Sliding esophagoplasty in esophageal obstruction after endovascular stent grafting of thoracic aortic aneurysm

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Disclosures: Authors have nothing to disclose with regard to commercial support.

Received for publication Oct 30, 2017; revisions received Jan 31, 2018; accepted for publication Feb 13, 2018; available ahead of print March 9, 2018.

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J Thorac Cardiovasc Surg 2018;156:e23-6

0022-5223/$36.00

https://doi.org/10.1016/j.jtcvs.2018.02.037

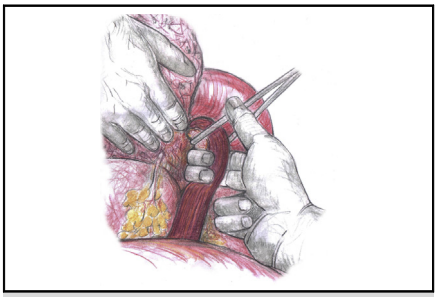


Illustration of an operative view of the sliding esophagoplasty.

Central Message

Sliding esophagoplasty proved to be a safe esophagus-sparing novel surgical option to resolve dysphagia in esophageal obstruction developed after previous stent grafting of thoracic aortic aneurysm.

See Editorial Commentary page e27.

Video clip is available online.

Esophageal obstruction after endovascular stent grafting of thoracic aortic aneurysm is a rare and anecdotally reported life-threatening complication,[1] which can be related to progressive necrosis of the compressed esophagus potentially evolving toward aortoesophageal fistula. Prompt aggressive surgical management including aortic replacement and esophagectomy have been advocated in these instances,[1,2] although eventually resulting in prohibitive mortality rates.[3]

Herein we report on a case of esophageal obstruction induced by a huge thoracic aortic aneurysm previously treated by endovascular stent grafting, which was managed by a sliding esophagoplasty, a novel surgical technique entailing repositioning of the compressed esophagus aside from the aneurysm and its reinforcement by an intercostal muscle flap.

SURGICAL TECHNIQUE AND CASE SUMMARY

A 71-year-old man with a history of chronic obstructive pulmonary disease, chronic renal failure, and treatment of a thoracic aortic aneurysm by multiple endovascular stent grafting 13 months before complained of progressively deteriorating dysphagia, chest pain, and weight loss (10 kg) for the previous 3 months. At admission, chest computed tomography showed a wide aneurysm of the thoracic aorta extending from the arch to the aortic hiatus (10 cm in maximal diameter) with the previously placed endovascular stents in the correct position, no evidence of endoleak, and with a compression of the middle third of the thoracic esophagus (Figure 1, *left* and *middle upper panels*). The main airways were also moderately compressed but viable. A barium esophagogram confirmed the abrupt interruption of the contrast medium above the upper limit of the aneurysm and at esophagoscopy the esophageal lumen was obstructed at 26 cm from the dental arcade (Figure 1, *right upper panel*). Preoperatively, the patient was placed on parenteral nutrition for 2 weeks to improve his nutritional status.

At multidisciplinary evaluation, including thoracic and vascular surgeons, it was decided to try to preserve the native esophagus and perform a sliding esophagoplasty to minimize morbidity risks. With the patient under general anesthesia with single-lung ventilation, a left posterolateral thoracotomy was carried out on the VI intercostal space and a pedicled intercostal muscle flap was prepared in anticipation of a by-necessity reinforcement of the esophageal wall. The esophagus was compressed and tightly adherent to the aortic wall behind and to the pericardium anteriorly. After isolation of the esophagus both below and above the compressed tract, a 6-cm long necrotic esophageal segment was freed by gentle finger and instrumental (Ultracision, Johnson & Johnson Medical, Pomezia, Italy) dissection and mobilized laterally aside from the aneurismatic wall. The esophageal wall appeared damaged with a covered perforation of the mucosa, which was debrided and sutured

