Emergency Use of Eschlmann Stylet (Tracheal Tube Introducer) in Acute Tracheo Bronchial Obstruction during General Anesthesia

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Introduction

Airway obstruction caused by blood clots is a rare complication of endobronchial haemorrhage. Treatment methods include manual extraction by forceps, suctioning, saline solution lavage, balloon tip embolectomy and coude catheter embolectomy.1 Sudden endobronchial blockage by a firm blood clot acutely occurring during general anesthesia is a potenttially life threatening condition if not recognized and treated urgently.

We describe a case in which Eschlmann Stylet (tracheal tube introducer) which has been used successfully for changing the endotracheal tubes safely over the years, was used to break an obstructing blood clot in the trachea of a trauma patient with multiple injuries. She was undergoing an open reduction and internal fixation of the spiral fracture of the distal femoral shaft under general anesthesia.

Case Report

A 40 years old female weighing 80 kilograms was involved in a motor vehicle accident and acquired multiple injuries to limbs and chest and a spiral comminuted fracture of distal femoral shaft. She had fracture of right 4th, 5th and left 5th, 6th ribs along with a right pneumothorax and a right lung contusion. The patient was transferred to the hospital with a right chest tube in place for further management.

CT scan of chest was performed which revealed right pneumthorax with multiple rib fractures and left lower lobe atelectasis. Cervical spine showed no injuries radiologically and there was no injury to great vessels on aortogram.

Her past medical history was significant for smoking five cigarettes a day for three years, easy bruising and allergy to Penicillin and Aspirin. She had previous history of tonsillectomy, cholecystectomy and hysterectomy under general anesthesia without complications. Her preanesthetic work up revealed Hb. 12.0 Gm%, haematocrit. 35%, prothrombin time 11.9 seconds and activated partial thromboplastin time 22.0 seconds and INR 1.0. Vital signs showed blood pressure of 123/76 mmHg, pulse of 84 per minute and respiratory rate of 24 per minute. After initial resuscitation in emergency room the patient was taken to operating room for open reduction and internal fixation of her right femoral shaft fracture. After intravenous rapid sequence induction of general anesthesia, patient was intubated with size 7.0 endotracheal tube. Mechanical ventilation was initiated with tidal volume of 700ml, rate of 9 breaths/min. Her peak airway pressures were 32-35cm of water at these ventilator settings consistently. A mixture of Isoforane, oxygen and air was used for maintenance of general anesthesia and Cis-atracurium was used for muscle relaxation. After approximately one hour of surgery, the peak airway pressure suddenly increased from an average of 30-31 cm of water to 65 cm of water. The capnogram also showed a rise in carbondioxide. At this point position of the endotracheal tube was checked and maneuvers for high peak pressures (decreasing the pressure in endotracheal tube cuff, suctioning of encotracheal tube) were performed. These maneuvers failed to decrease the peak airway pressure. It was noticed that the suction catheter failed to pass beyond a 23cm mark even after multiple attempts. There was no air entry bilaterally on auscultation. However the patient continued to maintain oxygen saturation.

Pediatric bronchoscope was passed through the endotracheal tube to find the cause of the obstruction, which showed a clot of blood in the trachea distal to the endotracheal tube, almost completely obstructing the tracheal lumen. At this point Eschmann stylet (15 FR) was passed

through the endotracheal tube blindly to open the obstruction. This maneuver successfully decreased the patient's peak airway pressures to initial values with a bilateral improvement in air entry.
Extraction of the clot by bronchoscope was not attempted at this point and the procedure was completed without any further adverse events. Patient was transferred to intensive care unit intubated. Flexible bronchoscopy performed in intensive care unit, revealed a blood clot at the distal end of the endotracheal tube, not obstructing the airway completely, which was subsequently removed along with other small blood clots. Flexible bronchoscopy was again repeated after four days, which showed right-sided airway trauma with evidence of edema and inflammation. Patient was extubated successfully after four days in intensive care unit.

Discussion

Acute endobronchial obstruction in an anesthetized patient can develop from a variety of conditions, including bronchospasm, mucosal edema, mucous impaction, kinked endotracheal tube, over inflated cuffs, endobronchial hemorrhage and aspirated foreign bodies.
Airway obstruction caused by the presence of blood clot has been noted as a complication of bronchiectasis, tuberculosis, mitral stenosis, pulmonary infarction, pulmonary arteriovenous malformation, sarcoidosis, bronchial carcinoma, and intrathoracic trauma.
The most notable finding among anesthetized and ventilated patients, is an acute rise in peak Inspiratory pressure (Typically greater than 60 cm of water) and a concomitant decrease in tidal volume. Despite elevated airway pressures, the patient's hemodynamic status may remain essentially unaffected.2
Airway obstruction caused by blood clots is a rare but potential life threatening complication of endobronchial bleeding. Various modes of treatments are thrombolytic agents3, manual extraction by forceps, suctioning, saline solution lavage, balloon tip embolectomy3 and coude catheter manipulation. In instances of firmly adherent clot, manipulation with a Fogarty arterial embolectomy catheter has also been used successfully.3 These methods are time consuming and are not available to anesthesiologist immediately in an intraoperative emergent situation.
To our knowledge the use of Gum elastic bougie to break an obstructing firm blood clot and opening the trachea intraoperatively has never been described. According to our experience the use of Gumelastic Bougie is a quick, safe and reliable alternative available immediately in the operating room to achieve the patency of acute airway obstruction without causing further airway trauma. Where as using the usual endotracheal tube stylet can cause further trauma to the airway because of its hardness. The dislodged blood clot can be removed subsequently by flexible bronchoscope. In this particular case the decision not to remove the blood clot in the operating room was made because after dislodging the completely obstructing clot we were able to maintain good ventilation and oxygenation, and the air entry improved clinically.
Gum elastic bougie has been used for several years for difficult intubation4 and to change the different size endotracheal tube over it successfully. The gumelastic bougie, which we used was manufactured by Concord/Protex and was fabricated from a braided Polyesterbase with a resin coating to provide both stiffness and flexibility at body temperature. The indications for its use as described in the literature are to give directional control during routine or difficult oral intubation when laryngeal inlet cannot be seen completely.5 But as we described, it can also be used safely to dislodge completely obstructing material in trachea without damage to surrounding soft tissue because of its flexible nature. Later complete extraction of obstructing material can be carried out using a flexible bronchoscope. It can really be beneficial in small facilities where flexible bronchoscopes are not available readily.
In conclusion gumelastic bougie is a quick and safe method, readily available to achieve the patency of acute endobronchial obstruction in the operating room setting in an anesthetized patient and to buy enough time for extraction of obstructing clot, later on using a flexible bronchoscope.

References

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