

Removal of a Large Stone in the Upper Thoracic Esophagus

Patricia V. Hernandez, MD; Diana L. Snyder, MD; Saba Ghorab, MD;
Neej J. Patel, MBBS; Michael L. Hinni, MD; and Jennifer L. Horsley-Silva, MD

Abstract

Ingestion of a foreign body is a common occurrence. Flexible endoscopy is most commonly used for treatment, but certain large foreign bodies are more easily retrieved with rigid endoscopy. We present a technically challenging case of intentional ingestion of a large stone that required retrieval from the upper thoracic esophagus using rigid endoscopy. This case highlights the importance of alternative methods to manage large foreign bodies and of collaboration of medical subspecialties.

© 2020 THE AUTHORS. Published by Elsevier Inc on behalf of Mayo Foundation for Medical Education and Research. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>) ■ *Mayo Clin Proc Inn Qual Out* 2020;4(1):105-108

Ingestion of a foreign body (FB) is a common occurrence with an estimated annual incidence of more than 100,000 cases in the United States,¹⁻³ leading to substantial financial burden on the health care system.^{4,5} Large FBs in the gastrointestinal tract may lead to more clinical complications and are challenging to manage.⁴ We present a case of a large stone in the upper thoracic esophagus that was successfully removed with rigid endoscopy utilizing endoscopic and laparoscopic instruments. Although the patient in our report is a person in a protected population, the Mayo Clinic Institutional Review Board waived the requirement for signed consent because this is a single case report that solely describes an individual event and not a systematic study.

REPORT OF CASE

A 34-year-old incarcerated man with no known remarkable medical history was transferred from an outside hospital for further management after ingestion of a stone that was retained in his esophagus. Per outside report, he had progressive difficulty tolerating his secretions after swallowing the stone. He was subsequently intubated and sedated for airway protection at the outside hospital. Attempts to remove the stone with flexible endoscopy were not successful, and the patient was transferred to the intensive care unit of our hospital for further management.

On admission, the patient's vital signs were stable and he had an elevated white blood cell count of $20.4 \times 10^9/L$, which was believed to be secondary to stress response and corticosteroids that were administered at the outside hospital. Chest radiography revealed a 5×3.7 -cm oval opacity over the mediastinum, posterior to the trachea, suggesting retention of the stone in the upper thoracic esophagus (Figure 1). A rendezvous endoscopic procedure with the assistance of gastroenterology/otolaryngology staff was planned in the operating room for attempted stone removal.

During the procedure, an a thermoplastic splint was used to fashion an upper dental guard. Once the dental guard was in place, a rigid esophagoscope was utilized to gain access to the upper thoracic esophagus. The esophagoscope was inserted through the mouth and then passed through the oropharynx and the esophageal inlet. The patient was noted to have a large, smooth, oval stone in the upper thoracic esophagus. Numerous instruments were trialed during the procedure, including endoscopic, laparoscopic, thoracic, and otolaryngological tools, to grasp the stone, without success. After trial of several instruments, an inflatable 18-mm endoscopic biliary balloon was passed alongside the stone and inflated distal to the stone, and tension was applied to assist several laparoscopic instruments in gradually advancing

From the Division of Gastroenterology and Hepatology Mayo Clinic, Scottsdale (P.V.H., D.L.S.,N.J.P., J.L.H.-S.); and Department of Otorhinolaryngology/Head and Neck Surgery Mayo Clinic, Phoenix, AZ (S.G.,M.L.H.).

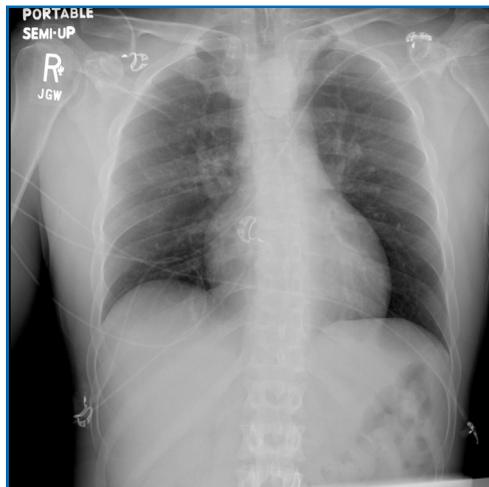


FIGURE 1. Chest x-ray showing stone impacted in the upper thoracic esophagus.

the stone toward the oral cavity. This technique helped to move the stone slightly but not completely out of the esophagus. The biliary balloon was then removed, and further manipulations were performed using several varieties of long laparoscopic Allis forceps. Once the stone was in the cervical esophagus, the endotracheal tube cuff was deflated to reduce the upper esophageal sphincter resistance, and the laparoscopic precise Allis grasping forceps with ratchet handle was used to slowly pull the stone out while applying moderate force. The stone was approximately 4 cm in its largest dimension (Figure 2).

