Endoscopic Repair of a Complete post-Radiation Esophageal Obstruction

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Abstract

We describe a 64-year-old man with squamous cell carcinoma of the esophagus who presented with an obstruction of the esophagus following radiation therapy and chemotherapy. Initial upper gastrointestinal barium swallow studies showed a complete stoppage of the barium column, not unlike that of a congenital esophageal atresia. Therapeutic endoscopy was performed using a two-endoscope, two-operator system that reestablished patency of the esophagus. Repeated endoscopy was then used to continue esophageal dilation with eventual placement of a permanent stent. A video and a comprehensive review of the literature regarding combined antegrade-retrograde dilation techniques used to date are also provided.

Key words


Background

Esophageal carcinoma is usually either adenocarcinoma or squamous cell carcinoma with those two histological types accounting for 90 percent of cases [1]. Worldwide, esophageal cancer is the 8th most common cancer (4.2 percent of cancers) and the 6th most common cause of cancer deaths (5.7 percent of deaths). There are significant differences in incidence rates throughout the world. High risk areas include China, southern and eastern Africa, south central Asia, and Japan. Low risk areas are western, middle, and northern Africa, and central America [2]. The incidence is generally much higher in men than women, and the ratio can range from 7-to-1 in Eastern Europe to 3-to-1 in the United States to almost equal in high-risk areas of Asia and Africa [2,3].

Risk factors for esophageal cancer are usually divided into those for squamous cell carcinoma and those for adenocarcinoma, although there is some overlap. Notable risk factors for squamous cell carcinoma include tylosis, caustic injury to the esophagus, alcohol and tobacco use, poverty, Plummer-Vinson syndrome, and prior radiation therapy. Similarly, adenocarcinoma risk factors include tobacco use and prior radiation therapy. Other risk factors for adenocarcinoma that are not similar include Barrett’s esophagus, weekly reflux symptoms and obesity [3]. There appear to be some risk factors that are more relevant in specific geographic regions. Esophageal cancer in North America and Europe shows a strong relationship with tobacco and alcohol (approximately 90 percent of cases) while drinking hot maté has been indicated in esophageal carcinoma in Uruguay, southern Brazil, and northern Argentina. Diets with nutritional deficiencies or high in pickled vegetables, nitrosamine-rich foods, and mycotoxins have been implicated as risk factors in central Asia, China, and southern Africa [2].

Most patients are diagnosed with intermediate or advanced disease. Daly et al [1] found that 23 percent of patients were diagnosed with stage II, 22 percent were stage III, and 39 percent were stage IV. The five-year survival rates range from 30 to 40 percent for stage II disease to less than 1 percent for stage IV disease [3]. Because many patients do not have symptoms of early disease and present late, treatments are limited to palliative care with a combination of surgery, chemotherapy, and radiotherapy. We present a case report of therapeutic endoscopy in a patient with advanced esophageal cancer and stenosis who was no longer a candidate for chemotherapy or radiation therapy.

Case Report

This patient was a 64-year-old man who was diagnosed with squamous cell carcinoma of the mid-esophagus with supraclavicular adenopathy, stage IVB, approximately 20 months prior to his referral to us. He received chemotherapy including cisplatin, irinotecan, carboplatin, paclitaxel, and
capecitabine in his last treatment in February 2007. He also received palliative radiation therapy at 4000 cGy in 20 fractions to relieve dysphagia with his last treatment 12 months ago. The patient developed an inability to handle his saliva and less than one month prior to admission had an upper gastrointestinal (GI) barium swallowing study that showed complete stoppage of the barium column with no barium moving into the distal esophagus.

Initially, we attempted to place an esophageal stent (Ultraflex™ Esophageal NG Stent System, Boston Scientific, Inc), but were unsuccessful. No tumor was identified; instead a completely epithelialized blind pouch was encountered. An endoscopic ultrasound (Olympus GF-UM160, Olympus, Inc) was used to investigate the blockage but was difficult to interpret. It appeared to show air trapping below the distal end of the blind pouch of the proximal esophagus and it was speculated that this represented a thin membrane separating the proximal and distal esophagus. A front-viewing gastroscope (Olympus GIF-160, Olympus, Inc) was inserted through the gastrostomy site and advanced retrogradely into the esophagus and we were able to visualize a similar situation as encountered from above. A second procedure was planned to attempt to reestablish patency of the esophagus using a two-endoscope, two-operator technique.

