Abstract: Securing the airway in patients with severe post burn contracture of the neck is often challenging for attending anesthesiologists. Fiberoptic bronchoscope (FOB)-guided endotracheal intubation is considered safe and reliable in this situation. Intubating Laryngeal Mask Airway (ILMA) is an alternative in case of FOB unavailability.

We report a case of 30 year old female with mentosternal contracture, where the use of ILMA allowed easy ventilation but failed to enable successful ILMA-guided blind intubation despite multiple attempts, the use of recommended Chandey’s maneuver and muscle relaxation. Subsequent FOB revealed marked anterior dislocation of laryngotracheal structures, leading to a slippage of the endotracheal tube back to the esophagus.

Key words: Intubating laryngeal mask airways; burn contracture neck.

Key message: In severe burn contracture neck, ILMA may not be a good alternative for blind endotracheal intubation in spite of proper insertion and ability to ventilate. Pulling of laryngeal structures consecutive to scarring possibly causes slippage of the endotracheal tube back to the esophagus during attempted intubation.

INTRODUCTION

Severe post burn contracture (PBC) of the neck may present a great challenge to the attending anesthesiologist. The contracture-induced traction forces may cause anatomical distortion of adjoining lower part of the face and laryngotracheal structures besides producing fixed flexion deformity of the neck, leading to difficult mask ventilation and endotracheal intubation. In these patients, fiberoptic bronchoscope (FOB)-guided intubation is considered safe and reliable but is associated with drawbacks of uneasy availability and requirement for a skilled practitioner. Intubating laryngeal mask airway (ILMA) is a possible alternative. However, failed endotracheal intubation using this device has been described in patients wearing a neck collar (1).

To the best of our knowledge, there is no such report in patients with PBC of the neck.

We report a case of postburn mentosternal contracture of the neck, where the use of ILMA led to successful ventilation but failed intubation after multiple attempts, and despite the use of recommended maneuvers and muscle relaxation. We describe the possible cause of esophageal intubation in such setting with the help of FOB.

CASE DESCRIPTION

A 30 year old female (weight: 58 kg, height: 160 cm) with severe postburn contracture of the neck and bilateral axilla was planned for release of the contracture and split skin grafting under general anesthesia. She had developed second degree burn of the neck, including lower half of the face, axilla and upper limb, due to the explosion of a kerosene domiciliary stove, 9 months ago. On examination, there was a midline mentosternal contracture involving the anterior neck muscles and lower face below the mouth (Fig. 1) leading, to flexed deformity of the neck. The nostrils were narrowed but patent. The lower lip was everted and the angle of the mouth was cicatrized, causing
spillovers during feeding. Airway examination revealed an inter-incisor distance of 30 mm and a class 4 Mallampati score (Fig. 2). Apart from the airway, her general and systemic examinations were normal. The laboratory investigations were within normal limits.

In the operating room, after attaching routine ASA monitoring and securing an IV access, she was premedicated with IV fentanyl (50 µg), midazolam (1 mg) and glycopyrrolate (0.5 mg). Lidocaine 10% was sprayed to produce topical anesthesia of the upper airway. A difficult airway cart was kept ready. After preoxygenation with 100% oxygen for 5 minutes, anesthesia was induced with sevoflurane (2-4%), while preserving spontaneous ventilation. At that time, mask ventilation was possible with minimal leak. A first conventional laryngoscopy showed only the epiglottis (Cormack-Lehane grade 4). Multiple attempts to pass a gum elastic bougie into the trachea failed. Subsequently, a size-3 ILMA was inserted and allowed ventilating the lungs without obvious leak. Attempts at intubation with silicon-wire reinforced endotracheal tube through the ILMA then always resulted in esophageal intubation. After three attempts, we used Chandy’s Maneuver to facilitate intubation, but it failed again. The Chandy’s Maneuver consists of two sequential steps. First the metal handle is used to rotate the device in the sagittal/or coronal planes to establish optimum ventilation by enabling optimum alignment of the laryngeal aperture and bowl of the mask. Second step is to use handle to lift the device away from the posterior pharyngeal wall to allow smooth passage of ETT. Intravenous rocuronium (0.5 mg/kg) was then administered to produce muscle relaxation and facilitate intubation through the ILMA without success. Finally, we borrowed FOB form the Intensive Care Unit (ICU). FOB allowed successful endotracheal intubation. During FOB, the epiglottic elevator of ILMA was visualized (Fig. 3) and, as we crossed it, a slit opening was noticed anteriorly between the arytenoid cartilages (Fig. 4). The whole structure was shifted anteriorly. With extreme anteflexion of the FOB tip, we could negotiate the slit opening and tracheal rings were seen (Fig. 5, 6). The endotracheal tube (ETT) was then railroaded along the FOB to the trachea. After intubation, the anesthetic management remained uneventful and release of neck contracture and split skin grafting lasted for 2 hrs. At the end of surgery
the trachea was extubated when the patient was fully conscious and oriented. Her subsequent course of stay in the hospital was uneventful.

