

## CASE REPORTS

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Anesthesiology  
2000; 92:1837-9  
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## Aspiration Pneumonia after Anesthesia in a Patient with a Zenker Diverticulum

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PULMONARY aspiration is one of the most feared complications of anesthesia. Only the prevention and the consequences related to aspiration of gastric contents are widely discussed in the literature.<sup>1</sup> Few reports highlight the particularities in the management of patients at high risk for aspiration of esophageal contents caused by esophageal diseases.<sup>2,3</sup> Thiagarajah *et al.*<sup>2</sup> discussed the anesthetic implications in a patient presenting for surgical resection of a Zenker diverticulum (ZD). We report a case of pulmonary aspiration in a patient with a ZD who underwent surgery for a different pathology.

### Case Report

A 64-yr-old, 73-kg man with a known ZD was scheduled for the repair of an infrarenal abdominal aortic aneurysm. The preoperative blood tests, electrocardiogram, and cardiac echography were within normal limits. A chest roentgenogram showed a widening of the upper mediastinum, which was compatible with the diagnosis of a ZD. A barium swallow showed a large pouch in the proximal posterior esophagus, with a neck slightly above the level of the cricoid ring (fig. 1). The patient had fasted for more than 12 h preoperatively, and was premedicated with atropine 0.3 mg intramuscularly, diazepam 5 mg orally, and nizatidine (a dihydrogen blocker) 150 mg orally 1 h before induction of anesthesia. In the operating room, the patient was placed in the neutral supine position. After 3 min of preoxygenation, midazolam 1 mg, fentanyl 100 µg, lidocaine 80 mg, propofol 140 mg, and rocuronium 60 mg were consecutively injected intravenously. The subsequent application of backward pressure over the cricoid ring was immediately followed by a burping sound. The face mask was removed to show that the mouth of the patient was full with a yellowish fluid. Suction was immediately applied, and the head was tilted down. Laryngoscopy followed by tracheal intubation with an 8.0-mm cuffed Portex tube (SIMS Portex, UK) was easily performed. Before ventilation, the endotracheal tube was suctioned, but nothing could be retrieved from the tracheobronchial tree. Mechanical ventilation was started, and chest auscultation revealed normal breath sounds over both lung fields. A nasogastric tube insertion was attempted several times, but it was coiling and did not reach the stomach. The surgical time was 6 h and the oxygen saturation measured by pulse oximetry ranged between 95% and 100%. At the end of the surgery, it was decided to keep the trachea intubated. A chest roentgenogram was

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Received from the Department of Anesthesiology, American University of Beirut, Beirut, Lebanon. Submitted for publication December 10, 1999. Accepted for publication March 3, 2000. Support was provided solely from institutional and/or departmental sources.

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Key words: Pharyngoesophageal diverticulum; pulmonary complications; regurgitation.

