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Outside the Cage (OTC) Non-Intercostal Robotic-Assisted Esophagectomy

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We describe a case of outside the cage non-intercostal robotic esophagectomy, a feasible approach for minimally invasive esophageal resection with potential benefits of reducing postoperative pain and related complications.

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To improve patients' postoperative course and prevent chronic pain from intercostal nerve instrumentation,[1,2] we used an outside the cage (OTC) nonintercostal robotic-assisted thoracic surgery (RATS) approach for esophageal resection, a surgical approach influenced by that of a recently published series of RATS OTC lung resections.[3]

A 76-year-old man with a body mass index of 32 kg/m^2 and esophageal adenocarcinoma was scheduled for resection. Combined imaging with endobronchial ultrasound, endoscopic ultrasound, and positron emission tomography confirmed the presence of a long Barrett esophagus and a T2 adenocarcinoma (29-37 cm). The patient received a diagnosis of cT2 N0 adenocarcinoma of the esophagus (Siewert I) and was scheduled for minimally invasive esophagectomy without neoadjuvant treatment.

SURGICAL PROCEDURE

Under general anesthesia and with double-lumen intubation, the patient was placed in a supine position. The abdominal approach was performed by standard laparoscopy with 6 incisions. CO_2 insufflation was used throughout the entire case.

The stomach and esophagus were mobilized using the Harmonic scalpel (Ethicon) and protecting the right gastroepiploic artery and vein. A Kocher maneuver was performed. A long and thin stomach conduit was partially fashioned from the pyloric antrum up to 2 cm from the fundus with laparoscopic green load staplers, and an intrapyloric botulinum toxin injection was performed along with a D2 lymph node dissection.

The most medial incision—initially used with a 12-mm trocar as an assistant port in the abdominal portion—proximal to the xiphoid process was enlarged to 4 cm. Cautery and blunt dissection were used to create a subcostal tunnel across the diaphragm and into the chest. A small Alexis-O (Applied Medical) wound retractor was placed to keep the tunnel open and retract the diaphragm. The wound retractor was covered with a plastic adhesive drape, and all other incisions were closed.

The patient was then placed in a left lateral position with his left arm abducted to expose his flank. Four subcostal incisions were made along the costal margin to insert the long bariatric 8-mm robotic ports through the diaphragm under vision (Figure A), as seen in the case Video. The Davinci Xi system (Intuitive) was docked in front of the patient. Two tip-up fenestrated graspers were docked in arms 1 and 4, a robotic Harmonic scalpel was docked in arm 3, and the camera was docked in arm 2. Throughout the case, the most medial incision was used by the assistant to suction as well as retract the lung and the diaphragm.

Using the robotic Harmonic scalpel, the esophagus was mobilized posteriorly and inferiorly from the azygos vein down to the diaphragmatic hiatus. The thoracic duct was identified and clipped between T10 and T12. Using blue robotic SureForm (Intuitive) 60 reloads through robotic arm 3, the proximal esophagus was cut below the azygos vein, while keeping a 2-cm margin from the tumor. The conduit was cut at the end of the gastric tube staple line, the specimen was

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removed, and the end-to-end anastomosis (EEA) stapler was placed through the opening in the conduit.

The 25-mm EEA Orvil (Medtronic) device was inserted through the oral cavity. While pushing slightly against the esophagus, the tip of the Harmonic scalpel was used to create a small opening in the corner of the staple line to allow for passage of the device. The gastric tube was then guided out through the accessory port. The sutures of the EEA OrVil were cut using the Harmonic scalpel, while leaving the device in place. The circular stapler was entered in the chest from the accessory port and placed inside the conduit. Using the fenestrated grasper, the tip of the stapler was guided toward and connected to the anvil (Figure B). The stapler was fired to complete the esophagogastric anastomosis. The proximal stomach was resected using green SureForm robotic 60 reloads, and the specimen was removed from the chest through the accessory port. The remainder of the omentum was sewn around the anastomosis. A 24F Blake (Ethicon) drain was placed in the chest, and the lung was reinflated under direct vision. Then, 2-0 polyglactin 910 (Vicryl, Ethicon) suture was used to close the diaphragm and muscles in all incisions, followed by 3-0 poliglecaprone 25 (Monocryl, Ethicon) suture at the skin.

Esophagogastroduodenoscopy was performed intraoperatively to observe the quality and impermeability of the anastomosis under water, vascularization of the conduit, and opening of the pylorus. The total surgical time was 3 hours and 9 minutes, and there were no intraoperative complications.

OUTCOMES

The patient was extubated in the operating room without any intraoperative complications. Postoperatively, the patient did not report any pain, aside from mild abdominal discomfort. Esophagogastroduodenoscopy was performed on postoperative day 6, as is routine on our service to identify anastomotic leaks. The patient resumed an oral diet and was discharged home on postoperative day 7. No complications or readmissions were noted in the 30-day postoperative period. The final pathology report confirmed the presence of a pT2 N0 adenocarcinoma in the distal esophagus that measured 3.8 cm × 2.5 cm × 0.5 cm and adjacent Barrett esophagus with high-grade intramucosal dysplasia and negative margins for both adenocarcinoma and Barrett esophagus.

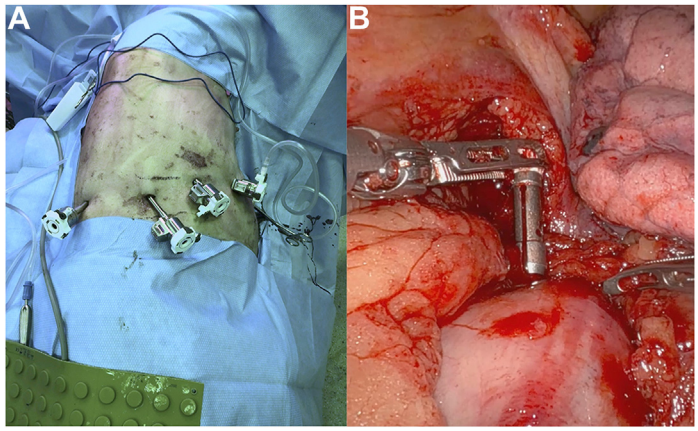

FIGURE (A) Port placement in the chest and (B) anastomosis of the esophagus to the conduit.

COMMENT

The use of OTC RATS esophagectomy is a feasible approach to minimally invasive esophagectomy with potential benefits to patients, including reduced chronic pain and early postoperative pain, with their related complications. Proper placement of the robotic ports is crucial to the success of this approach because placing them too close together could make the anastomotic setup difficult. Keeping the anterior subxiphoid port as a robotic port for CO_2 insufflation in the thoracic portion of the operation—facilitating esophageal and lymph node dissection—and expanding it only to a larger working port for the anastomosis would be a helpful improvement to the approach. Refinements of the technique are ongoing to make the procedure easier and generalizable for patients eligible for RATS.

The Video can be viewed in the online version of this article [https://doi.org/10.1016/j.atssr.2024.07.032] on http://www.annalsthoracicsurgery.org.

Patient written consent for the publication of the study data was waived by the Institutional Review Board of the Centre de Recherche du Centre Hospitalier de l'Université de Montréal because the present surgical approach did not influence the standard of care for the patient.

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DISCLOSURES

The authors have no conflict of interest to disclose.

PATIENT CONSENT

Obtained (verbal).

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