Robotic-assisted excision of an infected duplication cyst of the esophagus

Jessica E. Wahi[1]^, Navid Ajabshir[2], Fernando M. Safdie[3]

[1]Department of Thoracic and Foregut Surgery, University of Miami/Jackson Memorial Hospital, Miami, FL, USA; [2]Department of Cardiothoracic Surgery, University of Pittsburgh Medical Center, Pittsburgh, PA, USA; [3]Department of Thoracic and Cardiovascular Surgery, Mount Sinai Medical Center, Miami Beach, FL, USA

Contributions: (I) Conception and design: FM Safdie; (II) Administrative support: JE Wahi; (III) Provision of study materials or patients: FM Safdie; (IV) Collection and assembly of data: All authors; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Fernando M. Safdie, MD. Department of Thoracic and Cardiovascular Surgery, Mount Sinai Medical Center, 4300 Alton Road, Miami Beach, FL 33140, USA. Email: Fernando.safdie@msmc.com.

Abstract: Duplication cysts are rare congenital anomalies, most commonly diagnosed during infancy that may occur anywhere along the alimentary tract. Esophageal duplication cysts are frequently symptomatic because of compression of adjacent structures. Here, we discuss the case of a 64-year-old woman with an esophageal duplication cyst leading to progressive and worsening dysphagia. This cyst was identified in the distal esophagus via endoscopic ultrasound (EUS). Biopsy was performed and this resulted in a superimposed infection. The patient presented to our hospital with fevers and dysphagia. She was admitted after a complete history, physical exam and labs were obtained. A computed tomography scan of the chest, abdomen and pelvis was performed along with an esophagogastroduodenoscopy and EUS for further characterization of the cyst. After diagnosing her with a symptomatic duplication cyst of the esophagus, she was consented for surgical intervention. Here, we describe our operative approach of a robotic-assisted esophageal myotomy, duplication cyst excision and gastropexy through an abdominal approach. Postoperatively, the patient underwent an esophagram on post-operative day 5 that demonstrated an intact repair without stricture or leak. She was started on a full liquid diet at that time and discharged from the hospital on post-operative day 6. Symptomatic esophageal duplication cysts often require surgical resection. Generally, we recommend against needle biopsies due to the risk of infection. Our patient presented with an infected esophageal duplication cyst after EUS with biopsies was performed. Here, we present our transabdominal surgical technique using the robotic platform.

Keywords: Esophageal surgery; benign foregut; robotic surgery

Received: 02 October 2023; Accepted: 03 January 2024; Published online: 14 March 2024.
doi: 10.21037/vats-23-63
View this article at: https://dx.doi.org/10.21037/vats-23-63

Introduction

Duplication cysts of the alimentary tract are rare congenital anomalies. It is estimated that esophageal duplication cysts constitute between 0.5% and 2.5% of all esophageal masses (1). The exact etiology of duplication cysts of the alimentary tract is not completely understood. However, esophageal duplication cysts are thought to arise between the fourth and eighth weeks of development as a result of failure of intrauterine vacuolization of the esophagus (1). Esophageal duplication cysts are intramural lesions lying within the esophageal wall and surrounded by smooth muscle.

^ ORCID: 0000-0003-2379-1039.

Esophageal duplication cysts often remain asymptomatic, however in those patients that become symptomatic they usually present during childhood (1). Esophageal duplication cysts are most commonly an incidental finding in adults while patients are undergoing work-up for unrelated conditions. The most common location of esophageal duplication cysts is in the lower third of the esophagus, with the remaining being localized to the upper/middle third of the esophagus (2). The location of the cyst dictates clinical presentation. For those cysts localized to the upper esophagus, clinical manifestations can include dyspnea, stridor, respiratory distress, mass effect, retrosternal pain and cough. For those cysts localized in the lower third of the esophagus, clinical presentation can include dysphagia, esophageal stenosis, food impaction and emesis. Duplication cysts do not regress spontaneously and adequate resection requires full identification and excision of the cyst wall. Excision can be performed through either an open approach or utilizing minimally-invasive techniques dependent on the surgeon's skill set.

Here, we discuss the case of a 63-year-old woman who presented with progressive and worsening dysphagia due to an esophageal duplication cyst. This cyst was biopsied at an outside institution via endoscopic ultrasound (EUS) that led to a superimposed infection. The patient required operative intervention after medical optimization. Here, we describe our operative approach of a robotic-assisted esophageal myotomy, duplication cyst excision and gastropexy through an abdominal approach. We present this article in accordance with the SUPER reporting checklist (available at https://vats.amegroups.com/article/view/10.21037/vats-23-63/rc).

