

# The 5 Most Important Recent Publications Regarding Robotic Esophageal Surgery



Zane Hammoud, MD

Robotic-assisted minimally invasive esophagectomy is gaining acceptance as a safe and effective alternative to open esophagectomy.

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Esophagectomy remains the mainstay of treatment for esophageal cancer as well as for some benign esophageal conditions. There is no consensus regarding a variety of issues regarding the conduct of esophagectomy. There remains controversy regarding the optimal approach, that is, transhiatal or transthoracic, as well as the optimal anastomotic technique. In addition to these issues, one may also add whether esophagectomy should be performed in a “traditional” or open manner vs a minimally invasive manner.

The role of minimally invasive esophagectomy (MIE) has been well established. Multiple institutional series, systematic reviews, and meta-analyses have shown equal or superior outcomes of MIE compared with open esophagectomy.<sup>1,2</sup> However, as in open esophagectomy, multiple techniques of MIE have been described, most of which involve thoracoscopic dissection. For instance, Luketich et al<sup>3</sup> reported their series of 1033 patients who underwent MIE (481 McKeown and 530 Ivor Lewis) and concluded that the procedure can be performed safely and with good results. Most of these reports, however, use thoracoscopic techniques, whereas only a few reports use robotic assistance.

The addition of robotic assistance in MIE is relatively new. In 2003, Horgan et al<sup>4</sup> first described robotic-assisted transhiatal esophagectomy in 20 patients with esophageal cancer. Since this initial report, there have been several institutional series that have described robotic-assisted MIE (RAMIE) via a transhiatal, McKeown, and Ivor Lewis approach. Technical aspects, complications, and short-term outcomes have been reported and are mostly favorable. However, long-term efficacy especially regarding oncologic outcomes is lacking. Nonetheless, proponents of the robotic approach report some advantages compared with conventional thoracoscopic approaches. In this review, relevant articles detailing RAMIE are summarized.

Chief, General Thoracic Surgery Henry Ford Hospital Detroit, MI 48202.

\*Address reprint requests to Zane Hammoud, MD, Henry Ford Health System, 2799 West Grand Bld, K-14, Detroit, MI 48202. E-mail: [Zhammou1@hfhs.org](mailto:Zhammou1@hfhs.org)



Patient position and port placement for robotic esophagectomy.

## Central Message

Robotic-Assisted esophagectomy is feasible and safe

## THE FIRST SERIES OF COMPLETELY ROBOTIC ESOPHAGECTOMIES WITH 3-FIELD LYMPHADENECTOMY: INITIAL EXPERIENCE

Kernstine KH, DeArmond DT, Shamoun DM, Campos JH. *Surg Endosc* 21:2285-2292, 2007

The authors reported a total of 14 patients who underwent robotic-assisted McKeown esophagectomy. Thoracic dissection was performed robotically. In their first 3 patients, the abdominal phase was performed through laparotomy; whereas in their next 3 patients, the abdominal phase was performed laparoscopically. In the final 8 patients, both the thoracic and abdominal phases were performed robotically. All patients had a left neck anastomosis using a linear stapler. The authors describe the evolution of their technique, including ligation of the thoracic duct and systematic lymph node dissection. The mean operative time was 11.1 hours (range: 9.5-13). There was 1 postoperative mortality and 1 conversion to thoracotomy. Overall, 29% of patients experienced major complications (including 1 anastomotic leak and 2 strictures), whereas 93% experienced minor complications. All patients had R0 resection and the mean number of harvested lymph nodes was 18.

In their conclusion, the authors provide some points that may improve the efficiency of robotic esophagectomy based on their experience. These include the creation of a focused robotic team, use of an experienced surgical assistant, and precise port placement with minimization of exchange of instruments. The authors note further that they expect improvements in technique as they and other surgeons gain additional experience with robotic esophagectomy. However, given their early results, the authors are encouraged

by the robotic assistance's potential to provide a more oncologic operation and to reduce the effect of surgery on the patient.

