Iatrogenic Esophageal Foreign Body After Motor Vehicle Accident

Marty M. Meyer, MD
Edward J. Levine, MD

Division of Gastroenterology, Hepatology, and Nutrition, The Ohio State University Medical Center, Columbus, Ohio

Removing foreign bodies has long been a staple in the gastroenterologist's repertoire of therapeutic procedures. The intentional swallowing of foreign bodies is common within the adult population, particularly prison inmates, but accidental ingestions also lead to a significant number of endoscopies. Iatrogenic foreign bodies require special mention due to their rare occurrence and the unique circumstances involved. Iatrogenic sources typically consist of surgical equipment or pharyngeal prostheses. We report a case of an iatrogenic esophageal endotracheal tube that remained in vivo for 2 weeks prior to diagnosis.

Case Report

A 41-year-old man presented with an esophageal foreign body while recovering from a significant motor vehicle accident. The patient sustained a collision, which rendered him unconscious and required cardiopulmonary resuscitation and endotracheal intubation at the scene of the accident. Emergency medical service documents showed that an endotracheal tube was placed in the esophagus, but the tube was supposedly repositioned by medflight paramedics. An anesthesiologist also evaluated the patient after arriving at our institution and confirmed proper endotracheal tube placement. The patient's posttraumatic course included prolonged mechanical ventilation, ventriculostomy for increased intracranial pressure, and nasogastric feeding tube placement. He gradually improved, and all of his life support equipment was removed. The patient was given an oral diet but complained of persistent hiccups. He also reported chest discomfort "like someone was sitting on my chest." Upon further inquiry, he denied experiencing odynophagia, dysphagia, nausea, vomiting, hematemesis, melena, hematochezia, abdominal pain, or dyspnea, and he was making an uneventful recovery otherwise. After no response to chlorpromazine, an acute abdominal series revealed an enteric feeding tube from the mid-esophagus through the stomach. Fifteen days after the trauma, we were consulted for removal of the esophageal foreign body seen on plain films (Figure 1). The patient's medical history included gastroesophageal reflux disease, hiatal hernia, depression, and restless leg syndrome, and his surgical history consisted of remote cholecystectomy and the ventriculostomy performed after the accident.

Esophagogastroduodenoscopy (EGD) was performed and demonstrated an endotracheal tube within the lumen of the middle esophagus (Figure 2). There was significant erythema and friability surrounding the foreign body, but no perforations or ulcerations were appreciated. The tube was successfully removed using a rat-tooth forceps. The patient's esophagus was otherwise normal, as was his stomach. The patient reported that his hiccups and chest pain disappeared after the procedure.

Discussion

Esophageal foreign bodies are a common occurrence and are frequently removed to reduce the risk of perforation and bleeding. Foreign bodies are more prevalent in incarcerated patients and those with a history of psychiatric illness.[1] Patients who can provide a history can offer important information regarding the makeup of the foreign body, as well as its most likely location. Patients with a gastric or duodenal foreign body may not complain of symptoms. In contrast, those with foreign bodies within the oropharynx may be able to exactly describe the location of the sensation, which correlates well to the actual location of the foreign body.[2] The clinical symptoms associated with foreign body ingestion include chest pain,

Address correspondence to:
Dr. Marty M. Meyer, Division of Gastroenterology, Hepatology, and Nutrition, The Ohio State University Medical Center, 395 West 12th Avenue, Suite 200, Columbus, OH 43210.

Figure 1. Posterior-anterior chest radiograph demonstrating an endotracheal tube in the esophagus.

Figure 2. Endoscopic image of an endotracheal tube in the midesophagus.

dysphagia, odynophagia, vomiting, fever, drooling, sensation of a foreign body, stridor, coughing, wheezing, and choking. The most common symptom is dysphagia and is present in up to 78.1% of patients.[3] Drooling may be especially worrisome, as it indicates complete esophageal obstruction and high risk for aspiration.

