Case Report

Ruijin robotic thoracic surgery: robot-assisted Ivor Lewis esophagectomy

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Abstract: We are going to share the experience of robotic surgery for esophageal carcinoma. A 46-year-old patient who has esophageal squamous cell carcinoma underwent robotic-assisted Ivor-Lewis esophagectomy in our center. The patient was discharged on postoperative day 8 without any perioperative complications. The postoperative pathologic stage was pT1N0M0.

Keywords: Robotic-assisted thoracoscopic surgery; Ivor-Lewis; esophageal carcinoma

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Clinical data

A 51-year-old man was admitted to our hospital with a 1-week history of progressive dysphagia with solid food. He did not complain of retrosternal pain, gastroesophageal reflux or, weight loss. Esophagogastroscopy identified a 3-cm mass in the esophageal lumen approximately 35 cm from the incisors, which was diagnosed as squamous cell carcinoma by endoscopic biopsy. Computed tomography (CT) of the chest and the abdomen revealed a thick wall around the distal thoracic esophagus with no metastases in the liver or lung, and the lymph nodes were negative (*Figure 1*). Barium swallow demonstrated a filling defect in the lumen of the distal third of the esophagus. Physical examination revealed no abnormalities. His cardiopulmonary function and laboratory tests were normal. He had no medical history.

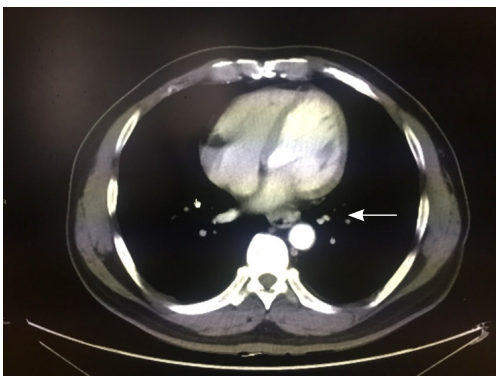

Figure 1 A mass located in the distal third of the esophagus and the mediastinal lymph nodes were negative.

Operation steps

Anesthesia and body position

Abdominal phase

After the general anesthesia and double-lumen endotracheal intubation, the patient was placed in a supine position (*Figure 2*).

Thoracic phase

Once the abdominal phase was completed, the patient was positioned in the left lateral decubitus position, and tilted 45° towards the prone position under double-lumen endotracheal intubation (*Figure 3*).

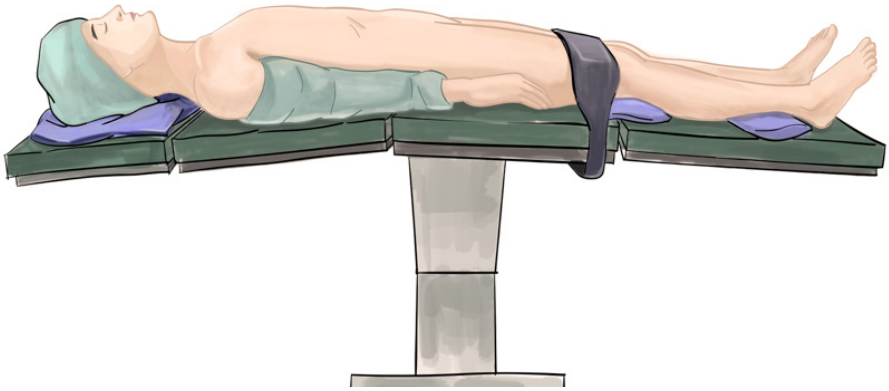

Figure 2 Supine position.