After stone removal, the esophageal and hypopharyngeal mucosae were carefully re-inspected with the rigid esophagoscope. An area of superficial mucosal laceration was located along the right lateral aspect of the esophagus, immediately adjacent to where the stone was lodged. This injury did not penetrate deeper than the mucosa, and there were no signs of ischemia or perforation. There were no additional stones identified.

After the procedure, the patient was extubated. At follow-up chest radiography and neck computed tomography, no mucosal disruption, perforation, or possible infection was noted. The patient's leukocytosis improved. He tolerated a clear liquid diet the next day and was advanced to a regular diet. He was subsequently discharged on the second day of hospitalization.

DISCUSSION

Foreign bodies in the gastrointestinal tract occur commonly, but only about 20% of cases require endoscopic management.^{1,6} When the ingestion is intentional, the percentage of patients who require endoscopic intervention is higher, between 63% and 76%.⁶ Foreign bodies may lead to serious adverse outcomes such as ulceration, obstruction, perforation, and even death.^{2,5,7,8} Foreign body ingestion occurs most commonly in the pediatric population.^{3,6,7,9-11} In adults, FB ingestion happens most often in patients with neurocognitive impairment or psychiatric conditions as well as incarcerated individuals, as seen with our case.^{3,6,12} The incarcerated population is particularly vulnerable to the ingestion of FBs because many in this population achieve secondary gain from being able to leave prison for medical care or have undiagnosed psychiatric disorders.¹³

Flexible endoscopy is the first approach for FB management in the esophagus and is associated with a high success rate.^{1,6,7,10,14} Although rigid endoscopy is not used as



FIGURE 2. Stone removed from patient's upper esophagus.

commonly for management of FBs,⁶ it may be considered, especially if flexible endoscopy fails or if an FB is wedged in the upper esophageal sphincter.^{1,2,6,9,10,14} Rigid endoscopy is as effective and safe as flexible endoscopy for FB removal when performed by an expert.^{1,2,8}

Our case demonstrates successful removal of a large and smooth FB impacted in the upper thoracic esophagus by rigid endoscopy after previous failure with flexible endoscopy. This management is supported by a 2018 systematic review and meta-analysis that concluded that rigid endoscopy may be particularly useful for removal of large FBs because it allows better visualization of the esophageal lumen.² In addition, a multidisciplinary approach with inclusion of gastroenterology/otolaryngology specialists may be needed because of the limited number of physicians who have experience working with rigid endoscopy; their experience is helpful in planning FB removal and in the use of available tools.^{6,10}

Several methods to retrieve FBs have been described, such as grasping forceps, rat-tooth and alligator forceps, polypectomy snares, Dormia baskets, and retrieval nets.⁵⁻⁷ The choice of equipment will depend on the FB characteristics (shape and size), anatomic location, time since ingestion, and presence of complications.^{3,5,15} Dormia basket and Roth Net (US Endoscopy) are preferred tools to retrieve button batteries, coins, and piercing and glass fragments, rat-tooth forceps is preferred to remove chicken and fish bones, and snares are the best choice for extraction of dental prostheses.^{3,5} Unique instruments may be needed for removal when standard ones are not successful. There are descriptions in the literature of using a Fogarty embolectomy balloon catheter to safely retrieve blunt and large esophageal FBs in pediatric patients,¹¹ as well as using Foley catheters to retrieve esophageal FBs in intubated adult patients.³ In these cases, both instruments were passed alongside the FB and inflated distal to the FB. Eventually, both catheters and the endoscope were withdrawn under direct visualization.¹¹ To our knowledge, this is the first published description of the use of endoscopic biliary balloons to assist in FB removal. In addition, when compared with the otolaryngologic

endoscopic instruments, laparoscopic forceps were found to be more useful for retrieval of the FB in this case because of their long working length that extended beyond the tip of the rigid esophagoscope to grasp the stone wedged in the thoracic esophagus and overall larger and sturdier design that allowed better manipulation of the smooth-surfaced stone.

There are limited case reports of stone impaction in the esophagus in the literature. Sah et al¹⁶ reported the case of a 35-year-old man with delayed cognitive development in Nepal who swallowed a stone and had it removed from the cervical esophagus through rigid upper endoscopy. Zameer et al¹⁷ described a 25-day-old neonate who presented with a large stone in the upper esophagus that unfortunately was unable to be removed and resulted in esophagotomy. These cases, as well as our patient, emphasize how large stones in the esophagus are clinically challenging to manage. Thankfully, we were able to remove the stone from our patient successfully with endoscopic techniques rather than a surgical approach.