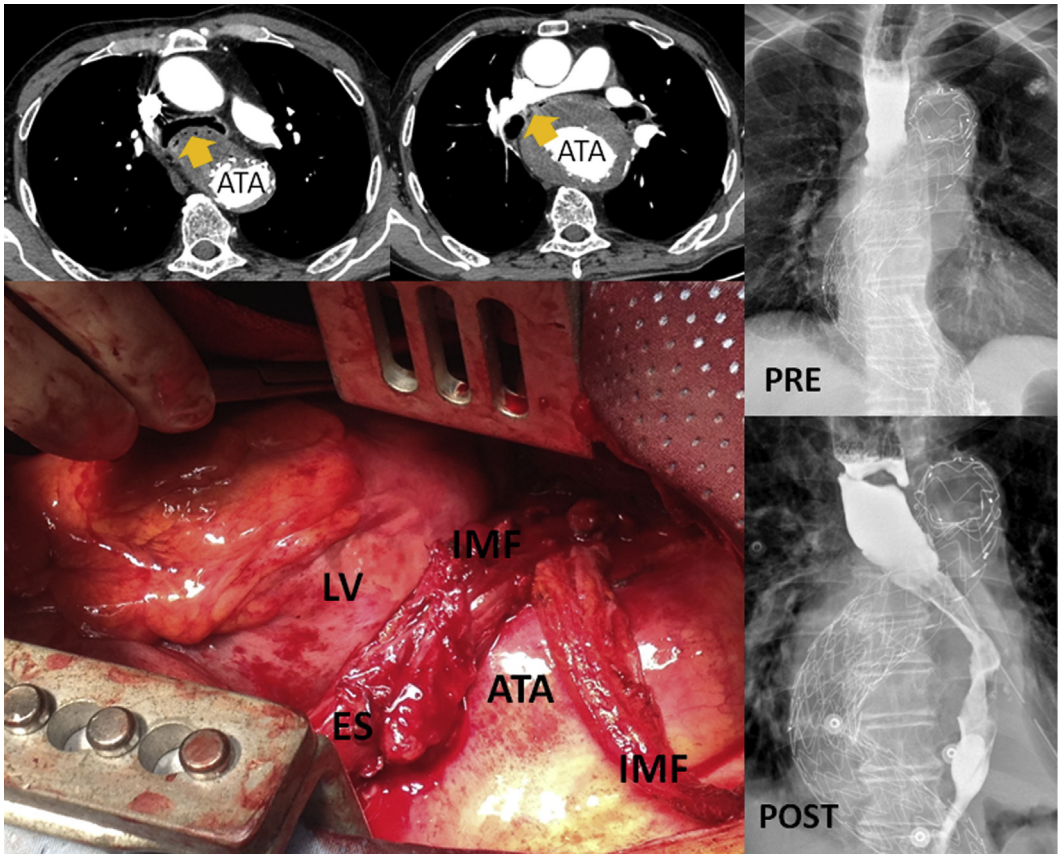


FIGURE 1. *Left* and *middle* upper panels are preoperative chest computed tomography scans showing a huge aneurysm of the thoracic aorta including endovascular graft stents compressing the middle third of the esophagus (*arrows*), and the *right upper panel* is a preoperative (*PRE*) esophagogram showing esophageal obstruction and abrupt interruption of the contrast medium above the aneurysm level. The *left lower panel* shows esophageal wall reinforcement by a pedicled intercostal muscle flap sutured over the necrotic tract of the esophagus. The *right lower panel* shows a postoperative (*POST*) barium esophagogram with restored continuity of the esophageal lumen and no extraesophageal leakage of the contrast medium. *ATA*, Aneurysm of the thoracic aorta; *LV*, left ventricle; *IMF*, intercostal muscle flap; *ES*, esophagus.

by absorbable interrupted sutures. Afterwards, the intercostal muscle was wrapped around the necrotic tract and sutured by interrupted nonabsorbable stitches (Figure 1, *left lower panel*, and Figure 2). No bubbling was disclosed at an intraoperative leak test, and closure of thoracotomy was accomplished after the placement of 2 chest tubes. On postoperative day 7, an esophagogram showed the ready passage of the GASTROGRAFIN (Bracco, Milan, Italy) with restoration of the esophageal lumen without leakage (Figure 1, *right lower panel*; Video 1). The patient was allowed to begin eating a soft diet and discharged 2 days later. At 6 months' follow-up, the patient could eat a normal diet and had gained 8 kg in weight.

