Minimally invasive Ivor Lewis esophagectomy in a patient with situs inversus totalis through a total of five ports

Situs inversus totalis hastasında toplam beş port ile minimal invaziv Ivor Lewis özofajektomisi

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ABSTRACT

Situs inversus totalis is inverse placement of intra-thoracic and abdominal organs identical with a mirror image. Herein, we present a rare case of situs inversus totalis and gastroesophageal junction carcinoma treated with minimally invasive Ivor Lewis esophagectomy. A 73-year-old male patient presented with dysphagia and a diagnosis of adenocarcinoma was made. He underwent three-port laparoscopic gastric conduit preparation without using a liver retractor. Esophageal mobilization in the chest was completed with biportal video-assisted thoracoscopic surgery technique and a completely side-to-side stapled anastomosis. The patient is still alive without recurrence four years after surgery. Minimally invasive Ivor Lewis esophagectomy can be performed in these cases; however, a careful planning and rethinking of the anatomy for correct intraoperative orientation are needed. Similar surgical and oncological outcomes are expected in this patient population.

Keywords: Esophagectomy, minimally invasive, situs inversus totalis.

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GEJ (Figure 1a) and positron emission tomography (PET)-CT showed an increase uptake (standard uptake value 8) only at the GEJ. Laparoscopic exploration was planned before the major surgery, and serosa was opened and sample was taken directly from the tumor. Biopsy was diagnosed as adenocarcinoma of GEJ. Three weeks later, three-port laparoscopy was performed without using

Table 1. Review of literature data of patients with situs inversus totalis who underwent esophagectomy for esophageal cancer

| Authors            | Age of the patient (year) | Abdominal approach | Thoracic approach | Lymph nodes dissected (n) | Postoperative outcome | Survival        |
|--------------------|---------------------------|--------------------|-------------------|---------------------------|-----------------------|-----------------|
| Singh et al.[2]    | 65                        | 5 port laparoscopy | Access and 3 port VATS | 20                         | Uneventful            | Not described   |
| Mimae et al.[3]    | 57                        | Laparotomy         | Thoracotomy        | Not described             | Uneventful            | 22 months       |
| Chinusamy et al.[4] | 62                        | Laparoscopy        | Prone VATS         | Not described             | Uneventful            | 18 months       |
| Nakano et al.[5]   | 82 and 66                 | Hand-assisted laparoscopy | Prone 5 port VATS | Case 1: 49 Case 2: Not described | Uneventful            | Not described   |
| Ujice et al.[6]    | 63                        | Hand-assisted laparoscopy | 6 port VATS       | 41                         | Uneventful            | 5 years         |
| Yagi et al.[7]     | 73                        | Hand-assisted laparoscopy | Access and 5 port VATS-conversion to thoracotomy | 19                         | Uneventful            | 12 months       |
| Yoshida et al.[8]  | 57                        | Hand-assisted laparoscopy | Access and 5 port VATS | Not described             | Died of liver and lung metastasis | 3 months       |
| Peel et al.[9]     | 67                        | 5 port laparoscopy | VATS-port placement not described | 43                         | Not described            | Not described   |
| Current case       | 73                        | 3 port laparoscopy | Biportal VATS      | 24                         | Uneventful            | 4 years         |

VATS: Video-assisted thoracoscopic surgery.
a liver retractor (Figure 1b). Gastrohepatic ligament was divided (Figure 1c). Left gastric lymph nodes were dissected and vessels were divided with an endoscopic stapler. Hiatus was dissected 5 cm into the chest. The greater curvature was freed preserving the gastroepiploic artery (Figure 1d). A 4 to 5-cm gastric tube was formed and laparoscopy was completed.

The patient was placed in the right lateral decubitus position. Biportal approach was adopted, first on the fifth intercostal space anterior axillary line and second on the eighth intercostal space posterior axillary line (Figure 1b). The pleura was opened up to azygos vein over the pericardium, intermediate bronchus, and the carina anteriorly and posteriorly (Figure 2e). Azygos vein was divided with a vascular stapler. Esophagus was encircled with a Penrose drain. After the esophagus was completely mobilized, a completely stapled, double-barrel, side-to-side anastomosis was performed using endoscopic linear staplers (Figure 1f). Total surgical time and bleeding were 180 min and 70 mL, respectively. Postoperative course was uneventful and the patient was discharged on Day 7. The pathological examination revealed a T4aN0, well-differentiated adenocarcinoma with clear margins and 24 non-metastatic lymph nodes. He had a hiatal intra-thoracic herniation of colon and omentum three months postoperatively that was managed through a mini-laparotomy. The patient is still alive and well without recurrence four years after surgery. A written informed consent was obtained from the patient.

**DISCUSSION**

Situs inversus totalis is a rare anomaly in which all the intrathoracic and abdominal organs are transposed. In the literature, there are nine patients with SIT of which eight are case reports who underwent surgery for esophageal pathology and eight were performed minimally invasively and one in an open fashion (Table 1). Intrathoracic anastomosis was used for three cases, two with circular stapler and the other one was a semi-stapled, side-to-side anastomosis. Minimally invasive esophagectomy is a complex procedure and, in case of a SIT, this is more challenging, as all the organs are located in different positions. Various types of esophagectomy were applied for patients with SIT cases in the literature, such as prone positioning and hand-assisted mobilization. In our case, we used three-port laparoscopy and biportal video-assisted thoracoscopic surgery, which is probably one of the least invasive approaches.

The most challenging surgical situation is the different position of the anatomical landmarks during the operation. The surgeon's high concentration and experience in normal anatomy are major factors in making the surgery safer. Careful and safe recognition of mirror imaged anatomy and preoperative mind setting is important to plan the incisions and the approach. Preoperative advanced imaging is useful for preparation of the case.

In conclusion, our case demonstrates that minimally invasive Ivor Lewis esophagectomy can be safely performed in a patient with situs inversus totalis and offers an equivalent surgical outcome and survival. Preoperative planning and mind-setting, as well as stepwise intraoperative approach, are important to perform the surgery uneventfully.

**Declaration of conflicting interests**

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