**TECHNICAL NOTE**

**Exclusive right thoracic approach for esophagus surgery**

Chuan Li, Nan Ge, Yi Shen & Wenjie Jiao

Thoracic Surgery Department, Affiliation Hospital of Qingdao University, Qingdao, China

**Keywords**

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**Correspondence**

Wenjie Jiao, Thoracic Surgery Department, Affiliation Hospital of Qingdao University, 16 Jiangsu Road, Qingdao City, Shandong Province 266003, China.

Email: jiaowenjie@163.com

Tel: +86 186 6180 6899; +86 532 8291 2305

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**Abstract**

An exclusive right thoracic approach for esophagus surgery is rarely used, with few reports of its use in China. We retrospectively reviewed the data of 21 esophageal cancer patients from January 2010 to January 2015. Their age ranged from 74–83 years (average 76.6). All of the patients had lower pulmonary function. After multidisciplinary team discussion, sufficient preoperative preparation, and assessment of cardiopulmonary reserve, an exclusive right thoracic approach for esophageal cancer resection was performed. The esophagus was dissected in the right chest and the stomach was separated through the esophageal hiatus. The tube stomach and the esophageal remnant were Anastomosed with a stapling device at the top of the right side of the thoracic cavity. All operations were successfully completed; however, there were two early postoperative deaths resulting from pulmonary infection and pulmonary artery embolism. The one-year postoperative survival rate was 66.7%. An exclusive right thoracic approach could be selectively used for elderly patients with poor pulmonary function.

**Introduction**

Belsey surgery was first reported in 1974. Belsey operated on 140 cases of esophageal cancer using an exclusive right thoracic approach. Since then no further cases have been reported in Western countries; however, a number of reports have documented the use of an exclusive right thoracic approach for esophagus surgery in China in recent years. When only a right thoracic approach is used, stomach separation and abdominal lymph node resection is difficult, thus an additional abdominal incision is usually necessary. More surgeons prefer to conduct esophageal cancer resection using a right thoracic approach combined with an abdominal incision or with abdominal and neck incisions. Some Chinese surgeons also use a left chest approach for cancer of the esophagus in lower segments. From January 2010 to January 2015 we used the Belsey technique in 21 patients with esophageus cancer. Herein we report our experience.

**Methods**

**General materials**

Twenty-one patients (18 men, 3 women) underwent esophageal cancer resection using an exclusive right thoracic approach from January 2010 to January 2015. Their average age was 76.6 years (range 74–83). Two of the patients were aged over 80 (80 and 83 years). All of the patients had a middle segment esophagus tumor and underwent gastroscopy, upper gastrointestinal barium, chest and upper abdominal computed tomography scans, brain magnetic resonance imaging, whole body bone nuclear scan, neck ultrasonography, electrocardiography, electrogastragram, and a pulmonary function examination before surgery. Multidisciplinary team discussion was conducted to determine treatment strategy. After providing consent, all patients underwent surgery with distinct indications and without contraindications. Pulmonary function data are shown in Table 1. All resection specimens were examined for final diagnoses of pathological tumor node metastasis stage: I (4 patients), II (9 patients), and III (8 patients). All of the carcinomas were squamous carcinoma.

**Surgery methods**

Partial resection of the esophagus and stomach-esophagus intrathoracic anastomosis was performed using an exclusive right thoracic approach, entering the thoracic cavity through a fifth intercostal posterolateral incision. First, we dissociated...
the esophagus in the right chest and dissected the paraesophageal, subcarinal, and mediastinal lymph nodes, including the recurrent laryngeal nerve lymph nodes. We then exposed the esophageal hiatus and exaggerated it. We separated the stomach through the esophageal hiatus. The stomach was mobilized, pulled up into the thoracic cavity though the hiatus, and made into a tube stomach. Finally, we moved the chest segment esophagus out of the thoracic cavity and anastomosed the tube stomach and the esophageal remnant with a stapling device in the right chest top.

### Results

All esophageal cancer patients underwent exclusive right thoracic incision surgery. All surgeries were successfully completed as proposed, without the need for exploratory thoracotomy. Surgical duration was $251.01 \pm 44.39$ minutes, operative blood loss was $190.69 \pm 54.11$ mL, and $10.66 \pm 4.61$ lymph nodes were cleared, including $1.90 \pm 0.51$ para left gastric artery lymph nodes. No postoperative anastomosis fistula developed. There were two early postoperative deaths, resulting from pulmonary infection and pulmonary embolism. The patients were followed-up postoperatively for one year. The one-year survival rate was $66.7\%$ (14/21). Death was caused by tumor recurrence, metastasis, cardiocerebral vascular accidents, and lung infection.