**DISCUSSION**

Securing the airway is challenging in case of PBC of the neck. According to classification of postburn mentosternal contractures, our case fit into type 3 that is, anterior mentosternal contracture with neck contracted in flexed position, and the chin (including lower lip) restrained down to the anterior trunk (2). Difficulty with intubation can be anticipated when the distance between the chin and the thyroid promience is less than 6 cm in the adult. In type 3 mentosternal contracture, this distance is shortened. In addition, in our patient, there was reduction in the interincisor distance and everted lower lip causing difficult mask ventilation and endotracheal intubation. Most of these patients would require either division of the contracting band before intubation or an advanced airway management technique. Tumescent local anesthesia supplemented with intravenous midazolam has been used for release of PBC’s and skin grafting, with the benefit of avoiding the need of endotracheal intubation and reduced blood loss (3). However, type 3 and more severe PBC’s need extensive dissection. Hence these patients often require general anesthesia.

Awake FOB is considered safe and reliable to secure the airway in patients with anticipated difficult airway (4). However, FOB is expensive, not necessarily available and needs an expert skilled practitioner Regional blocks of the airway for awake FOB are also difficult in patients with PBC neck. However, FOB-guided intubation can also be done under deep sedation or general anesthesia. We could not keep FOB ready due to its unavailability.
Our patient had a mouth opening that was compatible with a direct laryngoscopy. This allowed us performing a check laryngoscopy after induction of anesthesia with sevoflurane, while preserving spontaneous ventilation. After failure to pass a gumelastig bougie in to the trachea, we used alternative methods of intubation.

ILMA (LMA-Fastrach™) is a commonly available novel device specifically designed for better intubation characteristics. It is a superior conduit for both blind and fiberoptic-guided tracheal intubation (5). It has been used successfully in a high percentage of difficult airway patients after failure to intubate with direct laryngoscopy (6).

The use of ILMA in the presence of neck collar (Stiff neck Select collar) in simulated patients has led to difficult insertions, difficult ventilation and impossible blind intubation (1). The difficulty at insertion can be minimized with a 180° rotation technique i.e. ILMA held upside down with machine end facing cephalad as mask is being sleepeed between upper and lower incisor and after insertion of mask inside mouth until angulation it is rotated by 180° (7). Similarly, difficult ventilation and intubation can be improved by a number of maneuvers, of which Chandy’s maneuver is well known and most commonly practiced (8). Chandy’s maneuver helps in achieving optimal alignment of the device, leading to significant higher success rates at first-attempt blind intubation (7). The types of endotracheal tubes for intubation through an ILMA also influence the success rate. Usually, a reusable silicone wire-reinforced tube is recommended. It is associated with a higher initial success rate than disposable PVC tubes (9). However, PVC tubes have been used successfully through the ILMA. In that case, the first-attempt success rate improves with reverse tube orientation. However, PVC tubes are not recommend for intubation because of their stiffness and uneasy passage through the glottis (10, 11). The use of rocuronium has been shown to provide good intubating conditions and increased success rates of intubation if a second attempt is required with the ILMA (12). In our case, we used a recommended silicone wire-reinforced tube. We did not encountered problems with ILMA insertion and ventilation. Although there was no resistance at pushing the tube forward, it sled posteriorly to the esophagus despite the use of Chandy’s maneuvers and muscle relaxation.

Among the other alternatives to secure the airway in such a case, a newly designed lightwand device (Trachlight™) has been shown to be superior to the ILMA in patients with cervical spine disorders, with respect to reliability, safety and rapidity (13). A rigid fiberoptic laryngoscope, the Bullard laryngoscope (BL), visualizes the glottic opening even when the oral, pharyngeal, and laryngeal axes are not aligned. In addition, BL requires minimal head manipulation and can be used with a mouth opening of 6 mm (14). It may provide higher success rates of intubation compared to the ILMA in patients with simulated limitation of cervical movements (15). A video-optical intubation stilet has been shown to be more effective and simple intubation device for difficult tracheal intubation than the BL (16). We did not use the above mentioned devices because of their unavailability.

In our case, after failure of endotracheal intubation through the ILMA, we did a fiberoptic bronchoscopy and noticed a slit opening anteriorly between the arytenoid cartilages. We could not visualize the laryngeal structures. With extreme antiflexion of the FOB tip, we could enter into the slit opening and could see the tracheal rings. Subsequently, the ETT was railroaded along the FOB to the trachea. Scarring of the anterior neck muscles and adjacent tissue has probably shifted the laryngeal structures anteriorly in addition to producing a fixed flexion deformity of the neck. Direct laryngoscopy could only visualize the epiglottis due to improper alignment of the oropharyngeal and laryngeal, axis as well as anterior the shift of laryngeal structures. After insertion of the ILMA, ventilation was possible through the slit opening between the arytenoids, but attempts to intubation failed. This was possibly due to the slippage of the ETT to the esophagus, since laryngeal inlet was shifted anteriorly as seen during the FOB (Fig. 4). Neither Chandy’s maneuver nor muscle relaxants helped for intubation. The ILMA was properly positioned and further optimization did not helped to bringing laryngeal inlet just opposite to the ILMA.

In conclusion, PBC of the neck presents as a unique airway difficulty for endotracheal intubation. Intubating LMA may be used for ventilation in patients with adequate mouth opening, but endotracheal intubation may not always be possible. Fiberoptic bronchoscopy appears to be the gold standard in this setting. The role of the ILMA and the use of muscle relaxation in such patients need to be evaluated in a prospective manner.

References

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