Fortuitous Esophageal Intubation*
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Esophageal malposition is a potentially disastrous complication of attempted airway intubation. We report an unusual case in which a promptly recognized esophageal intubation aided detection of a perforated gastric ulcer. After the endotracheal tube was repositioned and the ulcer was surgically repaired, our patient had an excellent outcome.

(Chest 1993; 103:625-26)

ARDS = adult respiratory distress syndrome; ET = endotracheal

Intubation of the esophagus during attempted placement of an endotracheal (ET) tube is a common, often catastrophic complication. If not recognized within a few minutes, esophageal intubation results in anoxic encephalopathy or death. The literature amply documents the adverse consequences of inadvertent esophageal intubation and stresses methods to prevent or recognize malposition.1-3 We report a case in which inadvertent intubation of the esophagus facilitated detection of a perforated viscus, probably contributing to our patient's excellent outcome.

Case Report

A 48-year-old woman with a history of poorly controlled hypertension presented with shortness of breath. She had a five-year-history of hypertension but was otherwise in good health until 10 P.M. on the day of hospital admission when she had paroxysms of cough accompanied by a fever of 38.5°C. The cough was nonproductive and was soon followed by episodes of emesis and eventually by an ounce of serosanguinous vomitus. Worsening dyspnea over several hours led the patient to seek medical attention. She denied chills, diaphoresis, and chest, epigastric, or abdominal pain, and was receiving no medications. She had lost 4.5 kg over the previous two months as part of a dietary plan. The patient had no known risk factors for infection with the human immunodeficiency virus (HIV). Physical examination revealed an obese woman in moderate respiratory distress, breathing at 36/min, and using accessory muscles of respiration. The heart rate was 128/min, the blood pressure 168/102 mm Hg, and the temperature 37.5°C. On lung examination, there were diffuse bilateral crackles without signs of consolidation or wheezes. There was no jugular venous distention or third heart sound. The abdomen was obese and nontender without scars, organomegaly, masses, or evidence of ascites. Bowel sounds were diminished and the stool was guaicae negative.

Laboratory findings included a WBC of 25.1 (84 percent neutrophils; 4 percent band forms). An arterial blood gas determination on 40 percent oxygen by face mask showed a PaO2 of 56 (saturation 90 percent), Pco2 of 40, and a pH of 7.4. The chest roentgenogram revealed four quadrant air-space filling with mild cardiomegaly consistent with the clinical impression of the adult respiratory distress syndrome (ARDS). The ECG demonstrated sinus tachycardia.

Hypoxemia progressed over several hours despite 100 percent oxygen by face mask and intubation was attempted. A blind, nasal approach was selected and numerous passes were necessary before

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FIGURE 1. This portable, supine, anteroposterior roentgenogram demonstrates reduced lung volume, four-quadrant air-space filling, and a large collection of free abdominal air (arrows). Additional findings include a right main-stem intubation and a well-positioned pulmonary artery catheter. placement was achieved. During manual bag-assisted ventilation, the abdomen became distended and the patient became cyanotic. Epi gastric noises during ventilation and absent breath sounds confirmed esophageal malposition of the ET tube. The tube was removed and the patient was successfully intubated under direct laryngoscopy. Adequate hemoglobin saturation required 100 percent oxygen and 10 cm H2O positive end-expiratory pressure (PEEP). A pulmonary artery catheter placed to exclude cardiogenic pulmonary edema revealed the following: a pulmonary artery wedge pressure of 12 mm Hg, cardiac index of 3.2 L/min; systemic vascular resistance of 1.100 dynes-s-cm-2; and C(a-v)O2 of 4.0 ml O2/dl. The working diagnosis was ARDS secondary to community-acquired pneumonia and early diagnostic bronchoscopy was requested, possibly to be followed by open lung biopsy.

A repeated chest roentgenogram to assess ET tube and pulmonary artery catheter placement (Fig 1) unexpectedly showed a large pneumoperitoneum. Exploratory laparotomy disclosed wide disruption of the lesser curvature, probably due to gastric distention during esophageal intubation. In addition, however, omentum was adherent to the lesser curvature, indicating preexisting perforation, and providing a source for ARDS. Histologic examination confirmed the surgical impression of both subacute and acute gastric ulceration. Following gastric resection, ARDS resolved and the patient was extubated on the tenth hospital day. She was discharged from the hospital six days later without neurologic residua.

