask airway with standard tracheal tube when considering insertion success rate, procedure learning and complications occurringin military emergency medicine.

Discussion: Although endotracheal intubation is the gold standard, laryngeal mask airway proved to be an equally effective airway tool in terms of adequate oxygenation and ventilation with minimal intraoperative and postoperative complications.

Conclusion: Laryngeal mask airway is a suitable and safe alternative to endotracheal tube for airway management in emergency and during resuscitation, in military emergency medicine.

Keywords: Endotracheal intubation; Laryngeal mask; Military emergency medicine

Letter to the Editor

In military emergency medicine and during resuscitation two goals are crucial: oxygenation of blood and maintenance of circulation. In North America there are wide variations in the types of out-of-hospital airway procedures performed. Endotracheal intubation remains the gold standard for securing the airway. It is the only glottic device (apart from Combitube which can also be a glottic device if passed into trachea). Failed intubation, unrecognized esophageal intubation, skill teaching, skill maintenance and lack of proven benefit remain a problem when dealing with out-of-hospital endotracheal intubation [1]. The incidence of failed intubation in out-of-hospital conditions ranges between 25-50% [2-6]. In a study of more than 1700 patients by Newgard and colleagues, it was noted that orotracheal intubation was used in 63% to 99% of the cases, and supraglottic airway in 0 to 27% of the cases, depending on the site in registry from which data was collected [7]. Wango and colleagues reported on problematic intubation in one out of five patients, meaning that more than one intubation attempt was necessary, the tube was malpositioned or unsecured, or intubation was unsuccessful [8]. Katz and Falk showed that the tube was placed in esophagus or hypopharynx in 25% of out-of-hospital intubation cases [9]. This study described the incidence of ETI success rate and number of attempts by out-of-hospital rescuers (paramedics, out-of-hospital nurses and physicians), and found that more than one endotracheal intubation attempt was necessary in 30% of these cases [10].

Also, recent study by Wang and colleagues found 77% success rate for out-of-hospital ETI [11].

On the other hand, Bernard and colleagues studied the use of rapid sequence induction (a procedure of securing the airway using sedative agents, muscle relaxants and endotracheal intubation in a fast, consecutive manner leading to airway protection) for severe head trauma patients in prehospital conditions using a predefined protocol for securing the airway with endotracheal intubation. Out of 110 patients with severe head trauma, 107 were successfully intubated by paramedics [12]. Rapid sequence intubation in patients with severe head injury in this study proved that it may be safely undertaken by helicopter-based ambulance paramedics and was associated with improvements in oxygenation, ventilation and blood pressure.

French study described 99.1% success rate of prehospital intubation. In this study intubation was performed by emergency physicians [13].

Alternative airway devices can be called supraglottic, meaning they are positioned above the laryngeal aditus. Adequate seal achievement is always an issue when dealing with these devices. LMA found its place in the European resuscitation guidelines 2010 as an alternative airway device which is inserted blindly into the oropharynx while maintaining inline stabilization [14]. LMA is a supraglottic device and does not protect the airway from oropharyngeal and gastric secretions. This is the primary downside of LMA usage. If positioned correctly, it might serve as a barrier or first line aspiration protection at the level of upper esophageal sphincter [15]. The incidence of gastric regurgitation during CPR in the study by Stone and colleagues was 22.6% in hospital setting. Regurgitation that could be accounted to LMA usage occurred in 3.5% of the cases with LMA as the primary airway devices, excluding the cases when face mask ventilation preceded LMA insertion [16].

LMA usage is simple, and skill of LMA insertion is easier to learn when compared to endotracheal intubation [14,17,2]. Hein and colleagues found that LMA was successfully inserted in 74% of the cases in prehospital setting.

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In a British study by Deakin, et al. insertion success rate for LMA was 88.5% [2]. Reasons for unsuccessful LMA insertion include anatomical variations of orofacial structures, incorrect insertion technique, trismus, or high Glasgow coma scale score [18]. Some of these factors can be surpassed by education on correct LMA insertion technique. Doerges and colleagues studied and compared success rate of insertion and ventilation using a face mask, LMA and Combitube on a bench model. These airway devices were inserted by inexperienced medical personnel in training who have not used any of these airway devices before. High insertion success rate and satisfactory ventilation was achieved using LMA. Gastric insufflation which can lead to regurgitation and aspiration of gastric contents was lower with the use of LMA when compared to face mask. Gastric insufflation was not reported in the Combitube group, however median insertion time was substantially shorter for LMA (37 s) than for Combitube insertion (70 s), which is of great importance [19]. LMA is also used as an airway device during CPR in hospital conditions, showing high insertion success rates and satisfactory ventilation [20].

Gastric insufflation which can lead to regurgitation of gastric contents is inevitable when supraglottic devices are used during CPR. As stated before, the incidence of gastric contents regurgitation is 3.5% when LMA is used during CPR as a sole airway device.

Bench model using pediatric bags or smaller volumes with supraglottic airway devices showed lower occurrence of gastric insufflation [21]. European resuscitation guidelines do not mention smaller volumes when supraglotic devices are used during CPR. In critical patients who were transported to the hospital ventilation via LMA should be done in concordance with recommendations that peak airway pressure applied during ventilation should not exceed 20 cm H_2O. Hence, to achieve this, smaller tidal volumes are a reality.

ProSeal LMA has a separate channel in addition to the channel used for ventilation which allows escape of gastric contents and reduces stomach insufflation. It is easy to insert, has a second cuff to improve the seal, provides better ventilation if airway pressures are higher, and reduces the risk of pulmonary aspiration. In prehospital settings, patients requiring airway management in emergencies are not fasted and are always at risk for gastric regurgitation and pulmonary aspiration. ProSeal LMA might be a superior airway management device in this group of patients [22]. It has been known that LMA can be used as a rescue device in cases of impossible conventional endotracheal intubation during general anesthesia. Cervical flexion ankylosis in Mb. Bechterew is one of the situations when LMA usage was successful in maintaining and securing the airway [23]. There are numerous situations when pathological orofacial structures make endotracheal intubation very difficult. Hulme and Perkins described a case series of patients with critical airway during prehospital management in whom LMA was used when endotracheal intubation attempts failed or when direct laryngoscopy was impossible due to patient's difficult position (vehicle entrapment) [24]. In these situations LMA proved its value for maintaining critical amount of ventilation and oxygenation.

Prehospital LMA success rates seem to be lower than the one in hospital cardiac arrest or elective surgical patients. Reasons for this could lie in less controlled environment, presence of intact airway reflexes, or maxillofacial injuries [25-31]. Sometimes LMA is the only applicable airway device in everyday pediatric anesthesiological practice.

534 patients during the period studied, 56 (10.5%) underwent advanced airway management, of which 31 (5.8% of total) were initiated by the MERT in the peri-evacuation phase. Twenty five cases (4.7%) underwent advanced airway management by other pre-hospital providers prior to MERT arrival. Of the 31 advanced airway interventions undertaken in-flight, cardiac arrest was the primary indication in only nine cases.

Conclusion

The figure of 56 patients requiring advanced airway management is at the higher end of the range expected from the study of historical military data. This may reflect the doctrine of "intelligent tasking", that is sending this physician-led team to the most seriously injured casualties. LMA is irreplaceable, serving with much success as an airway device of choice in military emergency medicine and prehospital setting, while remaining a valuable option and rescue airway for failed or impossible intubation.

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