

Esophageal tear in a patient undergoing stereotactic brain biopsy under general anesthesia

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Abstract

Injuries of the esophagus with resultant mediastinitis have been reported following endotracheal intubation. Herein, we report a case of esophageal perforation that resulted from difficulty with intubation in a patient with a stereotactic head frame. A 52-year-old woman underwent a stereotactic brain biopsy of a left temporal tumor. After a stereotactic head frame was applied, intubation for anesthesia required three attempts. On postoperative day 2, she complained of worsening dysphagia and chest pain. A 4-mm tear in the right posterior cervical esophagus was discovered and repaired. Esophageal perforation may arise from limited neck extension imposed by a stereotactic head frame. Unexplained dysphagia postoperatively is the hallmark of this rare complication.

Key words Brain biopsy · Dysphagia · Esophageal perforation · Intubation · Mediastinitis

Introduction

We report a case in which an esophageal tear occurred in a patient as the result of an apparent atraumatic intubation. This case is unique in that the patient was intubated while in a stereotactic head frame with moderate difficulty. Esophageal perforation was suspected 48 h postoperatively, resulting in neck exploration and thoracotomy for mediastinitis. The objective of this case report is to discuss the airway management of patients in stereotactic head frames and to recognize esophageal perforation as an unusual yet life-threatening complication of intubation.

Case report

A 52-year-old woman with a history of recent-onset complex partial seizures, expressive dysphasia, and an ill-defined lesion in the left temporal lobe presented to the Department of Neurosurgery at Mayo Clinic Jacksonville. After evaluation, she was scheduled to undergo a stereotactic brain biopsy of a left temporal tumor. With the history of seizures, general anesthesia was requested. Preoperative examination revealed a 55-kg female appearing anxious but in no distress. Airway examination showed the patient to have a Mallampati score of II. The thyromental distance was greater than 6 cm, mouth opening was satisfactory, and she had full range of motion in her neck. The patient had no prior history of difficult intubation.

A stereotactic head frame was applied with monitored anesthesia care consisting of propofol for sedation. Supplemental oxygen was administered via nasal cannula, and the patient was monitored with standard American Society of Anesthesiologists monitors. The patient then underwent magnetic resonance imaging with anesthesiology staff present to provide sedation, owing to a history of claustrophobia.

Upon return to the operating room, general anesthesia was induced with propofol (160 mg), fentanyl (100 µg), and succinylcholine (100 mg) after preoxygenation. The forward mouthpiece of the head frame was removed (Fig. 1), and the patient was easily mask ventilated. An initial attempt at laryngoscopy was made with a Miller 2 laryngoscope blade and the vocal cords could not be visualized. No attempt was made to pass an endotracheal tube. A second attempt was made with a Macintosh 4 laryngoscope blade. The arytenoids were visualized and tracheal intubation was attempted with a 7.0-mm styleted endotracheal tube; the stylet was well inside the tip of the endotracheal tube. An esophageal intubation was immediately recognized by the absence of a capnographic waveform. The patient was mask



Fig. 1. Stereotactic head frame with removable forward mouthpiece (shown by a coauthor, E.L.B.)

ventilated, and a third attempt was made with an Eschmann stylet after visualization of the arytenoids. A 7.0-mm endotracheal tube was advanced over the Eschmann stylet into the trachea with the aid of cricoid pressure and limited neck extension. Confirmation of endotracheal placement was made via bilateral breath sounds and capnography. There was no evidence of blood on the endotracheal tube or in the oropharynx. A flexible adult esophageal stethoscope was later placed without difficulty for temperature monitoring.

The patient's intraoperative course was uneventful. Vancomycin (1 g) was given intravenously for surgical wound prophylaxis. General anesthesia was maintained with isoflurane in oxygen and air. Paralysis was maintained with vecuronium. The patient was extubated and had an uneventful course in the postanesthesia care unit.