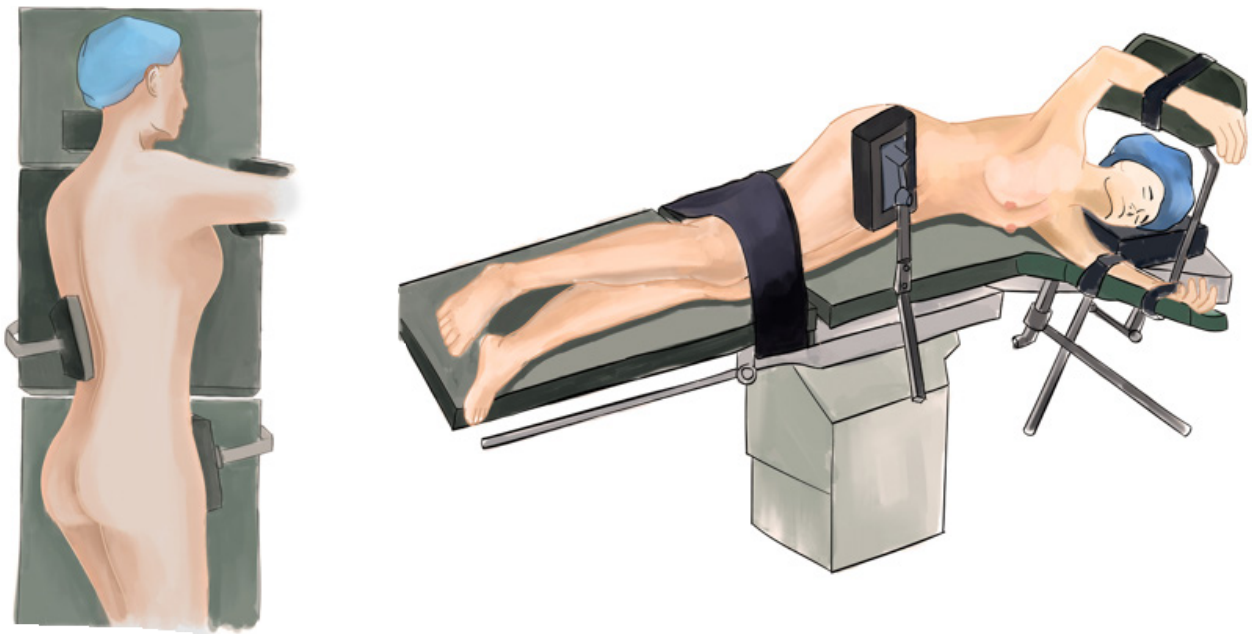

Figure 3 Left lateral decubitus and jackknife positon.

Ports

Abdominal phase

Abdominal ports: the five-port method was used. The subumbilical port was used for observation (12-mm trocar), the #1 robotic arm was placed on the left anterior axillary line under the costal arch (8-mm trocar), the #2 robotic arm was placed on the right anterior axillary line at the umbilical level (8-mm trocar), and the manual operative port was placed on the right mid clavicular line at 3 cm under the costal arch (12-mm trocar). An auxiliary port was placed on the left anterior axillary line at the umbilical level (8-mm trocar) (*Figure 4*).

Thoracic phase

Thoracic ports: the five-port method was used. The observation port was placed on the right anterior axillary line at the 5th intercostal space (12-mm trocar), the #1 robotic arm was placed on right posterior axillary line at the 3th intercostal level (8-mm trocar), the #2 robotic arm was placed on the right posterior axillary line at 8th intercostal space (8-mm trocar), and the manual operative ports were placed on the right posterior axillary line at the 10th (5-mm trocar), and an auxiliary port were placed on the right

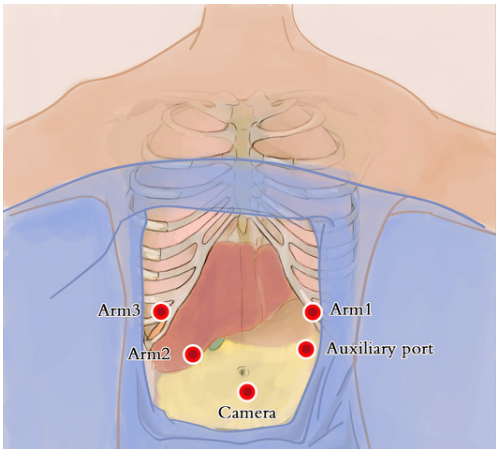

Figure 4 Ports for abdominal phase.

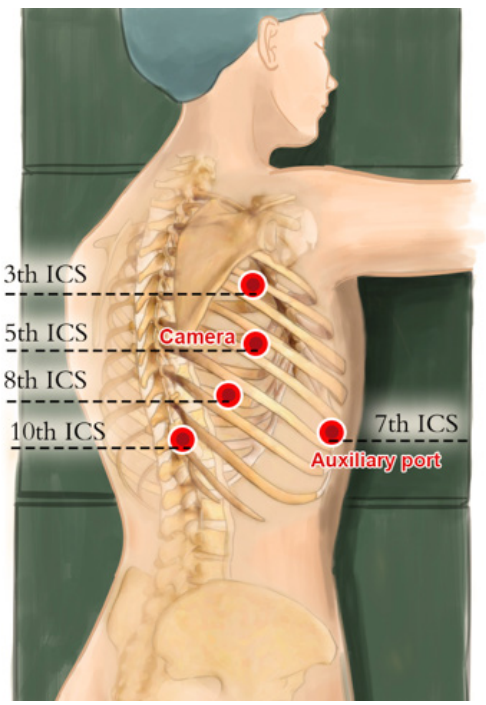

Figure 5 Ports for thoracic phase (3th, 5th, 7th, 8th, 10th ICS). ICS, ICS, intercostal space.

anterior axillary line at 7th intercostal spaces (12-mm trocar) (*Figure 5*).