DISCUSSION

Critical issues requiring consideration in our patient included previous placement of endovascular stents, which was deemed a relative contraindication for surgical decompression of the aneurismatic sac due to the risk of stent displacement and bleeding. Moreover, the patient's multiple comorbidities suggested us to try to avoid esophagectomy, which has been associated with high mortality rates.[4] As a result, we believed that a sliding esophagoplasty including reinforcement of the necrotic esophageal wall by a pedicled intercostal muscle flap (Figure 2)[5] might constitute a valuable, less-aggressive novel option, which in our patient resolved the esophageal compression, restored the esophageal continuity, and allowed him to rapidly resume a normal oral diet.

The compressed esophagus might have been approached from either side, but in this case we preferred a left thoracotomy for the following reasons. First, the radiologic evidence of an S-shaped course of the dilated thoracic aorta with right-sided convex curvature in its lower one third might have hampered a right-sided esophagoplasty. Second, we thought that if preservation of the native esophagus was impossible requiring an esophagectomy, a left phrenolaparotomy might have been performed to tubularize the stomach for an intrathoracic esophagogastrostomy without changing the patient position. In addition, although the

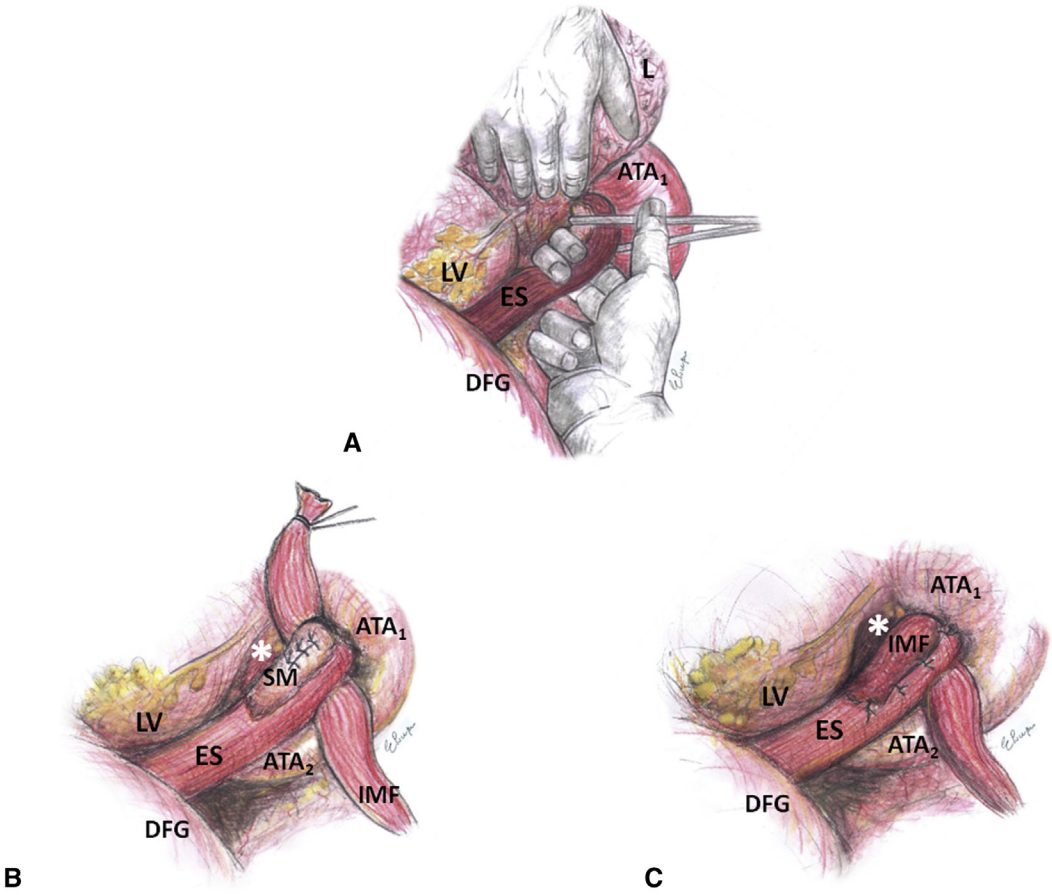
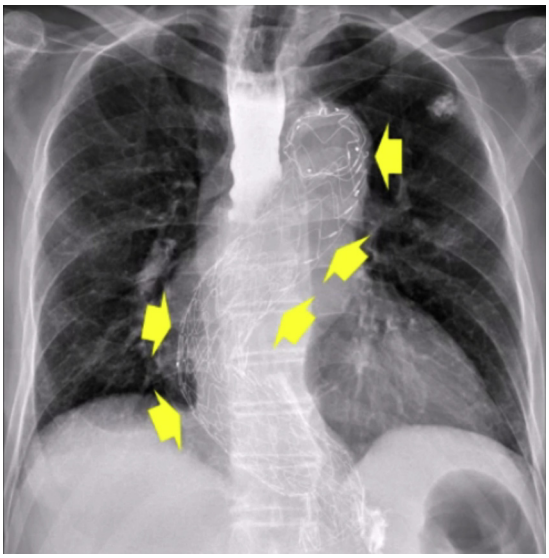