![Fig 1. Fluoroscopy shows endoscopes approaching the esophageal obstruction from above and below.](image)

**Technique**

The first endoscopist inserted an endoscope (Olympus GIF-160, Olympus, Inc) through the preexisting gastrostomy opening and retrogradely moved into the esophagus, where the obstruction was again encountered. The second endoscopist inserted a second endoscope (Fujinon EG-250WR5, Fujinon, Inc) through the oral cavity into the upper esophagus where it encountered the obstruction. Fluoroscopy showed a short-gap stenosis, with a length of approximately 1.6 cm (Fig. 1, 2). A 19-gauge EUS-FNA needle (Cook Echotip™ Endoscopic Ultrasound Needle, Cook Medical, Inc) was inserted through the Olympus endoscope from below and a puncture was made in the fibrous obstruction retrogradely, which was visualized by the Fujinon scope in the upper esophagus. A 0.035” guidewire (Hydra Jagwire® Guidewire, Boston Scientific, Inc) was inserted through the needle and received from above by a standard polypectomy snare and then brought out the patient’s oral cavity establishing guidewire access through the esophageal stenosis. The diameter of the opening was too small for a balloon dilation catheter, so we used a Microvasive needle-knife (Boston Scientific, Inc) to enlarge the opening. We were then able to transverse the stricture with a 6/7/8mm biliary balloon (OTW Hurricane Biliary Dilation Balloon, Boston Scientific) and dilate to 8mm. A nasogastric tube was inserted across the dilation to ensure patency until the next dilation.

![Fig 2. Barium swallow study showing movement of barium into the distal esophagus following the combined antegrade-retrograde dilations.](image)

We performed a third endoscopic procedure (Olympus GIF-160, Olympus, Inc) with the plan of expanding the esophageal stenosis to 10mm. The esophagus appeared to have remained patent, although the stricture appeared to have narrowed. A 10mm radial expansion balloon (CRE™ Wireguided Balloon Dilator, Boston Scientific, Inc) was used to dilate the stricture to the balloons full diameter, at which time the endoscope could be maneuvered into the tract and the distal esophagus could be visualized. The stricture appeared to be approximately 1.6 cm in length, although the endoscope could not be passed through the stricture into the distal esophagus for an exact measurement.

Given this scenario, we suspected that this patient’s esophagus would close quite rapidly. Therefore, we again planned to place an esophageal stent (Ultraflex™ Esophageal NG Stent System, Boston Scientific, Inc). The esophagus was easily intubated with the endoscope (Olympus GIF-160, Olympus, Inc), and showed that the previously dilated channel had significantly decreased in diameter after only five days. We used a 10mm radial expansion balloon (CRE™ Wireguided Balloon Dilator, Boston Scientific, Inc) to re-dilate the channel. A 10cm long, 18mm diameter self-expanding metal stent (Ultraflex™ Esophageal NG
Stent System, Boston Scientific, Inc) was inserted across the esophageal stricture under fluoroscopy and deployed (Fig. 3). Following the procedures, the patient felt much improvement in his ability to control his saliva and tolerate a soft diet.

**Discussion**

Quality of life is a major concern for those with esophageal carcinoma. Our patient could no longer control his oral secretions and had to continually spit into a cup, which caused him a great deal of distress. He could also no longer take any nutrition orally, which was limiting his participation in family events that surrounded meals. However, our urgency to palliate his esophageal obstruction was not only related to quality of life, but also to improve his immediate health status. Campbell et al [4] found that patients who subjectively reported difficult swallowing were objectively discovered to have aspiration on videofluoroscopic swallowing studies, and approximately half of those had trouble protecting their airway. Traditional palliative therapies for malignant esophageal obstruction include photodynamic therapy, brachytherapy, and expandable metal stents, all of which can be beneficial with proper patient selection [7]. We felt our patient would have the best outcome with stent placement, which has been shown to be effective in other patients with similar disease status to rapidly improvement in quality of life with minimal complications [5, 6, 8].

An antegrade-retrograde technique was first described by van Twisk et al [9], although the combined antegrade-retrograde dilation (CARD) we used was described in more detail by Bueno et al [10], which has also been reproduced in several other institutions. Additionally, others have used a similar technique to treat areas of the upper gastrointestinal tract other than the esophagus, for example Sullivan et al [11] have used a laryngoscope and endoscope to treat strictures in the hypopharynx (see Table I for a summary of the various reported uses of CARD).