After collecting the appropriate patient history, physical examination should assess the airway for visible foreign bodies or evidence of trauma. Typically, foreign bodies are not visible. Patients with the suggestion of airway compromise should undergo laryngoscopy with resultant endotracheal intubation, which reveals the foreign body and allows for possible forceps removal. In addition, the physical examination should include the neck, chest, and abdomen, to specifically investigate the possibility of perforation or infection. Despite these measures, the physical examination is generally not helpful for patients with upper digestive foreign bodies.[4]

Following the physical examination, the next step in the evaluation should include radiographs, especially if the ingested objects are likely to be radiopaque. Contrast studies of the esophagus should not be performed, due to the risk of aspiration and the impedance to the resultant endoscopy.[5] Patients with a history of foreign body ingestion commonly undergo radiography, though the sensitivity is suboptimal. The diagnostic sensitivity of plain radiography for diagnosing foreign bodies ranges from 44% to 77%.[6-8] The sensitivity is improved when the ingested object is a true foreign body (ie, not a meat bolus), as found by Chaves and colleagues, who reported a 90.8% sensitivity in this patient population.[3] Computed tomography is another option for evaluation of suspected foreign body ingestions, but it may delay endoscopic intervention and add unnecessary expenses in straightforward presentations.[9] When an upper esophageal foreign body is suspected and plain films are nondiagnostic, computed tomography has a sensitivity of 100% for localizing the object.[10] The most important finding to investigate is the possibility of a perforation. This finding is crucial, as it prohibits endoscopy and may call for surgical intervention.

Prior to endoscopic intervention, some physicians attempt to treat meat bolus impactions with glucagon. Doses of 1–2 mg are intravenously given to relax the lower esophageal sphincter in the hopes of spontaneous passage of the obstructing bolus. Glucagon has been reported to be effective in 12–50% of cases.[11-14] If two doses of glucagon are ineffective, further doses should not be given and endoscopy should be performed. Glucagon has also been effective as an adjunct to endoscopy. Unlike in meat bolus impactions, glucagon has no role in the treatment of true foreign body ingestion.

Once the decision to perform endoscopy is made and efforts are exhausted to identify the location, the timing becomes the next pertinent issue. Button batteries contained within the esophagus should undergo endoscopy immediately, given the risks of stenosis and perforation.[3] In addition, patients demonstrating respiratory symptoms resulting from ingested foreign bodies should have immediate intervention to reduce the risks of perforation and aspiration. Finally, sharp objects contained within the esophagus require emergent endoscopic removal. According to recent guidelines, a foreign object or food bolus should never be allowed to remain in the esophagus beyond 24 hours.[15]

Important consideration is also given to objects that have entered the stomach or small bowel but still pose a high risk of causing injury and/or obstruction. Sharp objects, typically animal bones, toothpicks, needles, and dental prostheses, should all undergo endoscopic removal after radiography has been performed. The risk of complications resulting from sharp foreign bodies is as high as 35%.[16] Polypectomy snares or retrieval forceps are excellent tools for the removal of sharp objects. After the foreign body is grasped, the pointed end should be directed away from the endoscope to minimize mucosal damage. Overtubes and fitted protector hoods can also be utilized to reduce the risk of injury during foreign body retrieval, though complications can also result from their use.[17]

In addition to sharp foreign bodies, long objects also pose a risk of mucosal injury and obstruction. Items longer than 6 cm have difficulty passing the duodenal sweep and should be endoscopically removed when possible.[18] Objects of a blunt nature may be conservatively observed once they enter the stomach, with weekly radiographs demonstrating transit through the gastrointestinal tract. Rounded objects larger than 2.5 cm are less likely to traverse the pylorus and should be removed.[14] Otherwise, patients should examine their stool for passage of the foreign body and maintain a regular diet. Items remaining in the stomach after a 3–4-week observation should undergo endoscopic removal.[14] If a foreign body migrates beyond the stomach but remains in the gastrointestinal tract longer than 1 week, surgical removal should be considered.[19]

The overall success of endoscopic retrieval of foreign bodies is high. Katsinelos and colleagues reported success in 137 of 139 patients in a patient population that included true foreign bodies as well as meat bolus impactions.[5] The failures of endoscopic therapy resulted from embedded sharp objects that could not be safely removed. In fact, surgical treatment is a rare occurrence, as it is required in less than 1% of foreign body ingestions.[19]

Complications commonly arise from ingested foreign bodies and correlate with the amount of time spent in the gastrointestinal tract. Chaves and colleagues reported complications in 29 of 105 patients, with the most common being erosions and ulcers directly caused by the foreign bodies.[3] They also observed that the complication rate did not depend upon the size and shape of the foreign body, but rather the amount of time the foreign body remained in the patient. Foreign bodies impacted for more than 24 hours resulted in a higher complication rate than those retrieved faster.[3] The most worrisome complications from foreign bodies are massive hemorrhage and perforation. Massive hemorrhage is typically the result of an aortoesophageal fistula after injury to the thoracic aorta and usually results in exsanguination and death.[20] Perforations occur more commonly than aortoesophageal fistulae and are much more likely to result from animal bones or other sharp objects, though they also result from instrumentation. Esophageal perforations have a mortality rate approaching 21% and are especially high in the case of spontaneous perforation or when treatment is delayed by more than 24 hours.[21] Overall, upper digestive foreign bodies result in 1,500 deaths annually in the United States.[22]