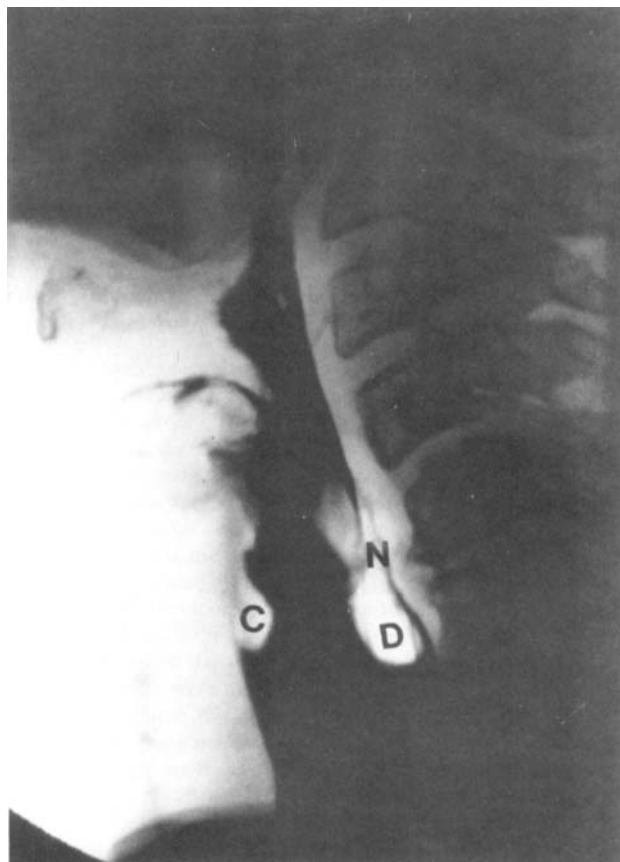


Fig. 1. Barium swallow showing the anatomical relationships between (C) the cricoid ring, (D) the diverticulum, and (N) the neck of the diverticulum.

unremarkable. The next day, a chest roentgenogram was still unremarkable and the arterial blood gases on a inspiratory oxygen fraction of 40% showed a partial pressure of alveolar oxygen of 86 mmHg, a partial pressure of alveolar carbon dioxide of 40 mmHg, and an arterial oxygen saturation of 97%. Trachea extubation was uneventful. On postoperative day 3, the patient became feverish (39°C), tachypneic, and began coughing yellowish sputum. A chest roentgenogram showed then an area of consolidation in the right lower lobe and some infiltrates in the left lower lobe with bilateral pleural effusions. An oxygen face mask and intravenous imipenem were administered. Sputum culture showed *Escherichia coli*. On postoperative day 10, the patient's condition deteriorated markedly. The arterial blood gases on room air showed a partial pressure of alveolar oxygen of 46 mmHg, a partial pressure of alveolar carbon dioxide of 28 mmHg, and an arterial oxygen saturation of 82%. The chest roentgenogram showed extensive bilateral intraalveolar infiltrates that were suggestive of severe aspiration pneumonia. The patient was reintubated and began mechanical ventilation using an inspiratory oxygen fraction of 60% and a positive end-expiratory pressure of 10 cm H<sub>2</sub>O. A deep tracheal aspirate culture showed heavy growth of *Candida albicans*, and fluconazol 400 mg intravenous drip every 12h was added. On day 19, the clinical status of the patient was adequate, as evidenced by improved arterial blood

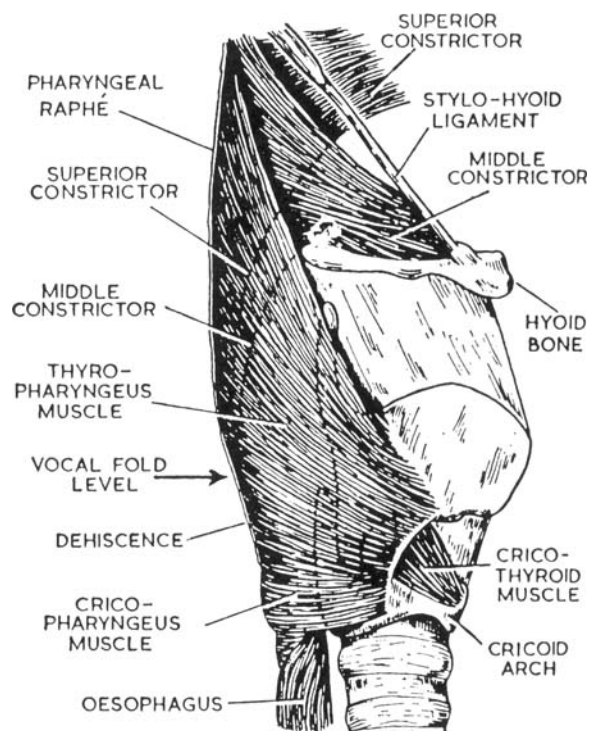


Fig. 2. The superior and middle constrictors of the pharynx and the thyropharyngeus muscles lie together from the pharyngeal ligament down to the level of the vocal cords. (Bottom) The posterior wall of the esophagus is only the single sheet of the thyropharyngeus (the dehiscence of Killian) that allows herniation of the esophageal diverticulum, and is always above the cricoid arch.

gases and a chest roentgenogram. After gradual weaning, the patient's trachea was extubated.