Installation of the surgical arms

Abdominal phase

The #2 arm was connected to a bipolar cautery forceps, and the #1 arm was connected to an ultrasound knife.

Thoracic phase

The robot was positioned on the dorsal cranial side, with two assistants on the anterior side. The #2 arm was connected to a bipolar cautery forceps, and the #1 arm was connected to a unipolar cautery hook.

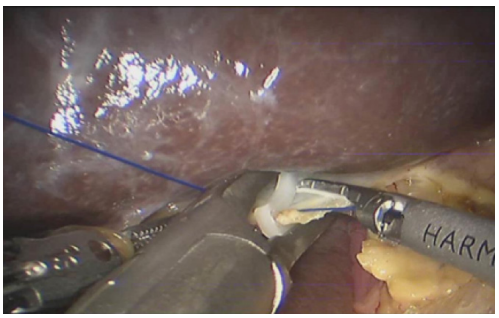

Figure 6 The liver was suspended with a purse string suture.

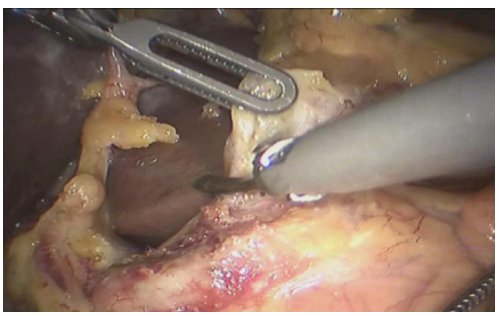

Figure 7 A radical en bloc lymphadenectomy was performed along the common hepatic artery, celiac trunk, and origin of the splenic artery.

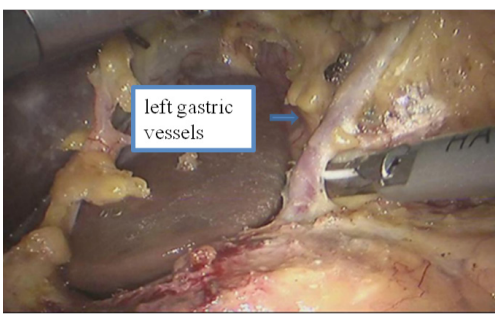

Figure 8 The left gastric vessels were dissected and interrupted, and the surrounding lymph nodes were removed.

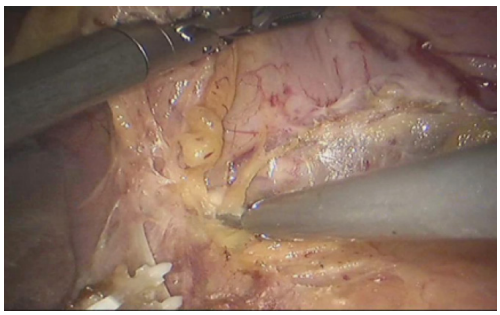

Figure 9 The adhesion between the stomach wall and pancreas was dissected.

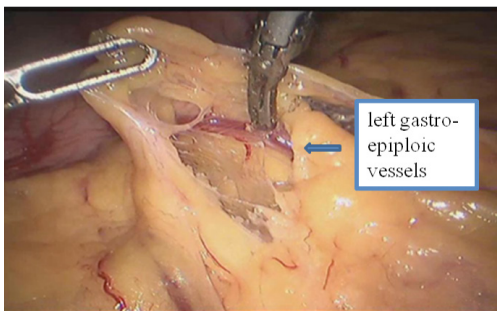

Figure 10 The greater curvature of the stomach was mobilized by dissecting the gastrocolic ligament and left gastroepiploic vessels.

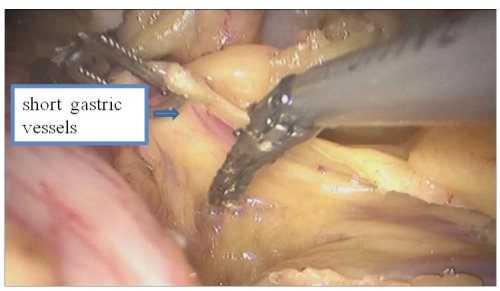

Figure 11 The short gastric vessels were cut.