### INITIAL EXPERIENCE FROM A LARGE REFERRAL CENTER WITH ROBOTIC-ASSISTED IVOR LEWIS ESOPHAGOGASTRECTOMY FOR ONCOLOGIC PURPOSES

*De la Fuente, SG, Weber J, Hoffe SE, Shridhar R, Karl R, Meredith KL. Surg Endosc 27:3339-3347, 2013*

The authors performed a retrospective review of 50 consecutive patients who underwent robotic-assisted Ivor Lewis (RAIL) esophagogastrctomy. A total of 35 (70%) of 50 patients had neoadjuvant chemoradiation. All patients underwent RAIL for a diagnosis of cancer.

The surgical technique described was variable for the abdominal portion. The abdominal portion was performed fully laparoscopically, hand-assisted laparoscopically, or completely robotic (the authors state that approximately half were completely robotic). The thoracic portion was performed robotically in all patients with an intracorporeal esophagogastric anastomosis using a 25 mm circular stapler. The mean operative time was 479 minutes for the first 25 cases and 410 minutes for the second 25 cases; this was a statistically significant difference and reflects the learning process of the procedure. There were no conversions to thoracotomy. The mean estimated blood loss was 146 mL, mean intensive care unit (ICU) stay was 3.4 days, and mean length of stay was 10.9 days. There were no deaths in hospital. Postoperative complications occurred in 14 patients and included 1 anastomotic leak, 1 conduit staple line leak, and 1 chyle leak. The mean and median number of lymph nodes harvested was 20 and 18.5, respectively. The authors noted that, compared with their institutional historical reported outcomes, RAIL resulted in 2-day reduction in length of stay, lower postoperative morbidity, higher number of lymph nodes harvested, and higher R0 resections. They conclude that "despite the steep learning curve associated with these procedures, our initial experience demonstrates acceptable complication rates, hospital stays, and lymph nodes harvested comparable with other techniques."

### ROBOTIC-ASSISTED TRANSHIATAL ESOPHAGECTOMY: A 3-YEAR SINGLE-CENTER EXPERIENCE

*Dunn DH, Johnson EM, Morpew JA, Dilworth HP, Krueger JL, Banerji N. Dis Esophagus 26: 159-166, 2013*

The authors report a series of 40 patients who underwent robotic-assisted transhiatal esophagectomy at a single institution. A total of 38 patients had a diagnosis of cancer and 17 patients underwent neoadjuvant therapy.

Technical details of the operative procedure describe a standard laparoscopic approach for gastric mobilization. Once this is completed, the robot is brought in transabdominally. The authors use the robot through the same laparoscopic ports for mediastinal dissection of the esophagus. Once the esophagus is dissected, the robot is undocked and laparoscopic techniques are used to create a gastric tube. An anastomosis is performed in the left neck with a 25 mm circular stapler. The average operative time was 313 minutes and the average blood loss was 98 mL. The median length of stay was 9 days (range: 6-36 days), with a median ICU stay of 1 day (range: 0-21 days). There was 1 postoperative mortality. The mean number of harvested lymph nodes was 18.5. Anastomotic leaks were noted in 10 patients, none of whom required operative intervention. A total of 5 patients were converted to open transhiatal esophagectomy because of "significant anatomical variation," mostly in obese patients.

In the discussion, the authors express caution regarding patient selection for their approach. Despite limitations, the authors conclude that robotic-assisted transhiatal esophagectomy is a safe and effective procedure for the treatment of esophageal cancer.

### TECHNICAL ASPECTS AND EARLY RESULTS OF ROBOTIC ESOPHAGECTOMY WITH CHEST ANASTOMOSIS

*Cerfolio RJ, Bryant AS, Hawn MT. J Thorac Cardiovasc Surg 145:90-96, 2013*

The authors report their initial experience with robotic Ivor Lewis in 22 patients. The operative technique described uses standard laparoscopic gastric mobilization and creation of the conduit. Once the abdominal portion is completed, the patient is placed in a left lateral decubitus position with the patient tilted slightly forward. A detailed description of robotic port placement is provided. The authors focus on the intrathoracic anastomosis performed. In 6 of the patients (the initial 6), the anastomosis was created by stapling the back wall and hand sewing the anterior wall. In the remaining 16 patients, the anastomosis was created using a 2-layer hand sewn technique, with the authors noting their preference for this technique and describing how robotic assistance provides certain advantages in the creation of such an anastomosis. All patients had a R0 resection and there were no conversions to

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