Discussion

Clinical precipitants of ARDS include sepsis, gastric acid aspiration, shock of any etiology, major trauma, overwhelming pneumonia, burns, acute pancreatitis, drug overdose, toxins, and near drowning. When major infection is the cause of ARDS, discerning the source is often difficult. In a review of 84 patients with ARDS, 40 percent of those who died had an important, but unsuspected, site of infection documented at necropsy, most commonly in the lungs or peritoneum.4 Nearly half of the previously undiscovered septic sources may have been amenable to surgical drainage, and most of these were in the abdomen. Even when presenting symptoms and signs are limited to the lungs,
extrapulmonary sources of ARDS must be considered.9

Our suspicion for an abdominal process was low because fever and cough were such prominent early complaints and preceded vomiting. Further, the abdominal examination was initially unimpressive and bowel sounds were present (although diminished). Therefore, we concluded that this patient's cough, dyspnea, and fever most likely represented severe, community-acquired pneumonia. Unintended gastric insufflation via the endotracheal tube proved the presence of a perforation. A similar technique, in which an upright chest roentgenogram is performed following injection of air through a nasogastric tube, has been used for many years to assist in the diagnosis of perforated ulcer in patients who present a diagnostic dilemma.9 In our patient, even when pneumoperitoneum was discovered, we initially assumed that it was due solely to acute gastric rupture. Only the surgical and pathologic findings solidly placed the true source of ARDS in the abdomen. While abdominal sepsis in the setting of a benign abdominal examination must be uncommon, we speculate that the inflammatory focus was initially walled off from the peritoneal surface. Alternatively, encephalopathy related to hypoxemia or sepsis could have blunted overt manifestations of abdominal infection.

There are an estimated 2,000 to 15,000 cases of anesthesi- or ventilator-related death and brain damage annually in the United States. Approximately 15 percent of all major anesthesia-related catastrophes are due to esophageal misplace- ment of the tracheal tube,1 a complication seen in approxi- mately 1 percent of attempted intubations.2 Unrecognized esophageal intubation is entirely preventable since there are several effective methods for detection of malposition. Most employ the determination of expired CO2 to confirm proper placement.8 Given the typically dire consequences associated with unrecognized malposition, all blind intubations, and those in which the tube is not seen to pass through the vocal cords, should be followed by one of these methods.

In contrast to the potentially disastrous outcome feared with esophageal intubation, it is likely that our patient benefited. Had the endotracheal tube been placed into the trachea, we might not have discovered the pneumoperito- neum as expeditiously. Our patient might have undergone an unnecessary open-lung biopsy or even died of abdominal sepsis. This serendipitous recognition of an abdominal source of sepsis, facilitated by a malpositioned ET, led to prompt surgical repair of the gastric perforation.

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Retrieval of an Aspirated Bullet Fragment by Flexible Bronchoscopy in a Mechanically Ventilated Patient*

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We report the case of a 25-year-old man who aspirated a bullet fragment following a gunshot. Review of the literature indicates this to be a rare finding. Bedside flexible bronchoscopy provided visualization of the foreign body and facilitated its removal while the patient was on a ventilator. The benefits of flexible bronchoscopy in similar conditions are discussed. (Chest 1993; 103:626-27)

Aspiration of a foreign body, a clinical problem seen more commonly in the pediatric age group, is infrequently seen in the adult population.1-4 Although a history of aspiration can be elicited sometimes, clinical suspicion is often necessary for making the diagnosis. Rigid bronchoscopy has been the mainstay of treatment, although increasing ex- perience with the flexible fiberoptic bronchoscope (FOB) has made this the instrument of choice for dealing with aspirated foreign bodies in adults.1,4,4 In this report, we describe the retrieval of an aspirated bullet fragment with a FOB in a critically ill patient in the intensive care unit (ICU).

CASE REPORT

A 25-year-old man sustained a self-inflicted gunshot wound to the face. The pistol was positioned under his chin and directed upward. A single .22 caliber bullet was discharged, entered the oral cavity, and fragmented after disrupting the hard palate. The patient sustained soft-tissue destruction of the lower part of the face and the tongue as well as complex fractures of the mandible, maxilla, and bony palate. In the emergency department, he was combative and had uncontrolled oropharyngeal bleeding. Orotracheal intubation with an 8-mm endotracheal tube was performed without apparent complication. No foreign body was seen. He was then taken to the operating room to repair his injuries.

He arrived in the ICU anesthetized requiring mechanical ventil- ation. Persistent, bloody secretions were noted in his endotracheal tube. A portable chest roentgenogram showed a radiopaque object in the bronchus intermedius (Fig 1). Various possibilities, including an artifact, tooth, gravel, or bullet, were considered. A repeated

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