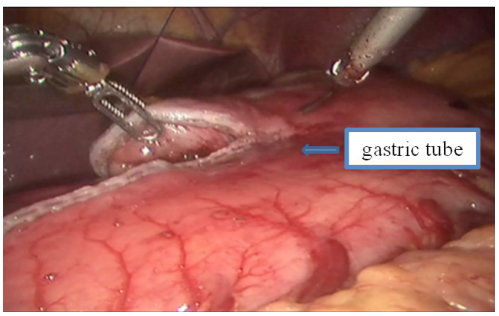

Figure 12 When the dissection was completed, a gastric tube was tailored using a stapling device. The transection started on the lesser curve and continued to the gastric fundus.

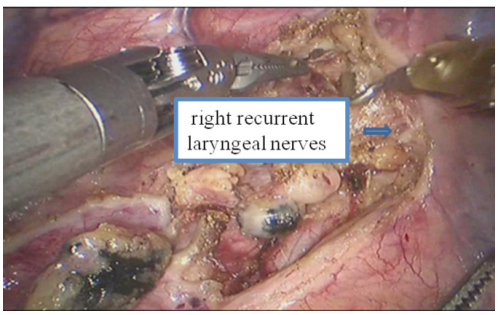

Figure 13 The lymph nodes with their associated fat pads around the right recurrent laryngeal nerves were dissected completely.

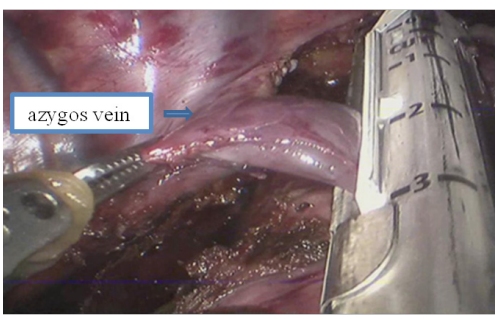

Figure 14 The azygos vein was dissected and divided using a stapling device.

Surgical procedure

Abdominal phase

See *Figures 6-12*.

Thoracic phase

See *Figures 13-22*.

Postoperative condition

Postoperative treatments included anti-inflammatory medication, enteral nutrition and phlegm-resolving treatment. The chest cavity drainage tube was withdrawn after 2 days and the liquid diet was started on postoperative day 6. The patient was discharged on postoperative day 8

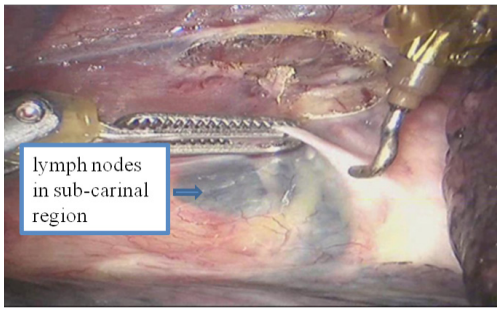

Figure 15 Complete lymph node dissection was performed in the sub-carinal region and right and left bronchus.

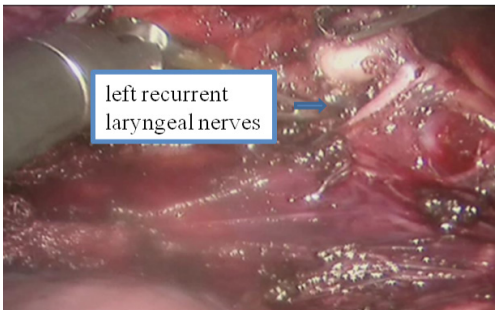

Figure 18 The lymph nodes around the left recurrent laryngeal nerves were dissected completely.

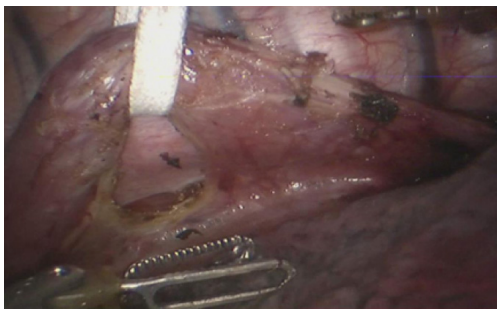

Figure 16 The esophagus was suspended with gauze.