Although most authors have presented a limited number of reports, the results have appeared favorable. There have been minimal complications and only one reported patient was not a candidate due to the length of his esophageal obstruction. The majority of cases have had some degree of opening in the obstruction and thus a guidewire was able to be passed through, however several cases required intervention to establish any degree of patency. Steele et al [12] used a modified dilation technique that involved

![Fig 3. Fluoroscopy image showing the final stent placement across the esophageal stricture.](image)

**Table 1. Summary of CARD procedures by author**

<table>
<thead>
<tr>
<th>Author</th>
<th>Number of patients</th>
<th>Method to navigate obstruction</th>
<th>Outcomes/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>van Twisk et al [9]</td>
<td>2</td>
<td>Guidewire</td>
<td>Lumenal patency re-established without perforation or any other complications. One patient required a mini-laparotomy to create retrograde access.</td>
</tr>
<tr>
<td>Bueno et al [10]</td>
<td>8</td>
<td>Guidewire</td>
<td>Lumenal patency re-established without perforation or any other complications in all patients.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biopsy forceps</td>
<td>Most like our procedure, the obstruction described is less than 2cm.</td>
</tr>
<tr>
<td>McGrath et al [13,14]</td>
<td>Undisclosed</td>
<td>EUS-FNA needle</td>
<td>Seven patients had successful re-establishment of esophageal patency. One patient was deemed not a candidate with an esophageal obstruction 6-to-8cm. Two patients with microperforations that resolved without intervention.</td>
</tr>
<tr>
<td>Maple et al [12]</td>
<td>8</td>
<td>Guidewire</td>
<td>Favor the EUS-FNA needle approach based on minimal time to cross obstruction and suitability for longer obstructions.</td>
</tr>
<tr>
<td>Moyer et al [15]</td>
<td>1</td>
<td>EUS-FNA needle</td>
<td>Sclerotherapy needle was used in patient with complete obstruction, developed a pneumothorax during the procedure. Used progressive balloon dilation in lieu of rigid guidewire dilation.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Needle knife</td>
<td>Lumenal patency re-established without perforation or any other complications.</td>
</tr>
<tr>
<td>Steele et al [8]</td>
<td>1</td>
<td>Sclerotherapy needle</td>
<td>Lumenal patency re-established without perforation or any other complications. Used laryngoscope for the antegrade approach.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Guidewire</td>
<td>Lumenal patency re-established without perforation or any other complications.</td>
</tr>
<tr>
<td>Baumgart et al [11]</td>
<td>1</td>
<td>Guidewire</td>
<td>Lumenal patency re-established without perforation or any other complications.</td>
</tr>
<tr>
<td>Lew et al [18]</td>
<td>5</td>
<td>Guidewire</td>
<td>Lumenal patency re-established without perforation or any other complications.</td>
</tr>
<tr>
<td>Garcia et al [17]</td>
<td>9</td>
<td>Guidewire</td>
<td>Lumenal patency re-established without perforation or any other complications.</td>
</tr>
</tbody>
</table>
progressive dilation of the obstruction by advancing the balloon into the stricture with the guidewire remaining inside the dilated balloon. They felt this was a safer technique that avoided inserting an uncovered guidewire into the lumen and decreased the risk of perforation. Maple et al [12] utilized a head and neck surgeon with a rigid instrument to manage the proximal end of the obstruction in 6 of their 8 cases, during which they also provided blunt dissection of the obstruction from above. McGrath et al [13,14] and Moyer et al [15] reported a technique most similar to our own, utilizing an EUS-FNA needle to traverse the obstruction.

Despite the numerous publications describing the CARD procedure, knowledge of its use and effectiveness is limited in other specialties. As an attempt to help spread awareness about esophageal CARD, we are submitting this case report and summary of currently published CARD procedures to this open-access journal, and have created a narrated video that has been published on the Digital Atlas of Video Endoscopy (DAVE) Project web site entitled “Endoscopic Repair of Acquired Esophageal Atresia” (the referenced video is available at http://daveproject.org/ViewFilms.cfml?Film_id=688). We feel that CARD is an underutilized procedure that is a safe alternative to surgery that will improve quality of life and decrease the risks associated with esophageal obstruction with minimal invasiveness. Although our patient was placed under general anesthesia because he was sedation resistant, we agree with the many other authors who suggest conscious sedation will probably be sufficient for most patients. We also agree that patency can be re-established in longer strictures, especially using an EUS-FNA needle under the direction of an experienced endoscopist.

Author’s contributions

TG observed the endoscopic procedures, reviewed the literature, and drafted the manuscript. KG performed the endoscopic procedures and approved the manuscript. AM assisted with the endoscopic procedures and approved the manuscript.

Conflicts of interest

Publication of this case report has been supported by an unrestricted educational grant of the Boston Scientific corporation (Natick, MA, USA).

References

15. Moyer MT, Stack BC, Mathew A. Successful recovery of esophageal patency in 2 patients with complete obstruction by using combined antegrade retrograde dilation procedure, needle knife, and EUS needle. Gastrointest Endosc 2006; 64: 789-792.