### Discussion

There are several approaches for esophageal surgery, including left and right thoracic approaches. The left thoracic approach usually includes a left posterolateral thoracic, left posterolateral thoracic associated with left cervical, or left thoracoabdominal approach. The right-thoracic approach usually includes right posterolateral thoracic, right posterolateral thoracic associated with abdominal (Ivor Lewis surgery), or right posterolateral thoracic associated with abdominal and cervical approach (McKeown surgery). No thoracotomy approaches are used in esophageal endarterectomy. At present, the Ivor Lewis and McKeown techniques are recommended for esophageal cancer surgical incision. Each of these techniques has the advantage of providing sufficient exposure to the esophagus; distinct exposure of the membranous trachea, carina, recurrent laryngeal nerve on both sides, and thoracic duct; and the convenience of left gastric artery, celiac artery, recurrent laryngeal nerve, and mediastinal lymph node clearance, allowing subtotal esophagectomy and two or three field lymph node dissection. Ivor Lewis and McKeown techniques are the two main surgeries performed in Western countries. For thoracic esophageal cancer, a left thoracic incision can be cautiously used if preoperative inspection shows no evidence of mediastinal lymph node metastasis. The left thoracic approach also has some merit, as the middle and lower esophagus can easily be anastomized, and it is easier to free the stomach and clear the left gastric artery lymph nodes by cutting the diaphragm esophageal hiatus. Esophagectomy through a left-sided approach is the predominant approach used in some Chinese hospitals, particularly for patients with esophageal tumors involving the thoracic aorta, as a left thoracic incision provides higher safety.

Minimally invasive esophagectomy has been reported to be safe and comparable to an open approach in terms of postoperative recovery and cancer survival. An exclusive right thoracic approach for esophageal surgery involves less surgical trauma. On the other hand, it is difficult to fully expose the left gastric artery lymph nodes and the splenogastric ligament using an exclusive right thoracic approach and this approach is not routinely recommended for esophageal surgery. Several domestic medical institutions have reported their limited experience of esophageal surgery using an exclusive right thoracic approach. Belsey surgery is only performed in elderly patients with poor pulmonary function, not as a routine operation for esophageal cancer. We performed esophageal operations using an exclusive right thoracic approach in our study sample because the patients were elderly with low pulmonary function. Mu et al. also concluded that an exclusive right thoracic approach (Belsey surgery) is not routine for cancer of the mid-upper thorax of the esophagus, but can be selectively used as palliative esophagectomy for esophageal cancer patients with poor pulmonary function. Our surgery procedure is to partially resect the esophagus, free the stomach by diaphragm esophageal hiatus, and complete esophago-gastric anastomosis within the right thoracic cavity.

According to documented reports and our experiences, we believe that an exclusive right thoracic approach for esophagectomy has distinct advantages and disadvantages. Less surgical trauma occurs because of the use of only one incision and the shorter operation duration. However, it is more difficult to expose the abdominal lymph nodes and the most difficult part of the procedure is to cut the short gastric arteries. This approach is not recommended for overweight patients and those with a history of upper abdomen surgery. During this procedure, we use a supersonic knife to free the gastrohepatic and splenogastric ligaments. A supersonic knife is more suitable in a narrow surgery field.

### Table 1: Pulmonary function in patient sample

| PaO₂ (mmHg) | MMV (%) | FEV₁ (%) |
|---|---|---|
| 70.06 ± 8.95 | 51.13 ± 9.37 | 56.69 ± 10.04 |

FEV₁, forced expiratory volume in one second; MMV, maximum minute ventilation; PaO₂, partial pressure of oxygen dissolved in arterial blood.

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surgeries in our sample were completed as expected without serious complication or perioperative death and all of the patients recovered successfully. Thus, our short-term results are satisfying and encouraging. The choice of esophageal surgical approach is based on the site of the lesion; lymph node metastasis; the general condition of the patient, including their cardiopulmonary function; and the preference of the surgeon. Based on our experiences, we believe that an exclusive right thoracic approach could be selectively used for elderly patients with poor pulmonary function.

Disclosure
No authors report any conflict of interest.

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