Case Report

Gastric perforation after accidental esophageal intubation in a patient with deep neck infection

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ABSTRACT

Deep neck infection with airway obstruction may complicate endotracheal intubation with limited neck motion, pharyngeal swelling, and prominent secretion. Unrecognized esophageal intubation (EI) may unduly overinflate the stomach to inhibit effective ventilation, increase the incidence of hypoxia, and produce a ruptured visceral organ. We report an 81-year-old female patient with deep neck infection and impending respiratory failure who suffered gastric perforation after accidental EI in the intensive care unit. After failed attempts of intubation, EI was recognized rapidly as the culprit, although roughly audible bilateral breathing sounds were present but not gastric bubble sounds. A catastrophic complication of gastric rupture occurred due to ambu-bagging and mechanical ventilation. Surgical intervention was performed immediately. Possible mechanisms are discussed.

1. Introduction

The neck is composed of complex anatomical spaces where infection may spread from local sites along the fascia planes to generate deep neck abscess.1 Aggravation of deep neck infection (DNI) results in asphyxia or hypoxia due to airway compromise. It is an emergency event needing immediate airway management to maintain airway patency. However, it is a real challenge to medical personnel because there is no consensus about when to assist the compromised airway, and some aged patients may develop a rapidly exacerbated condition without warning.2 To establish airway patency in DNI patients, endotracheal intubation may be complicated by limited neck motion, pharyngeal swelling, and excessive oral secretion.3,4 However, unexpected esophageal intubation (EI) is a catastrophic complication during difficult intubation. It may delay set-up airway if EI is undetected immediately and exacerbate arterial oxygen saturation. Furthermore, unrecognized EI with controlled ventilation may unduly overinflate the stomach to inhibit effective ventilation, exacerbate hypoxia, and produce a ruptured visceral organ. In this presentation, the DNI patient had unrecognized EI and controlled ventilation followed. Gastric perforation occurred following inadvertent oxygen administration and improper use of controlled ventilation. Gastric perforation after unrecognized EI is a rare complication. The possible mechanisms of such occurrence are discussed.

2. Case report

An 81-year-old female patient with a history of hypertension suffered from severe neck, throat swelling, and drooling. Air hunger had developed while she was in the emergency room. Her right tonsil, lateral and retropharyngeal swellings, with an impression of DNI, were revealed by computed tomography (Fig. 1). The patient initially refused surgical intervention; therefore, the patient with impending respiratory failure was referred to the intensive care unit (ICU) for further treatment. Unfortunately, respiratory distress became worse and the patient was desaturated rapidly. Due to limited neck motion, severe pharyngeal swelling and large amounts of oral secretions, the physician failed to intubate after a series of three attempts assisted by direct laryngoscopy with a 7.0 ID (Internal Diameter) endotracheal tube. The anesthesiologist took over to control her airway after arrival. Spontaneous breathing was maintained with mask Ambu-bagging to assist ventilation under sedation with thiamylal 3 mg/kg and midazolam 0.1 mg/kg. Muscle relaxants were not administered due to anticipated airway...
difficulty. The anesthesiologist intubated with a direct Macintosh laryngoscope (HEINE Optotechnik, Herrsching, Germany) and swollen arytenoids were visible. The intubation was undertaken with little difficulty; however, the first attempt of intubation failed to be detected early as an unexpected EI because there were no gastric bubble sounds and roughly audible bilateral breathing sounds shown in this spontaneously breathing patient. Ambu-bagging through endotracheal tube continued during the peri-intubating period and an assisted ventilator was connected. However, after a few moments of intermittent positive-pressure ventilation, the patient’s oxygen saturation decreased to 70% and acute abdominal distention was discovered. Although end-tidal CO2 value was not available, the anesthesiologist alerted the physician to an incorrect tube placement, the endotracheal tube was removed immediately, and an alternative technique using fiberoptic bronchoscope guidance for nasotracheal intubation was performed successfully while the patient continued to breathe spontaneously. A follow-up chest X-ray after intubation showed right sub-diaphragm pneumoperitoneum with right upward diaphragm (Fig. 2). Hollow organ perforation was suspected. The patient underwent emergency exploratory laparotomy and a 4-cm laceration in the lesser curvature of the stomach was repaired and incision and drainage of the deep neck abscess followed. Her condition has normalized since then. The nasotracheal tube was removed on the next day after surgery. The patient stayed in the ICU for 5 days and was then transferred to a general ward for 4 days, and subsequently was discharged. When she returned to the outpatient clinic 2 weeks later, her general condition was uneventful.