Conclusion

This case is unique, in that the patient's foreign body was iatrogenic, placed unbeknownst to him, and discovered incidentally on plain films ordered for the evaluation of hiccups 15 days after a motor vehicle accident. The patient had dozens of radiographic studies during his admission, but the esophageal endotracheal tube was not noticed, due to the presence of other life support equipment, including enteric feeding tubes. A post-EGD film revealed absence of the foreign body, and the patient's diet was advanced, as tolerated. As in our case, plain films should be obtained following difficult extractions and complicated ingestions, given the risk of esophageal perforation.[19] The tube was presumably placed by the initial responders, but it is still unknown how this tube migrated further into the gastrointestinal tract while a second endotracheal tube was positioned properly. This case should highlight the high index of suspicion needed to diagnose critically ill patients with foreign bodies, as they frequently cannot provide historical data.

References

1. Selivanov V, Sheldon GF, Cello JP, Crass RA. Management of foreign body ingestion. *Ann Surg.* 1984;199:187-191.
2. Stack LB, Munter DW. Foreign bodies in the gastrointestinal tract. *Emerg Med Clin North Am.* 1996;14:493-522.
3. Chaves DM, Ishioka S, Félix VN, Sakai P, Gama-Rodrigues JJ. Removal of a foreign body from the upper gastrointestinal tract with a flexible endoscope: a prospective study. *Endoscopy*. 2004;36:887-892.
4. Lyons MF, Tsuchida AM. Foreign bodies of the gastrointestinal tract. *Med Clin North Am.* 1993;77:1101-1114.
5. Katsinelos P, Kountouras J, Paroutoglou G, Zavos C, Mimidis K, Chatzimavroudis G. Endoscopic techniques and management of foreign body ingestion and food bolus impaction in the upper gastrointestinal tract: a retrospective analysis of 139 cases. *J Clin Gastroenterol*. 2006;40:784-789.
6. Roura J, Morello A, Comas J, Ferrán F, Colomé M, Traserra J. Esophageal foreign bodies in adults. *ORL J Otorhinolaryngol Relat Spec*. 1990;52:51-56.
7. Watanabe K, Kikuchi T, Katori Y, Fujiwara H, Sugita R, et al. The usefulness of computed tomography in the diagnosis of impacted fish bones in the oesophagus. *J Laryngol Otol.* 1998;112:360-364.
8. Herranz-Gonzalez J, Martinez-Vidal J, Garcia-Sarandeses A, Vazquez-Barro C. Esophageal foreign bodies in adults. *Otolaryngol Head Neck Surg.* 1991;105:649-654.
9. Braverman I, Gomori JM, Polv O, Saah D. The role of CT imaging in the evaluation of cervical esophageal foreign bodies. *J Otolaryngol.* 1993;22:311-314.
10. Marco De Lucas E, Sadaba P, Lastra Garcia-Baron P, Ruiz-Delgado ML, González Sánchez F, et al. Value of helical computed tomography in the management of upper esophageal foreign bodies. *Acta Radiol.* 2004;45:369-374.
11. Blair SR, Graeber GM, Cruzzavala JL, Gustafson RA, Hill RC, et al. Current management of esophageal impactions. *Chest*. 1993;104:1205-1209.
12. Brady PG. Esophageal foreign bodies. *Gastroenterol Clin North Am*. 1991;20:691-701.
13. Giordano A, Adams G, Boies L Jr, Meyerhoff W. Current management of esophageal foreign bodies. *Arch Otolaryngol.* 1981;107:249-251.
14. Taylor RB. Esophageal foreign bodies. *Emerg Med Clin North Am.* 1987;5:301-311.
15. Eisen GM, Baron TH, Dominitz JA, Faigel DO, Goldstein JL, et al. Guideline for the management of ingested foreign bodies. *Gastrointest Endosc.* 2002;55:802-806.
16. Vizcarrondo FJ, Brady PG, Nord HJ. Foreign bodies of the upper gastrointestinal tract. *Gastrointest Endosc.* 1983;29:208-210.
17. Bertoni G, Sassatelli R, Conigliaro R, Bedogni G. A simple latex protector hood for safe endoscopic removal of sharp-pointed gastroesophageal foreign bodies. *Gastrointest Endosc.* 1996;44:458-461.
18. Blaho KE, Merigian KS, Winbery SL, Park LJ, Cockrell M. Foreign body ingestions in the emergency department: case reports and review of treatment. *J Emerg Med*. 1998;16:21-26.

