Case Report

Laryngeal Mask Airway Obstruction by Mucous Plug in Newborn

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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, SpO2 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 EtCO2 and 100% saturation on SpO2, surgery was allowed to proceed on FiO2 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 EtCO2 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 SpO2 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 decapsulation, 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 mucus 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 mucus production and impaired clearance,
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 mucus 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 supra-glottic area proximal to the LMA seal, which may trickle down if its cuff is deflated accidentally. Use of atropine dries up the supraglottic area proximal to the LMA seal, which may trickle 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 mucus 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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**References**