FIGURE 2. A, By left thoracotomy, the thoracic esophagus (lower 2/3) is progressively freed from the pericardium anteriorly and the aortic aneurysm posteriorly with the aid of gentle digital and instrumental blunt dissection and eventually repositioned aside the dilated descending aorta. B, The intercostal muscle is passed behind the esophagus at the level of the necrotic tract and the denudated ruptured mucosa is repaired by interrupted sutures. C, Finally, the pedicled intercostal muscle flap is wrapped around the esophagus to reinforce the damaged tract and sutured by interrupted nonabsorbable stitches. *ATA_1*, Aneurysm of the thoracic aorta, aortic arch; *LV*, left ventricle; *ES*, esophagus; *DFG*, diaphragm; *SM*, sutured mucosa; *ATA_2*, aneurysm of the thoracic aorta, descending tract; *IMF*, intercostal muscle flap. *The lung is not depicted in the drawing.



VIDEO 1. Video clip illustrating the technical details of the sliding esophagoplasty. Video available at: http://www.jtcvsonline.org/article/S0022-5223(18)30402-1/fulltext.

finding of a damaged esophageal wall was unrecognized preoperatively, we deemed it highly presumable on the basis of the computed tomography findings. Thus, we decided to anticipate the preparation of a pedicled intercostal muscle flap during left thoracotomy to be ready for a by-necessity reinforcement of the esophageal wall.

A further critical issue is the timing of the intervention. The exact mechanisms underlying secondary esophageal necrosis and perforation in these instances remain conjectural, but logical hypotheses include direct erosion into the esophagus and pressure necrosis[3] evolving within a relatively short time interval ranging from 1 to 12 months.[4] Thus, we believe that in presence of symptoms such as dysphagia, thoracic pain, and progressive weight loss, computed tomography, barium esophagogram, and esophagoscopy can rapidly help recognize an esophageal compression before that esophageal perforation does occur thus maximizing the probability of treatment success and the patient's survival.

We conclude that sliding esophagoplasty with intercostal muscle flap reinforcement proved a safe, effective, and as-yet relatively simple method to resolve esophageal obstruction caused by previously multistented thoracic aortic aneurysm in a dysphagic patient with multiple comorbidities. This method might be thus taken into consideration as a reliable novel option by multidisciplinary thoracic and vascular surgical teams dealing with similar rare cases in the future.

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