Uniportal Video-Assisted Thoracoscopic Surgery Resection of a Giant Midesophageal Diverticulum

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We describe a new video-assisted technique for the management of a giant midesophageal diverticulum using a single 5-cm port. It maintained the same principles of the traditional open technique as diverticulectomy, myotomy, and fundoplication. The better visualization of the main esophageal body, diverticulum, and esophagogastric junction and the better alignment of the stapler cartridge to the longitudinal axis of the esophagus are all technical factors supporting our procedure. Heavily calcified mediastinal lymph nodes and diffuse pleural adhesions are the main contraindications. However, future experiences are needed before this technique can be recommended as acceptable treatment.


Midesophageal diverticulum is a rare clinical entity, also known as a “true” diverticulum because it affects all wall layers, whereas classic pulsion evolves from an eversion of the mucosa through a focal weakness of the muscle layer [1, 2]. The indications for operation are moderate to severe esophageal symptoms and large or complicated diverticula. Minimally invasive treatments of complicated diverticula have been reported since 1995; however, the best surgical approach remains uncertain [2]. Herein, we describe a new technique: resection of a giant midesophageal diverticulum through uniportal video-assisted thoracoscopic surgery (VATS).

A 55-year-old man with severe dysphagia, weight loss, and heartburn was referred to our attention for management of a giant midesophageal diverticulum (Fig 1A). Manometry showed diffuse esophageal spasm and impaired low esophageal sphincter (LES) relaxation. The indications for operation were severe esophageal symptoms and the size (7 cm) of the diverticulum. The patient was aware of the pros and cons of a uniportal VATS approach and of the possibility of conversion to thoracotomy, and he gave specific written informed consent. The procedure is summarized in Video 1 and Figure 2.

Initially, the patient was placed in the supine position and given general anesthesia and selective intubation; flexible esophagoscopy aspirated the food materials in the diverticulum. A guidewire was inserted into the stomach under fluoroscopic and endoscopic view. The patient was then placed in the full right lateral decubitus position with the left lung deflated; the surgeon and the assistant stood posteriorly to the patient (Fig 1B). A 5-cm incision was made at the level of the seventh left intercostal space and a 30° camera and working instruments were inserted without rib spreading. The camera was placed in the anterior part of incision and the instruments below it. The working instruments entered the chest parallel to the camera but with different angulation (Fig 1C). The surgeon divided the pulmonary ligament and the mediastinal pleura over the esophagus with ultrasonic shears, and the assistant packed the lung out of the way superiorly. The esophagus was gently mobilized, and the diverticulum was then dissected out with identification of the entire neck. During dissection, no Penrose neither other type of drain were placed around esophagus to preserve it from excessive skeletonization. Manometry established diffuse esophageal spasm and hypertensive LES; therefore, a long extramucosal myotomy was performed extending superiorly for 2 to 3 cm and involving inferiorly the LES and the gastric cardia. The myotomy was created by a combination of sharp dissection with ultrasonic shears and cold scissors and blunt dissection. A 50F bougie was introduced across the gastroesophageal junction over the guidewire, and the surgeon closely monitored the safe passage into the esophagus. The diverticulum was then stapled at its base with a standard transverse stapler (30 mm) placed parallel to the long axis of the esophagus to avoid tension and decrease the risk of leak. The staple line was then reinforced by approximating the muscularis with interrupted 4-0 silk sutures. Finally, the stomach was sutured to the esophagus 1 cm above the esophagogastric junction, encompassing 270° of the esophageal circumference (Belsey-Mark IV antireflux procedure). A chest drain was inserted through the same incision. Postoperatively, epidural analgesia was used for the first 48 hours, and then nonsteroidal antiinflammatory drugs were administered for pain control.

Unfortunately, an esophageal leak occurred 15 days later after the patient had begun eating solid food; it was treated successfully with a temporary esophageal stent at another hospital. The 12-month follow-up visit showed complete relief of symptoms without recurrence of the diverticulum.
Fig 1. (A) Roentgenographic view of barium swallow showing a 7-cm mid-esophageal diverticulum. (B) Placement of patient in right decubitus position with surgeon and assistant standing posteriorly to him. (C) Insertion of instruments and the camera parallel but with different angulations through the same incision (insert).

Fig 2. Main steps of the procedure. (A) Identification of neck of diverticulum. (B) Extramucosal myotomy. (C) Staple line parallel to longitudinal axis of esophagus; camera and instruments through the port (insert). (D) Fundoplication; drainage through the incision (insert).
Comment

Owing to advances in minimally invasive surgical techniques an alternative to open techniques, VATS and laparoscopic transhiatal procedures with success for the management of esophageal diverticula have been reported [1, 2]. In recent years, the standard multipor VATS has evolved into a uniportal approach, used for lung resection and other increasingly complex cases [3, 4]. In line with this tendency, we have performed resection of a midesophageal diverticulum through uniportal VATS—an issue not reported before.

In contrast to standard uniportal VATS, wherein the operating surgeon usually stands anterior to the patient, in this case the surgeon and the assistant designated to operate the camera were positioned posterior to the patient. With this distribution, the surgeon had the same view as with the standard open approach and could reproduce the same maneuvers performed during open surgical procedures such as diverticulectomy, myotomy, and fundoplication. In addition, the assistant had the same field of vision with improvement of coordination and ergonomics. The instruments and camera moved in the direction of two parallel lines approaching the diverticulum from a cranio-caudal perspective. This allowed the operative fulcrum to be brought inside the chest in a fashion similar to open surgical procedures [5]. Yet, the different angulation between the camera and instruments allowed maximal convergence of working instruments from either side of the target lesion without interference with the camera. Thus, surgeon worked with his eyes and hands in the same plane, much as in open operations, and in contrast to multipor VATS. This strategy allowed performance of the main maneuvers of standard procedure, such as (1) dissection of the esophagus and diverticulum from the mediastinal structures, preserving the esophagus from excessive skeletonization; (2) alignment of the diverticulectomy stapler to the longitudinal axis of the esophagus rather than perpendicular to prevent tension on the suture; (3) long myotomy by dividing the muscle layers with care to preserve the underlying mucosa; and (4) identification of the esophagogastric junction during myotomy and fundoplication to prevent leak and recurrence of symptoms.

Despite use of the correct technique to avoid adverse events, our patient had an esophageal leak that was treated successfully with a temporary stent. Esophageal diverticulectomy still carries significant morbidity related mainly to suture leakage. In the largest cohort of patients undergoing minimally invasive operations [1], adverse events related to diverticulectomy occurred in 45% of patients, with a 20% leak rate and a mortality of 5%. In a recent review including 133 patients undergoing minimally invasive diverticulectomy, Hirano and colleagues [2] reported a postoperative morbidity of 20%, an esophageal leak of 15%, and an intraoperative mortality of 2%.

As observed for other uniportal thoracic procedures, our approach compared with standard open procedure would help reduce postoperative pain and favor early return to normal activity. Even though it is feasible and attractive, our technique is challenging and is indicated in very carefully selected cases. Heavily calcified mediastinal lymph nodes and diffuse pleural adhesions are the main contraindications. The learning curve is steep and long, and future experiences are required before our strategy can be recommended as acceptable therapy.

The esophageal leak was treated with success at Thoracic Surgery Unit and Endoscopic Unit of ISMETT Hospital in Palermo, Italy.

References