Highlight box

Surgical highlights

- Robotic-assisted surgery is safe and feasible for patients with benign esophageal pathology.

What is conventional and what is novel/modified?

- Previously, open techniques were the mainstay for foregut operations.
- Now, robotic-assisted technology has changed the landscape of esophageal surgery. We describe our technique of excision an esophageal duplication cyst utilizing the robotic platform.

What is the implication, and what should change now?

- Minimally-invasive techniques including robotic-assisted surgery should be offered to patients requiring surgery for foregut pathology.

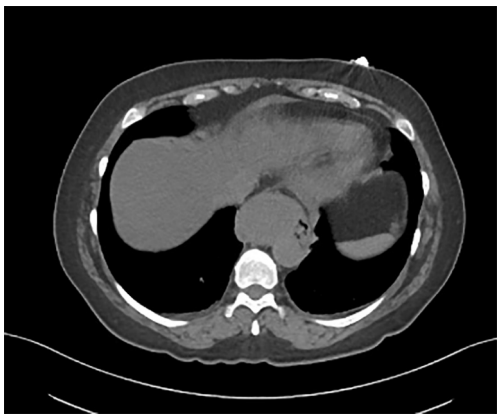


Figure 1 Computed tomography scan revealing duplication cyst with extrinsic compression of the esophageal wall.

Preoperative preparations and requirements

The patient presented to our institution with fevers and worsening dysphagia after undergoing an EUS with biopsy at an outside institution. Upon presentation, she was found to be febrile with a temperature of 38 ℃ and in sinus tachycardia with a heart rate in the low 100 s. Bloodwork in addition to an electrocardiogram and chest X-ray were obtained and found to be unremarkable. A computed tomography scan of the chest, abdomen and pelvis was performed using intravenous contrast that revealed a duplication cyst of the esophagus exhibiting extrinsic compression of the esophageal lumen (*Figure 1*) (3). Esophagogastroduodenoscopy revealed normal appearing mucosa throughout the esophagus with extrinsic compression of the lumen at 35 cm from the incisors (*Figure 2*) (3). No communication with the esophageal lumen was identified. EUS revealed an anechoic cystic lesion in direct contact with the esophagus and thickened wall, supportive of the diagnosis of an esophageal duplication cyst (*Figure 3*) (3).

Step-by-step description

The patient is placed supine with a footboard. Preoperative antibiotics and deep vein thrombosis prophylaxis are administered. A Foley catheter and radial arterial line are sterilely placed for continuous urine output and blood pressure monitoring. We utilize four robotic ports and a 12-mm assistant port as depicted in *Figure 4*. The robot is armed with the Cadiere forceps in arm one, the camera in arm two, the vessel sealer in arm three and the curved bipolar or double fenestrated graspers are used in arm four (*Figure 4*) (3).

After docking, the dissection was initiated at the

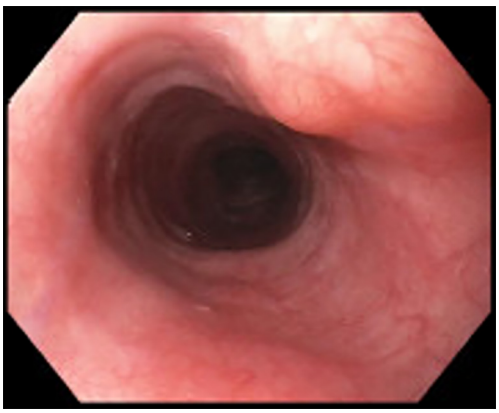


Figure 2 Esophagogastroduodenoscopy demonstrating extrinsic compression of the esophageal wall with normal appear mucosa.

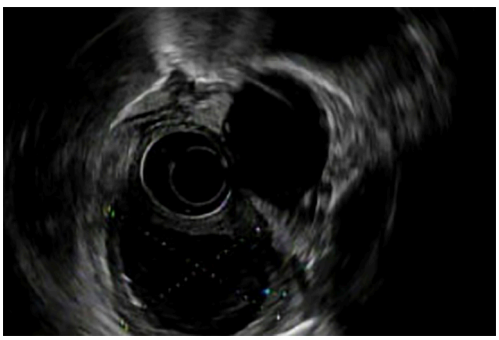


Figure 3 Endoscopic ultrasound with anechoic lesion with a thickened wall in direct contact with the esophagus.