## Discussion

Zenker diverticulum occurs in 0.1% of 20,000 routine barium examinations.<sup>4</sup> The ZD pouches posteriorly through the dehiscence of Killian between the thyropharyngeus and cricopharyngeus muscles (inferior constrictors), always above and never below the cricopharyngeus muscle<sup>5</sup> (fig. 2). This pouching is believed to result from dysfunction or spasm of cricopharyngeus muscle.

The anesthetic implications of a ZD have been discussed by Thiagarajah *et al.*<sup>2</sup> Oral premedication should be avoided because premedicants may lodge in the pouch and may be aspirated to the lung. The use of antacids or dihydrogen blockers is of no value because the contents of the pouch have an alkaline pH. Fasting is

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important, but does not guarantee an empty pouch. Also, insertion of a nasogastric tube is hazardous and may lead to the perforation of the diverticulum. Emptying the diverticulum before induction of anesthesia by manual external pressure is of paramount importance. This maneuver ensures a decreased pressure inside the pouch when the neck of the diverticulum, which is formed by striated muscles, is relaxed and incompetent after induction of anesthesia. In patients with ZD, a head-up tilt of 10 to 30° is recommended to decrease the likelihood of regurgitation from the sac of the diverticulum by the effect of gravity. Also, applying cricoid pressure in patients with ZD has been only recommended if the neck of the pouch is under the cricoid cartilage.<sup>2</sup> Because the neck of the pouch is always above the cricopharyngeus muscle, the cricoid ring is always below the neck of the diverticulum (fig. 2). Therefore, the application of cricoid pressure may increase rather than decrease the risk of regurgitation in patients with ZD. Intraoperatively, it has been suggested that a moist gauze pack placed to surround the endotracheal tube will prevent aspiration during surgery.<sup>2</sup> Postoperatively, nursing the patient in a semisitting position and avoiding excessive sedation may decrease the risk.

Aspiration of the contents of a ZD may lead to particle-related complications if undigested food is present. However, because the esophageal aspirate is usually alkaline, aspiration does not lead to acid-related complications. Although aspiration of gastric acid contents causes immediate chemical burn from the central airways to the alveoli, aspiration of material from the ZD, which contains oropharyngeal pathogens, leads to bacterial-related complications.<sup>1</sup>

Our patient was anesthetized using a rapid-sequence induction of anesthesia similar to that used in any patient with full stomach. No specific precaution concerning a ZD was stated. Aspiration may have followed the massive regurgitation that was observed after induction of anesthesia and the application of cricoid pressure. However, this patient underwent surgery for the manage-

ment of an abdominal aortic aneurysm, whereas the ZD was not resected; hence, aspiration from the nonresected pouch may have occurred at induction of anesthesia, during surgery, or during the postoperative period. The absence of fluids from the tracheobronchial tree after the episode of regurgitation at induction of anesthesia and the delayed occurrence of pneumonia at day 3 suggest that the aspiration may have occurred during the postoperative period. The presence of *E. coli* in the culture supports this postulation because this bacteria is not part of the normal flora of the oropharynx and may become predominant only after colonization with the coliform that are present in the hospital environment.<sup>6</sup>

In conclusion, fasting and preoperative manual emptying of the pouch are recommended in patients with ZD. Nasogastric tube insertion is hazardous and should be avoided. A 30° head-up tilt during rapid-sequence induction of anesthesia without the use of cricoid pressure is recommended to avoid regurgitation from the pouch. Also, the surgical excision of ZD should be attempted before other elective surgery because its presence will increase the risk of regurgitation and pulmonary aspiration during the intraoperative and the postoperative periods.

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