After discharge from the postanesthesia care unit to a general nursing unit, the patient complained of sore throat and mild dysphagia. A chest radiograph showed a possible air density in the mediastinum. On postoperative day 2, the patient's dysphagia worsened and she complained of chest pain. An electrocardiogram was within normal limits. However, a repeat chest radiograph revealed significant mediastinal air, subcutaneous air in the neck, and a new right pleural effusion.

The patient was subsequently transferred to the intensive care unit and an otorhinolaryngology consultation was obtained. After cultures were prepared, meropenem 1 g every 6 h was given intravenously. An otorhinolaryngologic surgical team discovered and repaired a 4-mm tear in the right posterior cervical esophagus. A drain was placed in the neck and purulent fluid was noted. A thoracic surgical team performed a right thoracotomy for mediastinal drainage and drain-

age of a right-sided empyema. The patient returned to the intensive care unit and was mechanically ventilated until postoperative day 2, when she was successfully weaned from the ventilator and extubated. She remained in the intensive care unit for 8 days. On postoperative day 14, she was discharged home with a feeding tube and with scheduled follow-up with specialists in otorhinolaryngology, neurology, and speech pathology. The brain biopsy revealed a low-grade glioma.

Discussion

Esophageal rupture is a very unusual complication of endotracheal intubation. It is rarely reported in adults but is more prevalent in pediatric patients [1]. To date, there are no reported cases of esophageal perforation occurring in patients intubated while in a stereotactic head frame.

Hilmi et al. [2] reported two cases of esophageal perforation in 2003. One case occurred during a gastric bypass and the other occurred during cataract extraction. In both cases, difficulty with intubation was reported, and in one case, the intubation was described as "traumatic." These authors correctly reported that a high degree of awareness is necessary to make an early diagnosis of esophageal perforation.

Our case is unique because the patient was intubated while in a stereotactic head frame. Although the head frame used in this case has a removable forward piece (Fig. 1) that lends itself to airway management, the frame may limit neck extension depending on frame placement. This made a potentially easy intubation more difficult by preventing use of the "sniffing" position. Some anesthesiologists recommend fiberoptic intubation in all patients who have stereotactic head frames. Furthermore, if difficulty with intubation is expected, one could secure the airway before placement of the head frame.

White and Morris [3] reported a series of 52 esophageal tears in which iatrogenic causes accounted for approximately half of the injuries (52%). The leading cause of the reported injuries was gastrointestinal endoscopy. Only 3 of the 52 tears were attributed to intubation, and all 3 occurred during attempted emergent blind nasotracheal intubation.

In the present patient, the injury consisted of a 4-mm tear in the right posterior cervical esophagus. On the basis of the size of the tear, the most likely mechanism of injury was the first attempt at intubation with an endotracheal tube with a stylet (Fig. 2). This could have resulted in contact between the tip of the rigid stylet in the endotracheal tube and the posterior esophageal wall. A second cause could have been the use of the Eschmann stylet (Fig. 3), but this is less likely because

