Transthoracic Esophagectomy Using Endobronchial Blocker After Previous Pneumonectomy

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Esophagectomy after pneumonectomy is very rare. We present a case of esophagectomy for esophageal cancer after left pneumonectomy. By application of an endobronchial blocker, satisfactory results were achieved and the disadvantages of extracorporeal membrane oxygenation, cardiopulmonary bypass, and other ventilation methods were avoided.

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Surgical treatments for synchronous and metachronous primary esophageal cancer and lung cancer have been sporadically reported [1–4]. Esophagectomy after pneumonectomy is even rarer. We report a case of esophagectomy through right thoracotomy and laparotomy with the help of an endobronchial blocker, 18 months after left pneumonectomy for squamous cell lung cancer. Similar methods have not been reported in the literature.

Technique

This study was approved by the Ethics Committee of Shanghai Pulmonary Hospital. A 62-year-old man was admitted because of progressive dysphagia for 1 month. The patient had a history of lung cancer and accepted left pneumonectomy 18 months before admission. Postoperative pathology diagnosis was squamous cell accompanied with large-cell lung cancer (pT3N0M0, stage IIb). The patient had a history of lung cancer and accepted left pneumonectomy 18 months before admission. Postoperative pathology diagnosis was squamous cell accompanied with large-cell lung cancer (pT3N0M0, stage IIb).

After left pneumonectomy, the patient was given four sessions of chemotherapy. Barium swallow and gastroscopy demonstrated a cauliflower-like lesion in the esophageal lumen 34 cm from the incisors. Pathology confirmed the diagnosis of squamous cell esophageal cancer. The forced expiratory volume in 1 second (FEV₁) was 2.07 L, 61.2% of predicted value. After exclusion of distant metastasis, the patient accepted surgical treatment.

A bi-incisional esophagectomy was performed under general anesthesia and endotracheal intubation without cardiopulmonary bypass (CPB). A left lateral position was initially assumed. Through a right posterolateral thoracotomy at the sixth costal bed, the right hemithorax was explored. An endobronchial blocker tube (Tappa Medical Technology, Hangzhou, China) was introduced into the right upper bronchus through the endotracheal tube. After blocking the right intermediate bronchus with the endobronchial blocker, the right middle and lower lobes were deflated, facilitating mobilization of the inferior part of the esophagus. The cancer was located 3 cm below the carina, measuring 4 cm to 5 cm in diameter, infiltrating the whole thickness of the musculature. Then the endobronchial blocker was transferred into the right upper bronchus. After the right upper lobe was deflated, the superior portion of the esophagus was mobilized (Fig 1). The esophagus was severed 8 cm from the upper margin of the cancer. After lymph node dissection, the chest was temporarily closed.

Then the patient was transferred to a supine position. The second stage was performed through an upper median laparotomy incision. The stomach was divided routinely, and then shaped into a gastric conduit by firing three 8-cm GIA staplers (United States Surgical Corp, Norwalk, CT). Thus, the esophagus, together with the cephalic part of the lesser curvature of the stomach, was excised. The stapled line was reinforced with interrupted 2-0 silk sutures.

Because the mediastinum was twisted and shifted to the left hemithorax, and the gastric conduit was not long enough to be drawn to the neck, the decision was made to perform the esophagogastric anastomosis in the right hemithorax. The cephalic part of the gastric conduit was introduced to the right hemithorax through the hiatus. The abdomen was then closed.

The patient was again placed in a left lateral position, and the right thoracic incision was reopened. After the right middle and lower lobes were deflated by blocking the right intermediate bronchus, the whole length of the gastric conduit was drawn up through the hiatus. The esophagogastric anastomosis was performed at the apex of the right thorax with a 25-mm CEEA circular stapler (United States Surgical Corp), after the right upper lobe was deflated by moving the endobronchial blocker into the right upper bronchus. When the anastomosis was finished, a nasogastric tube was passed through the anastomosis into the stomach. Two 28F chest tubes were placed in the right chest, and the chest was routinely closed.
The entire operation took 310 minutes. The patient remained stable throughout the surgery, and was extubated in the operating room.

The postoperative process was uneventful. The patient began to take fluid on postoperative day 7, resumed normal diet on day 10, and was discharged 2 weeks after surgery. The patient was in good condition with no signs of recurrence 6 months after surgery. Postoperative barium swallow showed a patent esophagogastric anastomosis. Computed tomography of the chest showed an intact left postpneumonectomy chest cavity and no signs of active infection in the right lung (Fig 2). The postoperative FEV₁ was 1.33 L, 39.3% of predicted value. However, the arterial blood gas was normal.

Postoperative pathology revealed a moderately differentiated squamous cell esophageal carcinoma, infiltrating the whole thickness of the esophageal musculature, with metastasis to subcarinal lymph node (pT2N1M0, stage IIb).

Comment

It is challenging to perform esophagectomy after pneumonectomy. In patients with compromised lung function, it is relatively easier to perform esophagectomy under CPB or extracorporeal membrane oxygenation (ECMO) [5]. We chose to operate under general anesthesia, so that the inherent side effects and complications of CPB or ECMO could be avoided. By maneuvering an endobronchial blocker between the right upper and intermediate bronchi, good exposure of the operating field could be achieved. Another advantage of the endobronchial blocker is that it can be withdrawn whenever necessary, so that safety of operation can be guaranteed. Nevertheless, we had a CPB unit ready and waiting throughout the operation.

To perform an esophagectomy through either the post-pneumonectomy or contralateral hemithorax has its advantages and disadvantages. Reardon and colleagues [3]
operated through the postpneumonectomy hemithorax. Although ventilation of the contralateral lung remained uncompromised throughout the operation, there was a series of disadvantages to overcome, such as stiff and thickened pleura, elevated diaphragm, shrunken hemithorax, shifted and callous mediastinum, and herniating contralateral lung. Most important, interrupting the postpneumonectomy hemithorax might increase the chance of contaminating such a closed cavity, leading to fatal empyema. By operating on the contralateral hemithorax, the above disadvantages can be avoided.

Transhiatal esophagectomy has become a mature procedure. In our case, the left diaphragm was significantly elevated, and there was dense adhesion around the diaphragm due to previous pneumonectomy, and the esophageal cancer had infiltrated through the entire thickness of the musculature. These factors made transhiatal esophagectomy difficult. For the same reason, other minimally invasive procedures were not considered for this patient [6].

Petri and coworkers [7] had performed on a similar patient by means of thoracoscopy. Ventilation was maintained but with a smaller tidal volume and partial atelectasis of the whole lung. Because the esophagus lies in the mediastinum, this evenly distributed ventilation and partial atelectasis of the whole lung will inevitably compromise exposure [7]. Given the segmental nature of esophagectomy, our method of selective lobar deflation has its unique advantage in exposing the operating field.

High-frequency jet ventilation offers another option for postpneumonectomy patients. One major disadvantage of high-frequency jet ventilation, however, is CO₂ retention [6]. By using an endobronchial blocker, the patient’s arterial blood gas was maintained within normal ranges throughout the operation.

In conclusion, transthoracic esophagectomy after pneumonectomy is feasible. Tactical application of endobronchial blocker in selected patients ensures appropriate exposure of the operating field, saves medical expenditure, and avoids the disadvantages of CPB, ECMO, and other methods of ventilation.

References