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Case Report

Laryngeal Mask Airway Obstruction by Mucous Plug in Newborn

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Abstract

Paediatric airway crisis with acute intra-operative distress is common in newborn with congenital defects. Acute intraoperative endotracheal tube obstruction leading to airway crisis has been reported in literature. Herein, we report a case of laryngeal mask Airway (LMA) obstruction by supra laryngeal mucus plug in a premature new-born with tracheo-esophageal fistula where airway was secured with LMA after failed endotracheal intubation.

Background: Acute airway obstruction is a life threatening situation requiring immediate attention, intervention and proper management for a successful outcome. Airway obstruction secondary to mucus plug in a case of bronchial asthma and other respiratory diseases is a common problem, especially in ICU settings, that leads to sudden respiratory insufficiency requiring ventilatory support and often resulting in death [1]. Intraoperative acute airway obstruction following endotracheal intubation has many causes [2]. Unexpected obstruction has been reported in relation to head injury [3]. However, Laryngeal Mask Airway obstruction by supraglottic mucous plug has not been reported in literature.

Keywords: Laryngeal Mask Airway Obstruction; Supraglottic Mucous plug; Newborn

Case Report

A 1.8 kg female baby was born to a severely anaemic and eclamptic mother, through emergency caesarean section at 34 weeks of gestation. At birth, the baby had an Apgar score of 3 and soon developed primary apnoea and immediate cardiac arrest but was resuscitated successfully and then managed in neonatal intensive care unit (NICU) where tracheo-esophageal fistula (Type A) was diagnosed. She was posted for stage 1 operation (feeding jejunostomy and cervical thoracotomy for release of stricture) under general anaesthesia.

After preparation, premedication with intravenous atropine (0. 1 mg) and pre-oxygenation, anaesthesia was induced with 5 mg of intravenous ketamine. Tracheal intubation was attempted with 3.0 & 2.5 mm ETT tube following relaxation with I.V. Suxamethonium (4 mg) but failed. During subsequent intubation attempts, SpO_2 fell rapidly to < 65% and heart rate declined to 80/min. LMA (size 1) was placed as a rescue device for airway management. After getting the square wave pattern on $EtCO_2$ and 100% saturation on SpO_2, surgery was allowed to proceed on FiO_2 of 0.5 on LMA.

Approximately 20 minutes after the beginning of surgery, the surgeon requested for Ryle's tube insertion to localize the site of stricture and the site of incision for thoracotomy. After deflating the LMA's cuff; an attempt to insert Ryle's tube adjacent to the LMA was taken, but was unsuccessful. LMA cuff was re-inflated for ventilation. Soon after, decreased lung compliance with increased resistance was noticed during manual ventilation through LMA. The $EtCO_2$ tracing gradually became feeble and irrelevant, and finally disappeared. The oxygen saturation also dropped rapidly to 85%. This created the suspicion of LMA displacement during intraoperative period. So the LMA was removed immediately.

The baby was then ventilated through the face mask. However, face mask ventilation failed to produce visible chest rise, and SpO_2 continued to decline. Check laryngoscopy was done, and a large thick mucus plug was discovered covering the whole laryngeal inlet, which was promptly, removed using a Magill's forceps. Now the repeat attempt at intubation was successful, resulting in immediate improvement and 100% oxygen saturation. Surgery was subsequently completed uneventfully. Extubation and recovery were smooth without any untoward incidence.

Discussion

"Maintaining a patent airway is vital to life" [4]. A person can clear the airway by coughing. Inability to cough out in various disease states may end up in critical condition [6]. Maintenance of clear airway is always the first priority, especially in cases of trauma, acute neurological decompensation, or cardiac arrest [4]. Presence of big mucus plug can end up as life-threatening **respiratory failure** [5] particularly in paediatric patients with lung disease or acute head injury [6]. Mucus plug formation occurs secondary to condition of excessive mucous production, and/or inadequate coughing leads to thickening of the plug that may obstruct the airflow, resulting in a critical situation [7] or a fatal condition [8]. Accumulation of mucus often occurs during and after surgery because of weak cough reflex [6].

Excessive salivation associated with choking, coughing, vomiting, and cyanosis starting with the onset of the feeding is the hallmark of tracheo-esophageal fistula [9]. The common Type A TEO fistula associated with oesophageal atresia may have multiple factors that promote excessive mucous production and impaired clearance,

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leading to accelerated mucus plug formation, sometimes thick enough to block the glottis [10]. Premature birth, immature lungs, post-resuscitation impaired swallowing function, shallow breathing due to depressed reflexes, infection, recent general anaesthesia and respiratory muscle weakness due to neuromuscular paralysis produced by muscle relaxant have all been incriminated as causes of inspissation of mucous and other secretion and plug formation [10].

In our case, other factors which could have contributed to the excessive mucus production are use of ketamine (does not supress the airway reflexes and causes increased saliva and mucus production), multiple laryngoscopy attempts and the presence of oesophageal atresia. Anaesthetic drugs given during surgery also cause respiratory depression, leading to hypoventilation and collection of normal secretions in the airways.

The use of LMA does not allow suctioning and clearing of secretions, leading to its accumulation and inspissation. Furthermore, positive pressure ventilation through LMA allows accumulation of secretions in the most dependant part in the pre-laryngeal or supraglottic area proximal to the LMA seal, which may trickle down if its cuff is deflated accidentally. Use of atropine dries up the secretions, which may at times form thick flakes/ crusts /plugs even in the large airways/ catheters producing a state of atelectasis with complete lung collapse and extreme desaturation or hypoxaemia [6]. Even repeated lung scan is unable to detect mucus plug obstruction which is confirmed on post-mortem examination. Investigators have advocated serial flow-volume loop analysis or early use of fiberoptic bronchoscopy for diagnosis of the airway obstruction in such patients [8].

In our patient, near total airway obstruction was caused by a large thick mucus plug that gradually formed intra-operatively at the laryngeal inlet during the LMA use, resulting in severe deterioration in oxygenation. Prompt check rigid laryngoscopy led to early detection and removal of the well-formed mucus plug with rapid improvement and successful tracheal intubation and outcome. Such a clinical situation is not yet emphasized in literature but our experience demands continuous careful vigilance during LMA placement, despite its popularity with minimal complications. Moreover, it cannot be overemphasized that immediate oropharyngeal suctioning is mandatory on accidental/ intentional cuff deflation.

Conclusion

Excessive salivation is the hallmark of tracheo-esophageal fistula and may lead to thick mucus-plug formation. This could even occur intra-operatively and lead to partial or complete airway obstruction. The obstruction can appear not only in the bronchi, bronchioles or ETT [11,12] but may also occur with LMA use. In paediatric population, other conditions associated with excessive mucous secretion especially chronic inflammatory airway diseases such as asthma, chronic bronchitis, and cystic fibrosis [13] requires meticulous planning, continuous vigilance and prompt management to prevent obstruction in natural or artificial airways.

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