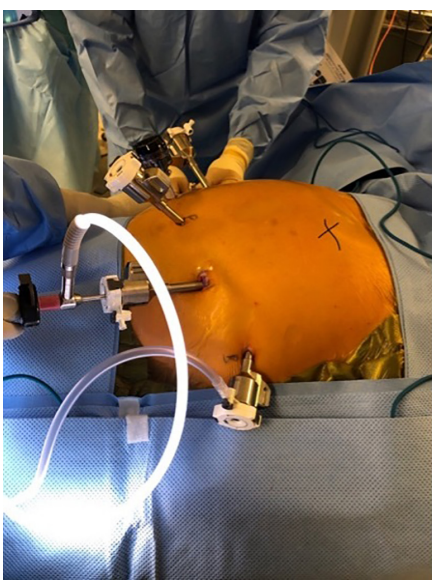


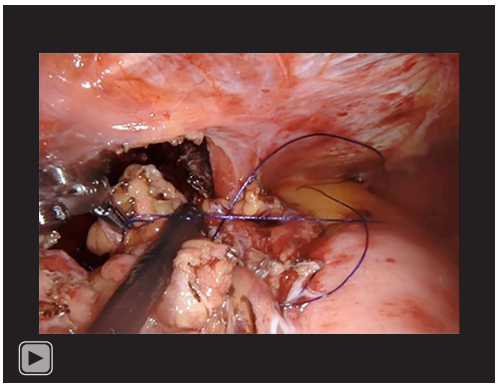
Figure 4 Trocar placement for robotic-assisted abdominal approach.

phrenoesophageal membrane to enter the diaphanous plane. The anterior and posterior vagus nerves were identified and protected throughout the dissection. The mediastinal circumferential esophageal dissected continued cephalad to the level of the inferior pulmonary veins. Thereafter, the gastrohepatic ligament was incised to expose the right crus of the diaphragm while preserving the peritoneal lining. During the dissection, a replaced left hepatic artery was encountered. We realized we would not be able to safely proceed without control of this vessel. Thereafter, clips were placed for proximal and distal control and since no ischemic changes were noted to the left lobe of the liver, the vessel was divided. The dissection continued with mobilization of the greater curvature and entering into the lesser sac. The short gastric arteries were divided using the vessel sealer. A retroesophageal window was created and a Penrose drain was passed for assistance in dissection.

A long myotomy of approximately 10 cm was performed to fully expose the duplication cyst. Inherent to the dissection, there was violation into the cyst wall with drainage of pus and this was sent for culture. The dissection proceeded until the base of the duplication cyst was exposed. The root of the cyst was fused and required transection using a 45-mm Endo GIA Covidien purple load through the assistant port. Once the cyst was excised, we noted an inadvertent injury to the mucosa of the esophagus that required repair in the distal esophagus. A gastroscope was utilized to fully visualize the defect that measured less than 1 cm in diameter. The mucosa was approximated using 2-0 polydioxanone sutures in an interrupted fashion and reinforced using a fat pad harvested from the gastroesophageal junction. A leak test was performed to ensure an intact repair.

Thereafter, we reapproximated the crura posteriorly using non-absorbable 0 V-Loc sutures. A 54-F bougie was advanced and the posterior crura approximated to the level of the esophagus. Due to the large crural defect, an anterior cruroplasty was also required. We would routinely perform an anti-reflux procedure in patients where a long myotomy was performed. However, due to violation of the mucosa intraoperatively, the decision was made to perform a gastropexy. This was accomplished suturing the greater curvature of the stomach to the left hemidiaphragm using interrupted 2-0 ethibond sutures were placed in a mattress fashion. The duration of the patient's operation was a total of 347 minutes. The key portions of the operation can be visualized in *Video 1*.

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki



Video 1 Robotic-assisted excision of an infected duplication cyst of the esophagus with gastropexy.

Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this article and accompanying images and video. A copy of the written consent is available for review by the editorial office of this journal.

Postoperative considerations and tasks

Given the mucosa injury intraoperatively, the patient remained nil per os postoperatively. An esophagram was performed on postoperative day 5 demonstrating an intact repair without stricture or leak. She was started on a liquid diet and discharged on postoperative day 6. At 2 weeks from her index operation, her diet was advanced from liquids to a soft diet and continued to be advanced as an outpatient. She was seen subsequently in clinic at which time her dysphagia had completely resolved and she was tolerating both solids and liquids without issue. Final pathology confirmed diagnosis of an esophageal duplication cyst.

