

# Experience with the surgical treatment of patients with both esophageal carcinoma and bullous emphysema

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**Abstract Objective:** We aimed to investigate the security and feasibility of the simultaneous surgery for patients with both esophageal carcinoma and bullous emphysema. **Methods:** We described simultaneous surgery performed on 49 cases with both esophageal carcinoma and bullous emphysema, accounting for 2.5% of all esophagectomy patients from January 2000 to January 2003. Radical resection of upper and mid-thoracic esophageal cancer was performed in 31 cases, including three approaches from the right chest, left neck and midsection. Thirty-six patients were underwent cervical anastomosis and 13 cases were operated by intrathoracic anastomosis. **Results:** No perioperative period death occurred. And postoperative complications were as follows: cervical anastomotic leakage in 9 cases, lung infection in 11 cases, pulmonary air leak in 13 cases (2 cases lasted for 4 weeks), recurrent laryngeal nerve damage in 4 cases, supraventricular tachycardia in 4 cases. Patients all recovered and left the hospital with average hospitalization time of 17.5 days. **Conclusion:** Patients with both esophageal carcinoma and bullous can perform the esophageal carcinoma resection and lung volume reduction surgery (LVRS) simultaneously. It will not increase the mortality rate and show the feasibility and safety in patients.

**Key words** esophageal carcinoma; bullous emphysema; simultaneous surgery

Patients with esophageal carcinoma are mostly elderly people, some of them are accompanied by chronic obstructive lung disease, including bullous emphysema. There are high operative risk for patients with coexisting bullous emphysema during esophageal resection [1]. Lung volume reduction surgery (LVRS) has been shown to improve respiratory function, dyspnea symptoms, and quality of life for up to 3 to 5 years in selected patients with end-stage emphysema [2]. In our study, we described simultaneous surgery performed on 49 cases with both esophageal carcinoma and bullous emphysema, accounting for 2.5% of all esophagectomy patients.

## Materials and methods

### Subjects

A total of 49 esophageal patients were enrolled in the study, including 38 males and 11 females with a median age of 64.2 years (52–75 years). All of them had different degrees of dysphagia, chronic bronchitis and 3–16 years history of emphysema. Barium swallow and gastroscopy confirmed upper esophageal carcinoma in 11 cases, mid-

dle esophageal carcinoma in 29 cases, lower esophageal carcinoma in 9 cases. The pathological examination revealed squamous cell carcinoma. All patients had the history of chronic bronchitis and emphysema for 3–16 years. CT and X-ray showed 31 cases of bullous emphysema located mainly in the right upper lobe, while 18 cases located mainly in the left upper lobe. Pulmonary function tests were performed in all patients. Maximum voluntary ventilation (MVV) as percentage of predicted: 65%–60% in 8 cases, 60%–55% in 32 cases, < 55% in 9 cases. FEV<sub>1</sub> (forced expiratory volume in 1 s) as percentage of predicted: 60%–55% in 24 cases, 55%–50% in 19 cases, < 50% in 6 cases. FEV<sub>1</sub>: 1.5–1.2 L in 28 cases, 1.2–1.0 L in 15 cases, < 1.0 L in 6 cases. SaO<sub>2</sub>: 95%–90% in 34 cases, 90%–85% in 15 cases. Arterial blood gas (ABG) value: 90 mmHg > PaO<sub>2</sub> > 85 mmHg in 31 cases, 85 mmHg > PaO<sub>2</sub> > 80 mmHg in 18 cases; or 30 mmHg < PaCO<sub>2</sub> < 40 mmHg in 32 cases, 40 mmHg < PaCO<sub>2</sub> < 45 mmHg in 17 cases.

### Surgical treatment

Preoperative care included: routine physical therapy, application of antibiotics to control lung inflammation, intermittent delivery low-flow oxygen and abdominal breathing exercises. All patients were treated with epidu-

ral anesthesia and double-lumen endotracheal-tube anesthesia, radial artery pressures were monitored. Radical resection of upper and mid-thoracic esophageal cancer was performed in 31 cases, including three approaches from the right chest, left neck and midsection. Thirty-six patients were underwent cervical anastomosis and 13 cases were operated by intrathoracic anastomosis. According to the preoperative X-ray, CT and intraoperative findings, the extent of pulmonary resection was determined. Among all patients, 5 cases were treated with upper lobe resection, 35 cases with pulmonary wedge resection, 9 cases with single or multiple segmental resection of lung (accounting for 1/3–1/2 of the whole upper lung lobe). An Ethicon TLC 75 mm staple gun (Johnson & Johnson Company, USA) was used to cut the lesion of lung segment. The bronchial stump was closed with 3–0 prolene interrupted sutures and biological protein glue sealing was insufflated to reduce air leak. Two drainage tubes were placed for closed drainage system with no vacuum aspiration. Patients were treated with liquid diet after removing the gastrointestinal decompression pipe tube. The drainage tubes were removed 4–7 days after surgery according to the X-ray and situation of drainage. All patients received postoperative thoracic epidural analgesia for pain control, and the epidural catheters were removed 3–5 days after operation. Postoperative respiratory management was provided. Patients with difficulty breathing, failure of breathing with oxygen mask, much sputum and disability to cough up phlegm were treated with tracheal intubation and mechanical ventilation.