19. Webb WA. Management of foreign bodies of the upper gastrointestinal tract: update. *Gastrointest Endosc.* 1995;41:39-51.
20. Huiping Y, Jian Z, Shixi L. Esophageal foreign body as a cause of upper gastrointestinal hemorrhage: case report and review of the literature. *Eur Arch Otorhinolaryngol.* 2008;265:247-249.
21. Bladergroen MR, Lowe JE, Postlethwait RW. Diagnosis and recommended management of esophageal perforation and rupture. *Ann Thorac Surg.* 1986;42:235-239.
22. Schwartz GF, Polsky HS. Ingested foreign bodies of the gastrointestinal tract. *Am Surg.* 1976;42:236-238.

Review

Clinical Recognition and Endoscopic Retrieval of Misplaced Endotracheal Tubes

Todd H. Baron, MD

Department of Medicine,
Division of Gastroenterology & Hepatology,
Mayo Clinic, Rochester, Minnesota

Removal of foreign bodies has become the purview of gastroenterologists. Almost all foreign bodies within the reach of the endoscope can be endoscopically removed. Meyer and Levine describe a patient in whom an endotracheal tube was identified in the esophagus 2 weeks after emergency intubation outside of the hospital.[1] This case raises an important point: endotracheal intubation in the "field" can be associated with serious complications. In a recent prospective, observational study of consecutive patients who were emergently endotracheally intubated, 11 of 132 patients had the tube incorrectly placed into their esophagus.[2] Meyer and Levine's patient may have been re-intubated in flight prior to arrival in the hospital. It is possible that the original tube, which was believed to have been placed in the esophagus, was pushed further distally, such that it was entirely within the esophageal lumen.

Similar cases to the preceding one have been previously reported in the literature.[3-6] In one case, the tube was apparently swallowed and remained in place for 2 years until it was detected by a chest radiograph obtained when the patient was hospitalized for an unrelated health problem.[5] The tube could not be extracted endoscopically due to "rigidity." In another case, a child was emergently intubated in the field. The retained tube caused vomiting, which dislodged the tube into the retropharynx. The tube was then identified when the oropharynx was suctioned, and it was subsequently removed with digital extraction.[6]

As the preceding case illustrates, the symptoms of a retained endotracheal tube may not be as straightforward as expected. The patient presented to Meyer and Levine with complaints of hiccups and chest discomfort but not dysphagia. Thus, it is important for gastroenterologists asked to examine patients who present with any symptomatology and have been emergently intubated outside the hospital setting to recognize that the endotracheal tube could have been displaced into the esophagus, to ensure the prompt management of the tube. One would imagine that all of these tubes are radiopaque, and a careful review of available radiographs of the chest (including computed tomography, if obtained) is in order. As demonstrated in this case and in the cases previously published, endoscopic extraction is highly effective in retrieving displaced endotracheal tubes.

Address correspondence to:
Dr. Todd H. Baron, 200 First Street SW, Charlton 8, Rochester, MN 55905; Tel: 507-266-6931; Fax: 507-266-3939; E-mail: baron.todd@mayo.edu

References

1. Meyer MM, Levine EJ. Iatrogenic esophageal foreign body after motor vehicle accident. *Gastroenterol Hepatol.* 2008;4:279-282.
2. Wirtz DD, Ortiz C, Newman DH, Zhitomirsky I. Unrecognized misplacement of endotracheal tubes by ground prehospital providers. *Prehosp Emerg Care.* 2007;11:213-218.
3. Wu CT, Li CY, Wong CS, Ho ST, Chu CC, et al. The lost endotracheal tube—a rare complication of accidental esophageal intubation. *Acta Anaesthesiol Sin.* 1997;35:55-58.
4. Er M. An unusual foreign body of the esophagus. *Asian Cardiovasc Thorac Ann.* 2005;13:70-71.
5. Block EF, Cheatham ML, Parrish GA, Nelson LD, Beam N. Ingested endotracheal tube in an adult following intubation attempt for head injury. *Am Surg.* 1999;65:1134-1136.
6. Gronczewski CA. The lost endotracheal tube: an unreported complication of prehospital intubation. *Pediatr Emerg Care.* 2005;21:318-321.