Tips and pearls

The techniques described in this video can be implemented in a number of benign esophageal procedures. Robotic-assisted techniques for esophageal surgery allow for a complete intrathoracic mediastinal dissection. We recommend a circumferential dissection to the level of the inferior pulmonary veins to help facilitate a tension-free cruroplasty.

Discussion

Once the diagnosis of an esophageal duplication cyst is made, surgery can be considered for both asymptomatic and symptomatic patients given the risk of future complications (4,5). Generally, we recommend against needle biopsies due to the risk of infection. A discussion with patients regarding the risks, benefits and alternatives of surgical excision is recommended for a shared decision-making approach. Symptomatic esophageal duplication cysts often require surgical resection and minimally-invasive approaches have demonstrated to be safe and feasible (6,7). In our case, there was an inadvertent mucosal injury that occurred during the dissection. Due to her previous EUS with biopsies, the tissue planes were more hostile than usual. If we had refrained from dissecting so close to the esophageal mucosa we could have decreased the likelihood of a mucosal injury. While we routinely use a bedside assistant for stapling of structures, a robotic stapler could have been implemented if a skilled bedside assistant is not available. Nevertheless, the mucosal injury occurred during the dissection prior to the stapling of the cyst. Therefore, utilization of either a robotic stapler or a bedside assistant would not have impacted the inadvertent injury.

In this patient, the decision was made to primarily repair the mucosal defect, buttress it with omentum and perform a gastropexy. While we considered performing an anterior wrap that could have functioned an anti-reflux procedure, we felt that buttressing the injury using omentum was a safer option. We were concerned that a wrap could lead to significant narrowing, which would behave as a distal obstruction. This could have led to oral intake following the path of least resistance, thereby compromising our repair. Additionally, since the patient's main symptom was obstructive dysphagia even a loose wrap could have exacerbated this symptom. We wanted to ensure that the mucosal injury fully healed and if the patient were to develop reflux symptoms in the future, we could perform an anti-reflux procedure at that time.

Conclusions

Esophageal duplication cysts of the esophagus are rare and often times asymptomatic. However, they can lead to complications and shared decision making between providers and patients regarding surgical excision is suggested. Once the diagnosis is suspected, needle biopsies can lead to infection of the cyst and should be avoided. Here, we present the case of a biopsy via EUS leading to infection of a symptomatic esophageal duplication cyst. We describe our operative approach of a robotic-

assisted esophageal myotomy, duplication cyst excision and gastropexy through an abdominal approach.

Acknowledgments

Funding: None.

Footnote

Reporting Checklist: The authors have completed the SUPER reporting checklist. Available at https://vats.amegroups.com/article/view/10.21037/vats-23-63/rc

Peer Review File: Available at https://vats.amegroups.com/article/view/10.21037/vats-23-63/prf

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://vats.amegroups.com/article/view/10.21037/vats-23-63/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this article and accompanying images and video. A copy of the written consent is available for review by the editorial office of this journal.

References

1. Whitaker JA, Deffenbaugh LD, Cooke AR. Esophageal duplication cyst. Case report. Am J Gastroenterol 1980;73:329-32.
2. Bhatia V, Tajika M, Rastogi A. Upper gastrointestinal submucosal lesions--clinical and endosonographic evaluation and management. Trop Gastroenterol 2010;31:5-29.
3. Wahi JE, Safdie FM. Esophageal duplication cysts: a clinical practice review. Mediastinum 2023;7:1.
4. Dai ZJ, Kang HF, Lin S, et al. Esophageal cancer with esophageal duplication cyst. Ann Thorac Surg 2013;96:e15-6.
5. Sangüesa Nebot C, Llorens Salvador R, Carazo Palacios E, et al. Enteric duplication cysts in children: varied presentations, varied imaging findings. Insights Imaging 2018;9:1097-106.
6. Surendran S, Samuel AS, Yacob M, et al. Minimally invasive surgery for adult oesophageal duplication cysts: Clinical profile and outcomes of treatment from a tertiary care centre and a review of literature. J Minim Access Surg 2021;17:525-31.
7. Gonzalez-Urquijo M, Hinojosa-Gonzalez DE, Padilla-Armendariz DP, et al. Esophageal Duplication Cysts in 97 Adult Patients: A Systematic Review. World J Surg 2022;46:154-62.

doi: 10.21037/vats-23-63
Cite this article as: Wahi JE, Ajabshir N, Safdie FM. Robotic-assisted excision of an infected duplication cyst of the esophagus. Video-assist Thorac Surg 2024.