3. Discussion

Infectious neck abscess may contiguously spread from local sites along the fascia planes to the involved tissues including the mandible, mylo-hyoid muscles, soft tissues of the floor of the mouth and root of the tongue, and hyoid soft tissues swelling.5 The DNI patient is in the same situation where maintenance of airway patency becomes difficult because of airway compromises such as swollen mandible tissues, limited neck motion, swollen oral mucosa and tongue, swollen nasopharynx and larynx, and increased oral secretions. In this presentation, muscle relaxants were not administered because the patient’s spontaneous breathing with intermittent mask ventilation maintained her oxygen saturation. However, it is a difficult decision to use muscle relaxant. After administration of muscle relaxant, the patient needs bag-valve mask ventilation and assisted intubation techniques (backward—upward—rightward pressure or increased cricoid pressure). Nevertheless, swollen upper airways and inflammatory glottis might lead to more air being entrapped in the stomach than the lungs. Awake intubation in such patients is indicated. In addition, a sedated patient given bag-mask resuscitation may develop an overinflated stomach easily after only a few incorrectly performed breaths.6

Gastric perforation should be considered in patients with acute distended abdomen following unexpected EI.7,8 However, the

Fig. 1. Right tonsil swelling in oral pharyngeal cavity.

Fig. 2. Compared to the previous chest X-ray film (A) from the emergency department, the post-intubation film (B) revealed massive subphrenic and intra-abdominal air spaces, indicating hollow organ perforation.
majority of patients with gastric perforation are associated with incorrect airway placement as well as forceful external chest compressions for cardiopulmonary resuscitation. In general, a fully developed stomach is able to tolerate pressure up to 120–150 mm Hg before gastric perforation occurs. The present patient did not undergo forceful chest compression but had no immediately recognized EI. Ambu-bagging and mechanical ventilation should be the sole cause of gastric perforation.

Gastric perforation occurs commonly along the lesser curvature for areas that are less elastic, have fewer mucosal folds, and are fixed by hepatogastric ligaments. The main therapeutic principal for areas that are less elastic, have fewer mucosal folds, and are fixed by hepatogastric ligaments. The main therapeutic principal for areas that are less elastic, have fewer mucosal folds, and are fixed by hepatogastric ligaments.

To determine correct positioning of the endotracheal tube into the trachea, the presence of audible bilateral breathing sounds without gastric bubble sounds is not reliable. Undetected EI is an uncommon (<1%) but a catastrophic complication if not diagnosed quickly. Commonly used pulse oximetry in the ICU is able to detect desaturation, but it is a late sign of a malpositioned endotracheal tube. Monitoring of end-tidal CO₂ combined with auscultation has been demonstrated as a standardized tool to determine endotracheal tube positioning in the trachea. However, short-run waveform shown in capnography due to pre-existing CO₂ in the stomach have been reported in accidental EI in a spontaneously breathing patient with distended stomach. Fiberoptic-bronchoscope-assisted intubation is reliable in positioning the tube correctly, but is not a routine first-line tool. According to a previous study, video-laryngoscopy is able to reduce esophageal intubations. However, instruments are not available in all circumstances. The present patient reminds us that breathing sounds are still audible by stethoscope in spontaneously breathing patients even when Ambu-bagging leads to endotracheal tube malposition in the esophagus. Although it is time consuming, chest X-ray is recommended as routine examination after attempted intubation, to identify the correct tube position. If the nasogastric tube is placed before intubation in DNI patients, gastric perforation will not occur.

In conclusion, DNI patients with spontaneous breathing but presenting with air hunger should be considered as presenting with a difficult airway. After unrecognized EI, gastric perforation was seen following bag-valve mask ventilation and controlled ventilation. Therefore, immediate recognition and correction of EI aided by fiberoptic bronchoscopy or video-laryngoscopy are important. Although portable capnography is not available to all patients, it may be suitable for DNI patients for early detection of inaccurate tube positioning.

References