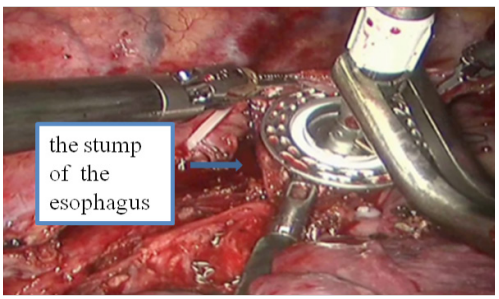

Figure 19 Anvil placement. Atraumatic robot graspers were used to pull the anvil into the cut end of the esophagus.

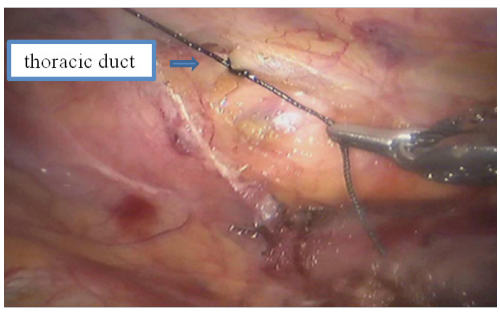

Figure 17 The thoracic duct was ligated.

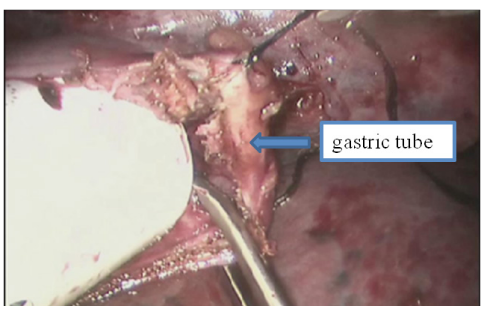

Figure 20 The end of the stapler was placed into the gastric tube.

and tolerated a semi-liquid diet. No complications were observed during hospitalization. Pathologic diagnosis was squamous cell carcinoma infiltrating into the submucosa of the esophagus. All lymph nodes were negative. Postoperative pathologic stage was pT1N0M0 (IA squamous cell carcinoma).

Discussion

Surgery is currently the main treatment for esophageal cancer (1). Esophagectomy is technically challenging and is associated with high morbidity and mortality rates. Efforts to reduce these rates have spurred the adoption of minimally invasive techniques (2). But the conventional video-assisted surgery has some limitations such as the two-dimensional view or movement restrictions which could make a complex procedure such as esophagectomy difficult. Robotic systems have been designed to overcome some of these disadvantages which could provide an amplified three-dimensional view and a greater freedom of movement (3).

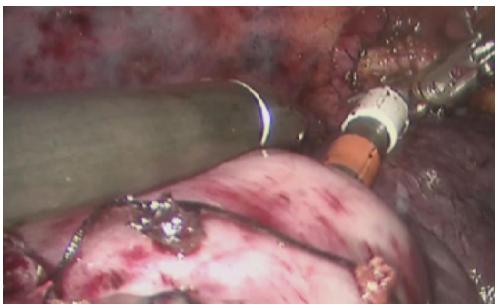

Figure 21 End-to-end anastomosis was created with circular stapler.

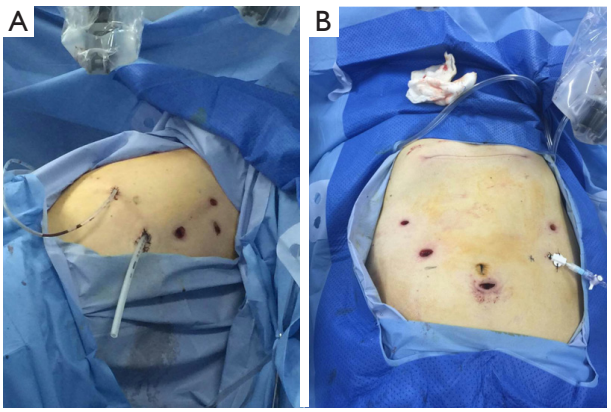

Figure 22 The placement of drainage. (A) Thoracic cavity; (B) abdominal cavity.

Most of the published reports on robotic esophagectomy describe two types of anastomosis including cervical or intrathoracic anastomosis that are created by using the suturing technique (4,5). Here we report the robot-assisted Ivor Lewis esophagectomy with intrathoracic stapled anastomosis. Our initial results suggest that the robotic-assisted surgical technique is safe and satisfies the oncological principles. However, the potential of the da Vinci system remains to be proven in future clinical trials.

Acknowledgements

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Footnote

Conflicts of Interest: The authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/amj.2017.01.14). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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