CONCLUSION

Foreign body ingestion is common in the United States and typically managed with flexible endoscopy and standard retrieval devices. We present a unique case in which FB removal could not be achieved with flexible endoscopy but was ultimately successful with rigid endoscopy employing unique tools. Additionally, our case highlights the importance of a multidisciplinary team approach including gastroenterologists/otolaryngologists in the management of difficult FBs in the esophagus.

Abbreviations and Acronyms: FB = foreign body

Potential Competing Interests: Dr Hinni receives royalties from KARL STORZ SE & Co. KG for his design of a laryngoscope (funds paid to both author and his institution).

Publication dates: Received for publication August 21, 2019; accepted for publication October 15, 2019.

Correspondence: Address to Jennifer L.Horsley-Silva, MD, Division of Gastroenterology and Hepatology, Mayo Clinic, 13400 E Shea Blvd, Scottsdale, AZ 85259 (HorsleySilva.Jennifer@mayo.edu).

REFERENCES

1. Chirica M, Kelly MD, Siboni S, et al. Esophageal emergencies: VSES guidelines. *World J Emerg Surg.* 2019;14:26.
2. Ferrari D, Aiolfi A, Bonitta G, et al. Flexible versus rigid endoscopy in the management of esophageal foreign body impaction: systematic review and meta-analysis. *World J Emerg Surg.* 2018;13:42.
3. Fung BM, Sweetser S, Wong Kee Song LM, Tabibian JH. Foreign object ingestion and esophageal food impaction: an update and review on endoscopic management. *World J Gastrointest Endosc.* 2019;11(3):174-192.
4. Emara MH, Darwiesh EM, Refaey MM, Galal SM. Endoscopic removal of foreign bodies from the upper gastrointestinal tract: 5-year experience. *Clin Exp Gastroenterol.* 2014;7:249-253.
5. Geraci G, Sciume C, Di Carlo G, Picciorro A, Modica G. Retrospective analysis of management of ingested foreign bodies and food impactions in emergency endoscopic setting in adults. *BMC Emerg Med.* 2016;16(1):42.
6. Ikenberry SO, Jue TL, Anderson MA, et al; ASGE Standards of Practice Committee. Management of ingested foreign bodies and food impactions. *Gastrointest Endosc.* 2011;73(6):1085-1091.
7. Birk M, Bauerfeind P, Deprez PH, et al. Removal of foreign bodies in the upper gastrointestinal tract in adults: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. *Endoscopy.* 2016;48(5):489-496.
8. Webb WA. Management of foreign bodies of the upper gastrointestinal tract: update. *Gastrointest Endosc.* 1995;41(1):39-51.
9. Popel J, El-Hakim H, El-Matary W. Esophageal foreign body extraction in children: flexible versus rigid endoscopy. *Surg Endosc.* 2011;25(3):919-922.
10. Yan XE, Zhou LY, Lin SR, Wang Y, Wang YC. Therapeutic effect of esophageal foreign body extraction management: flexible versus rigid endoscopy in 216 adults of Beijing. *Med Sci Monit.* 2014;20:2054-2060.
11. You P, Katsiris S, Strychowsky JE. Double Fogarty balloon catheter technique for difficult to retrieve esophageal foreign bodies. *J Otolaryngol Head Neck Surg.* 2018;47(1):72.
12. Evans DC, Wojda TR, Jones CD, Otey AJ, Stawicki SP. Intentional ingestions of foreign objects among prisoners: a review. *World J Gastrointest Endosc.* 2015;7(3):162-168.
13. Grimes IC, Spier BJ, Swize LR, Lindstrom MJ, Pfau PR. Predictors of recurrent ingestion of gastrointestinal foreign bodies. *Can J Gastroenterol.* 2013;27(1):e1-e4.
14. Gmeiner D, von Rahden BH, Meco C, Hutter J, Oberascher G, Stein HJ. Flexible versus rigid endoscopy for treatment of foreign body impaction in the esophagus. *Surg Endosc.* 2007;21(11):2026-2029.
15. Smith MT, Wong RK. Foreign bodies. *Gastrointest Endosc Clin N Am.* 2007;17(2):361-382, vii.
16. Sah BP, Chettri ST, Prasad JN, Gupta PP. Foreign body stone in oesophagus: a unique case. *Health Renaissance.* 2015;12(2):140-142.
17. Zameer M, Kanojia RP, Thapa BR, Rao KL. Foreign body oesophagus in a neonate: a common occurrence at an uncommon age. *Afr J Paediatr Surg.* 2010;7(2):114-116.