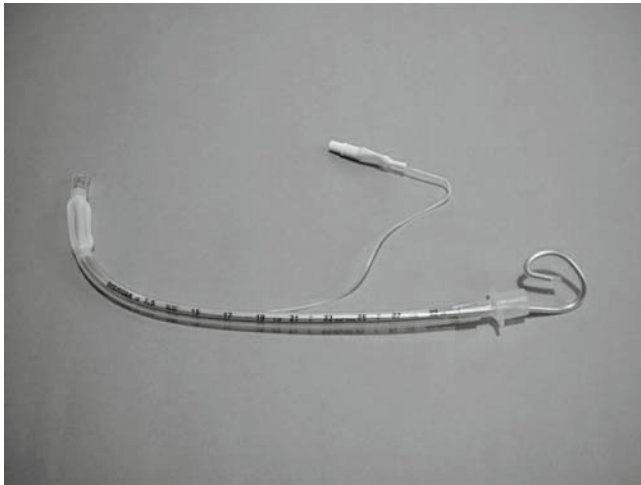


Fig. 2. Endotracheal tube with a rigid stylet

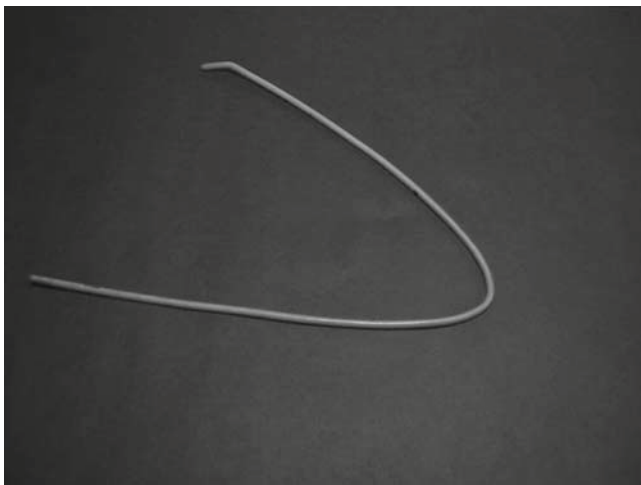


Fig. 3. Eschmann stylet

the stylet is soft. Hilmi et al. [2] noted that the most common site for esophageal injury was the piriform sinus and the posterior esophageal wall. Cricoid pressure and neck extension may increase the risk of posterior esophageal injury. Furthermore, imaging studies confirm that cervical extension compresses the posterior esophageal wall against the bodies of the sixth and seventh cervical vertebrae [4]. Both cricoid pressure and external laryngeal manipulation were used in our patient because of limitations on cervical extension imposed by the stereotactic head frame.

Risk factors reported for esophageal injury include a difficult intubation with multiple attempts, age older than 60 years, and female sex [5]. In our patient, there were three attempts at laryngoscopy and two attempts to pass the endotracheal tube. Furthermore, the use of a rigid stylet, although necessary, probably increased the risk of esophageal injury. In addition, an esophageal

stethoscope was used and passed easily. This also could have been a cause of esophageal perforation.

Postoperatively, symptoms that may indicate esophageal injury include sore throat [6], dysphagia, fever, and chest pain. In particular, postoperative dysphagia can be a hallmark symptom specific for esophageal injury. Chest radiographic findings may include pneumomediastinum, subcutaneous emphysema, pneumothorax, and new-onset pleural effusion [7]. Each of these findings is dependent on the time interval since the injury and the amount of positive-pressure mask ventilation used during airway management. Johnson and Hood [8] reported a case of esophageal perforation that occurred during intubation and was immediately suspected because facial and cervical subcutaneous emphysema developed during positive-pressure mask ventilation. Our patient had no obvious subcutaneous emphysema. Furthermore, the presence of mediastinal air was a subtle finding in our patient's first chest radiograph but became obvious on the subsequent study.

Good outcomes depend on early diagnosis and prompt management. Mortality after esophageal perforation is reported to be between 10% and 40%. Patients with an early diagnosis, less than 24 h after injury, are more likely to survive [9]. Patients with cervical perforations have a lower mortality than patients with abdominal and thoracic perforations [10]. Appropriate management includes antibiotics, proper nutrition, and often primary surgical repair. For our patient, primary closure of the esophageal perforation was chosen. Furthermore, a thoracotomy was necessary because of the presence of mediastinitis and empyema. These complications developed within 48 h after the injury despite the patient's treatment with vancomycin for surgical wound prophylaxis.

Conclusions

An esophageal tear is a rare but potentially fatal complication of intubation. The presence of a stereotactic head frame makes airway management more challenging and may predispose the patient to esophageal injury. Likewise, the use of a rigid stylet may increase the likelihood of esophageal injury, along with attempts at blind intubation. Fiberoptic intubation after head frame placement or intubation before head frame placement may help eliminate this complication. Postoperative symptoms of worsening pharyngitis, new-onset dysphagia, and chest pain should prompt the physician to consider esophageal injury. Furthermore, evidence of subcutaneous emphysema and mediastinal air on a chest radiograph should prompt the institution of broad-spectrum antibiotics and possible surgical intervention.

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