## Results

All patients (45 cases) were extubated in the operating room or shortly after arriving in the postanesthesia recovery area. Among them, 4 patients were required mechanical ventilation in ICU and achieved successful extubation on the following morning. There was no hospital mortality or reoperation. And postoperative complications were as follows: cervical anastomotic leakage in 9 cases, lung infection in 11 cases, pulmonary air leak in 13 cases (2 cases lasted for 4 weeks), recurrent laryngeal nerve damage in 4 cases, supraventricular tachycardia in 4 cases. Patients all recovered and left the hospital with average hospitalization time of 17.5 days.

## Discussion

Esophageal carcinoma is one of the most common carcinomas and the leading causes of death in the developing world, including China. And radical resection is the best treatment for those patients, early esophageal carcinoma treatment and surgical treatment for trends is the operation indications to expand gradually [3]. But after esoph-

agectomy, chest stomach, respiratory infections, pain stimulation respiratory function decline, tidal volume and alveolar effective ventilation to reduce and cause respiratory function failure, is often lethal complications [4]. If patients were found bullous emphysema by preoperative evaluation and pulmonary function testing showed ventilation function reducing, they were most likely to be considered contraindications for surgery. Literature reported that [5] FEV<sub>1</sub> as percentage of predicted < 50% and MVV as percentage of predicted < 50% were contraindications for surgery; FEV<sub>1</sub> < 1.5 L, FEV<sub>1</sub> as percentage of predicted < 60%, the operation should be carefully considered. The patients enrolled in our study have chronic bronchitis, 3–16 years history of emphysema, and a severe ventilation dysfunction, for such patients, radiotherapy is the first choice instead of surgery.

In recent years, with the development of intravenous anesthesia combined with epidural anesthesia and improvement of perioperative management, the patients in our study were treated with radical resection of esophageal carcinoma and LVRS, showing good operational results. Our experience are as follows: Sufficient preoperative preparation. Craig reported that, at the first day after surgery, the vital capacity and MVV of patients with esophageal carcinoma decreased 30% and 27.5%, respectively. Dysphagia and odynophagia are the most common symptoms of esophageal cancer. As a result of reduced appetite, most of the people diagnosed with esophageal cancer will occurred substantial weight loss, poor nutrition and decreased body resistance. At the same time, hypoalbuminemia in patients commonly induced pulmonary interstitial edema and pulmonary shunt increasing, combining with chronic bronchitis, emphysema and pulmonary function decline will generate hypoxemia. Therefore, it is important to select patients, evaluate pulmonary function and treat preoperative patients reasonably. Other therapies included quitting smoking, respiratory physical therapy, atomization inhalation, improving respiratory function, preoperative antibiotics application, plasma transfusion and albumin treatment [6]. A total of 49 patients with both esophageal carcinoma and bullous emphysema underwent surgery from January 2000 to January 2013 and achieved good results. The theoretical basis of LVRS include an improvement in elastic recoil of the lung; reduced airway resistance; an improvement in diaphragmatic function, chest wall mechanics, and respiratory muscle efficiency; and an overall reduction in ventilation/perfusion mismatch and an increase in FEV<sub>1</sub> [7–8]. We tried to simplify the operation process and shorten the operation time. If patients' tumor can be surgically removed, and abdominal cavity and esophageal stomach replacements were normally done, then esophageal tumor were resected and lymph nodes were cleaning. We should note some points: making the gastric body into tu-

bular structure and fixation in esophageal bed; reducing the traction and contusion of lung and trachea; protecting the recurrent laryngeal nerve<sup>[9]</sup>. The LVRS can perform with the cervical esophagogastrostomy simultaneously. Based on preoperative chest X-ray and CT scans, wedge resection or multiple resection were performed on patients and 20%–30% upper lobes were cut. Four patients with congenital pulmonary hypoplasia and cystic fibrosis of upper right lung were underwent lobectomy. In the wedge resection or segmental resection, an Ethicon TLC 75 mm staple gun (Johnson & Johnson Company, USA) was used to cut the lesion of lung segment. The bronchial stump was closed with 3–0 prolene interrupted sutures and biological protein glue sealing was insufflated to reduce air leak. Two drainage tubes were placed for closed drainage system with no vacuum aspiration. Of all patients, 4 cases with tracheal intubation should move to an ICU with a higher level of care, and the rest of the patients remained in the operating room until they gained their consciousness. The doctors should pay attention to the management of drainage tubes: a small amount of air leakage can not be processing; making sure drainage tubes unobstructed and negative pressure wave with breathing. If patients with more air leak or subcutaneous emphysema and X-ray showed localized pneumothorax could consider to place a drainage tube, and patients with mediastinal emphysema required mediastinal incision and drainage. In our study, the drainage tubes in 38 cases were removed within one week after surgery, 9 cases were removed in the second week, 2 cases were removed in the fourth week because of continued leak. Eight patients with complication respiratory insufficiency were treated with tracheostomy and mechanical ventilation. All of the patients underwent rehabilitation due to timely treatment and no deaths occurred. On the other hand, we also emphasize postoperative thoracic epidural analgesia, encourage the patient to cough, effective atomization inhalation and intensive nursing, good nutrition support is also very important<sup>[10]</sup>.

In conclusion, patients with both esophageal carcinoma and bullous can perform the esophageal carcinoma resection in one stage and LVRS simultaneously. It will not increase the mortality rate and show the feasibility and safety in patients, but the roles of enhancing lung function and the quality of life still need further research.

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