Local anesthetic infiltration to the trachea facilitates spontaneous ventilation in a patient with giant lung bullae undergoing an emergent non-pulmonary surgery

To the Editor:

Bullous lung disease is an uncommon cause of respiratory distress. However, patients with giant lung bullae are sometimes scheduled for non-thoracic surgery. Specific problems associated with anesthesia in patients with bullae, such as acute enlargement or rupture of the bullae perioperatively, are challenging to the anesthesiologists. The anesthetic technique that most authors recommend is avoiding positive pressure ventilation and keeping spontaneous ventilation throughout the entire procedure. However, upon emergence from anesthesia, tracheal stimulation by the endotracheal tube (ETT) may sometimes evoke coughing or bucking reflex, the outgrowth of which may subsequently produce high intrathoracic pressure and even creation of barotraumas. Hereby we share our experience in maintaining spontaneous ventilation and using a modified technique for infiltrating local anesthetics (LA) around the ETT in a patient with multiple pulmonary giant bullae scheduled for emergent laparotomy.

A 40-year-old male with peptic ulcer perforation was scheduled for emergent exploratory laparotomy. The patient's preoperative chest X-ray (Fig. 1A) revealed multiple giant bullae over bilateral upper lung fields. The largest one encroached upon more than one-third of the left hemithorax with slight shift of the mediastinum towards the right. Standard monitorings included electrocardiography, noninvasive cuff blood pressure, and pulse oximetry. With adequate preoxygenation anesthesia was induced with fentanyl 100 μg, etomidate 18 mg, succinylcholine 100 mg and 2% xilocaine 100 mg intravenously. The trachea was intubated with a modified 7.5# cuffed ETT under Sellick maneuver. The ETT was used as a regular tracheal tube modified by attachment of an epidural catheter (BIBRAUN, Perfix®catheter, 20G) along the outer wall of the lesser curvature of the ETT with Trgaderm®. The tip of epidural catheter was fixed above the distal end of the cuff 1 mm distant (Fig. 1B). Anesthesia was maintained with sevoflurane 1.5% in air (1 L/min) and oxygen (1 L/min) mixture. Precautionary measure included the avoidance of use of nitrous oxide. Arterial and central venous lines were established for close perioperative monitoring. To reduce the stimulation of the in-place ETT, 2 mL of 2% lidocaine was infiltrated around the modified ETT cuff intermittently via the epidural catheter. The whole surgical procedure was smoothly completed with stable hemodynamics in one and a half hours. The patient breathed spontaneously without bucking or coughing despite vigorous manipulation of the alimentary tract during operation. No hypoxemia or hypercarbia was noted intraoperatively. Upon emergence from general anesthesia and when the patient was fully awake, the ETT was smoothly removed without signs of coughing or bucking and the patient was sent to the post-anesthesia care unit (PACU). The patient was neither cyanotic nor breathless during the stay in PACU. A postoperative chest X-ray taken at the PACU was unaltered except for mild infiltration over the bilateral lower lung fields, which was not visible on the follow-up chest X-ray taken on the next day.

A lung “bulla” is defined as a sub-pleural air cyst that forms as a result of dissolution of alveolar walls with enlargement of air spaces. Surgery is indicated in patients who have incapacitating dyspnea with a large bulla that encroaches upon more than 30% of either hemithorax and in patients who have complications related to bullous disease such as infection or pneumothorax. Intraoperative barotrauma could be catastrophic in these patients. Thorough preoperative assessment and preparation should be made for this possibility. In anesthesia for patients with bullae avoidance of the use of nitrous oxide and application of positive-pressure ventilation is imperative in order to decrease the risk of barotrauma to form a ball valve mechanism. Keeping spontaneous breathing smoothly without coughing or bucking throughout the surgical procedure and during the emergence from general anesthesia were recommended. Either the laryngeal mask airway (LMA) or the ETT is used to maintain patent airway with spontaneous ventilation; the ETT is particularly preferable in advanced airway management in emergency surgery, because the ETT allows better control of the airway and protects the airway or lungs from aspiration of regurgitated material. Also, one of the contraindications of the use of LMA is patients at risk of aspiration. Our patient is a case of peptic ulcer perforation who was at risk for aspiration. This is the reason why the use of LMA was not considered in our patient. Moreover, the stimulations, such as peritoneal traction from surgery or discomfort entailed by the cuffed ETT may have impact on spontaneous ventilation and they should be solved. Adequate anesthesia/analgesia and improving cuffed ETT tolerance were imperative. Gonzalez et al. used the Laryngotraheal Instillation of Topic Anesthesia (LITA™) tube (Sheridan Catheter Corp., Argyle, NY) for prevention of ETT-induced coughing during emergence from general anesthesia. Chien and Chen used similar method for improving ETT tolerance in awake-sleep-awake deep brain stimulation procedure. We modified a regular ETT in accordance to the principle of the LITA™ tube. Spontaneous ventilation was made possible with this application to infiltrate LA and thus inhibited coughing throughout the entire course of the operation. Besides blockade by LA in situ as we did, there are other methods to block ETT stimulation. These include direct spraying LA into the tracheal and larynx or through the ETT, deepening of inhalant agent, or addition of agonistic agent

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such as opioids or intravenous anesthetics. The application of LA to the trachea or larynx through direct spraying or instillation via the ETT may be unpredictable and may produce micro-aspiration due to unanticipated laryngeal blockade. Effects of infiltration of LA via the ETT are sometimes ineffective as the drug is directed to the larynx instead of the area around the stimulant, i.e. the mucosa that contacts the ETT cuff. Moderate dose of sevoflurane in combination with opioids could suppress the stimulation of peritoneal traction from surgery and the cough reflex invoked by treacheal intubation. However, deep anesthesia may also suppress cough reflex in spontaneous respiration, but it is not the case during the anesthetic emergence. Coughing or bucking during emergence from general anesthesia is a serious problem which could augment intrathoracic pressure and may result in bullae rupture. Our method of injecting LA only allows precise infiltration of LA to the tracheal mucosa that is adjacent to the cuff of the ETT. With the suppression of cough reflex the abolishment of coughing and bucking was made possible in our case, so we recommend the use of our method in patients who require spontaneous ventilation in general anesthesia. For these reasons, our modified method provides benefits to decrease intraoperative risks of barotraumas in patients with giant bullae who need general anesthesia for non-thoracic surgery.

References


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