Minimally Invasive Thoracoabdominal Esophagectomy in a Morbidly Obese Patient
Salvatore A. Parascandola, BS, and M. Blair Marshall, MD
Georgetown University School of Medicine, and Division of Thoracic Surgery, Georgetown University Medical Center, Washington, DC

Open approaches to esophagectomy include transhiatal, Ivor-Lewis, left thoracoabdominal, and McKeown, each with inherent advantages and disadvantages. Minimally invasive esophagectomy most commonly refers to a minimally invasive Ivor-Lewis style approach, although transhiatal and McKeown approaches have also been described. A minimally invasive thoracoabdominal esophagectomy has not yet been reported. This minimally invasive approach offers the same advantages as the open thoracoabdominal procedure: excellent exposure, evaluation for resectability before gastric mobilization, and no need for intraoperative repositioning. We describe a minimally invasive thoracoabdominal esophagectomy, the technique, and advantages of this approach in a morbidly obese patient with esophageal cancer.


Open esophagectomy is associated with significant morbidity and mortality. Since the 1990s, minimally invasive approaches to esophagectomy have been adopted in an effort to reduce the complications associated with the open procedures [1]. Surgeons at high-volume centers have reported good or better results with various minimally invasive esophagectomy techniques, observing decreased intraoperative blood loss, shorter hospital stays, and lower mortality rates [1, 2]. As with open esophagectomy, the approach to minimally invasive esophagectomy is contingent on several factors that relate to the patient and their cancer, as well as surgeon preference. Some surgeons may consider morbid obesity a contraindication to minimally invasive esophagectomy.

A National Health and Nutrition Examination Survey demonstrated that in the United States, 35.7% of adults are obese (body mass index ≥30 kg/m²) [3]. This increasingly obese population presents additional challenges to the nation’s healthcare providers, particularly with regard to the transportation and moving of patients. They require specific equipment (larger table attachments, stronger lifts, and so forth) and additional staff to provide adequate and safe care for the patient while avoiding injury to the staff [4]. Testimony from those caring for morbidly obese patients identifies that some of the most challenging aspects of care are the physical tasks of turning and moving these patients [5].

A 66-year-old morbidly obese man (body mass index 50 kg/m²) presented with stage pT3N1 esophageal adenocarcinoma of the gastroesophageal junction (Fig 1). He received neoadjuvant chemoradiation, had an excellent response, and returned for surgical resection. The patient’s medical history included prostate cancer, cholecystitis, hypertension, obesity, atrial fibrillation, and lower extremity edema. Preoperatively, he underwent percutaneous inferior vena cava filter owing to his increased perioperative risk of venous thrombosis [6].

For the procedure, the patient was placed in the left thoracoabdominal position, as for the corresponding open operation with the placement of a double-lumen endotracheal tube. The procedure began in the left chest with four port sites located at the sixth and eighth intercostal spaces. The most posterior and anterior ports were placed in the sixth intercostal space with the two in the center being placed in the eighth intercostal space located along the anterior and posterior axillary lines. We chose to begin in the chest as the pretreatment imaging raised the question of resectability. Retraction sutures were placed on the diaphragm and pericardium with the use of CO₂ to optimize the exposure. The esophagus was mobilized, and subcarinal and additional mediastinal lymph nodes were resected.

Fig 1. Positron emission tomography scan reveals adenocarcinoma of the gastroesophageal junction from a frontal view. The adenocarcinoma at the gastroesophageal junction is highlighted in red.
The laparoscopic portion proceeded next. Given the thoracoabdominal position, port placement was tailored to suit this positioning. A GelPort (Applied Medical, Rancho Santa Margarita, CA) was placed through the rectus of the left upper quadrant with four additional 5-mm ports (Fig 2). Upon entering the abdomen, the peritoneal cavity and liver were evaluated for metastatic disease. The stomach was mobilized, and a modified D-1 lymphadenectomy as well as pyloroplasty were performed. The left gastric vessels were divided from the left side of the patient in coordination with the celiac lymphadenectomy. Two stay sutures were placed on the proximal esophagus in the chest just under the aortic arch, and it was divided with an Endo GIA stapler (Covidien, Dublin, Ireland).

The specimen was delivered through the hiatus and into the abdomen. The Endo GIA stapler was used to tubularize the distal stomach, and the staple line was oversewn with a running 3-0 PDS. The gastric conduit was then delivered into the chest. The DST series EEA OrVil anvil (Covidien) was positioned through the proximal staple line of the esophagus transorally. The DST series EEA stapler (Covidien) was placed through a gastrotomy through the GelPort, and an end-to-end anastomosis was performed (Fig 3). The anastomosis was oversewn with interrupted silk sutures.

A 28F chest tube, intercostal blocks, and feeding jejunostomy were placed. The patient was extubated at the conclusion of the procedure. Pathology revealed negative margins, with the proximal margin measuring 4.0 cm. There was a 1.5-cm focus of residual cancer from the primary tumor and 1 of 18 lymph nodes with persistent cancer. His tube feeds were advanced during his hospital stay. Postoperatively, he had an episode of atrial fibrillation and was controlled on medical therapy. An esophagram 5 days after the operation showed no leak (Fig 4), and the patient was discharged to home on postoperative day 6. At follow-up, he was without complaints of reflux.

Fig 2. The GelPort (Applied Medical, Rancho Santa Margarita, CA) and four additional 5-mm ports (numbered 1 through 4) are placed through the rectus of the left upper quadrant.

Fig 3. Thoracoscopic view of the thorax shows the divided esophagus inferior to the aortic arch with two stay sutures attached. The gastric conduit can be seen in the left of the image with the stapled anastomosis being performed between the distal esophagus and stomach.

Fig 4. Contrast esophagram conducted 5 days after esophagectomy demonstrates patent anastomosis without leak.

Comment
In the past 2 decades, there has been an increasing incidence of adenocarcinoma of the esophagus and gastroesophageal junction [7]. The rises in obesity and reflux disease correspond to this increased incidence of adenocarcinoma and have been attributed as related factors [7]. For some thoracic surgeons, open thoracoabdominal esophagectomy is the approach of choice because of its inherent advantages, namely, no need for repositioning, ability to evaluate the primary lesion initially, and
excellent exposure. Although this is a useful approach in obese patients, the increased morbidity and mortality associated with open approaches is a disadvantage.

Other minimally invasive approaches, such as the transthoracic Ivor-Lewis and McKeown approaches require that the patient be repositioned as the procedure moves from the abdomen to the thorax or vice versa [8]. These approaches have the disadvantages of increased operative time associated with repositioning and inability to evaluate resectability, not to mention additional challenges with the morbidly obese. Although a minimally invasive transhiatal esophagectomy can be performed in a single position (supine), from our experience, we are not convinced this procedure is feasible for the morbidly obese patient owing to the increased mediastinal fat obscuring visibility in the mediastinum. Additionally, a mediastinal lymphadenectomy is difficult with this approach. In contrast, the minimally invasive thoracoabdominal approach provides excellent exposure of the esophagus and intrathoracic visualization, allowing for distal mediastinal and celiac lymphadenectomy in one position. In particular, this approach may be of value when the patient has a hostile right chest. In situations where the proximal margin returns positive, a cervical dissection with cervical anastomosis may be performed.

Minimally invasive thoracoabdominal esophagectomy is a practical approach corresponding to the open procedure, potentially conferring the improved outcomes associated with minimally invasive esophagectomy in addition to the providing the same advantages as the corresponding open technique.

References