Totally Thoracoscopic Tracheoplasty for a Squamous Cell Carcinoma of the Mediastinal Trachea

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This report describes the first totally thoracoscopic tracheoplasty for a squamous cell carcinoma at the mediastinal trachea. The surgical procedure was conducted with five access incisions. A segment of the trachea was resected circumferentially, and the tracheal stumps were joined by an end-to-end anastomosis. The patient recovered rapidly and was discharged on the 12th postoperative day.

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Although video-assisted thoracic surgery (VATS) is widely performed because of its well-recognized advantages [1], open thoracotomy remains the primary approach for mediastinal tracheal lesions [2, 3]. One report has been published of a “hybrid” thoracoscopic tracheoplasty, which used thoracoscopy and a “small” thoracotomy with direct visualization [4]. Here, we report the first totally thoracoscopic tracheoplasty for a mediastinal trachea squamous cell carcinoma.

The patient was a 68-year-old man who presented with dysphagia and coughing that had been worsening during the previous 6 months. Computed tomography (CT) of the chest and bronchoscopy revealed a 1.3-cm cauliflower-like tumor on the right anterior wall of the mediastinal trachea, 2.2 cm from the carina (Fig 1A). CT also revealed prior tuberculosis and pleural adhesion. In addition, the patient had iron deficiency anemia (hemoglobin 60 g/L) and a nonfunctioning left kidney, presumably caused by the prior tuberculosis.

The operation was conducted with the patient under general anesthesia and with tracheal intubation above the lesion. To achieve left lung ventilation, an endobronchial blocker tube (BBT-B3060, Deiken Medical, Japan) was placed in the right main stem bronchus under bronchoscopic guidance. The patient was placed in the left lateral decubitus position. Figure 2 shows the placement of five access ports, ranging from 0.5 to 2 cm in diameter. The first port was placed in the sixth intercostal space on the midaxillary line. The second port was placed in the left lateral decubitus position. The first port was placed in the sixth intercostal space on the midaxillary line. The second port was placed in the fourth intercostal space on the midclavicular line. The third port, primarily used for the camera, was placed in the seventh intercostal space.

Fig 1. Bronchoscopic findings. (A) Preoperative view of tumor. (B) Postoperative view of anastomosis.
on the scapula line. The fourth port was placed in the third intercostal space on the posterior axillary line. Extensive pleural adhesions were observed and separated through these ports by use of electrocauterization. The fifth port, 5 mm in diameter, was placed in the second intercostal space on the anterior axillary line and was primarily used for the scissors and needle holder.

The inferior pulmonary ligament was divided, and the entire right hilum was mobilized. The azygos vein was dissected and stapled (ATW35, Ethicon). Para-tracheal lymph nodes were dissected. Afterward, the bronroscope was introduced into the trachea, with its tip 0.8 cm distal to the pedicle of the tumor. The thoracoscope light was turned off, and the distal tracheal transection line of the tumor was marked by cauterizing the tracheal wall, where the light spot from the bronchoscope was visible (Fig 3A). A sterile cross-field armored endotracheal tube was introduced into the chest through the fourth port, and the trachea was then divided at the marked transection line. The distal tracheal stump was intubated with the cross-field endotracheal tube, with the tip of the tube inserted 5 cm into the left main stem bronchus; and the other end of the tube was connected to a ventilator. A 3-cm segment of the trachea was resected circumferentially (Fig 3B), and the resection margins were found to be negative by frozen section analysis. While the neck of the patient was maintained in flexion by the anesthesiologist, an end-to-end anastomosis was created between the tracheal stumps with a 4-0 Prolene (8521H, Ethicon) running suture. The suture began at the right posterior tracheal wall and ended at the middle part of the right tracheal wall, where the two ends of the suture met (Fig 3C, D). Once the suture was tightened, the cross-field endotracheal tube was removed, and the endobronchial blocker tube was placed in the right main stem bronchus to maintain left single-lung ventilation. The running suture was tied, and the anastomosis was checked for air leak under water. Two 30F chest tubes were placed, and the patient was extubated in the operating room.

The operation time was 330 minutes, of which 120 minutes were spent in the separation of pleural adhesions. The blood loss was about 100 mL. The patient could sit by himself on the same day of the operation and was able to walk around on the next day. Pulmonary air leakage was observed after the operation and spontaneously resolved on postoperative day 9; the chest tube was removed on the next day. Pathologic analysis showed tracheal squamous cell carcinoma without lymph node metastasis. The patient was discharged on postoperative day 12. Bronchoscopy (Fig 1B) and CT on postoperative day 40 showed neither anastomotic stenosis nor fistula.

**Comment**

Primary tracheal tumor is rare, and an operation is the preferred treatment if possible [2–4]. The work of Dr Hermes Grillo led to current surgical practices, and the indications for, and techniques of, operations on the trachea have been described in detail [2, 3].

We addressed several challenges during the totally thoracoscopic tracheoplasty. An endobronchial blocker tube and a cross-field endotracheal tube, similar to that reported in the literature [4], were used to achieve left single-lung ventilation. It was very important to...
accurately divide the trachea distal to the lesion, which we did by marking the distal transection line, where the bronchoscopic light spot was visible (Fig 3A). It was also very important to quickly place the cross-field endotracheal tube into the left main stem bronchus to limit the time without ventilation. We determined the size of the cross-field endotracheal tube and the depth of tube insertion by measuring the diameter of the left main stem bronchus and the distance from the tumor to the opening of the left upper lobe bronchus on the preoperative CT scans. By the use of this method, the thoracoscopic intubation of the cross-field endotracheal tube was not difficult.

The next challenge was tracheal anastomosis. To best expose the trachea, we placed the camera through the third port, placed the fifth port right in front of the trachea, and divided the azygos vein as close as possible to the superior vena cava. In contrast to reported procedures, which used interrupted absorbable sutures [2–4], we made the anastomosis with a 4-0 Prolene running suture. We chose the suture on the basis of our experiences with open and totally thoracoscopic bronchial sleeve resections [5] and open tracheoplasty, in which we did not observe any anastomotic dehiscence, fistula, stricture, or long-term anastomotic granulation hyperplasia. The running suture was in a relaxed state before being tied, and this allowed us to make essential manipulations without difficulty.

Although a modern thoracoscope gives a very clear magnified view of the operation field, performing the totally thoracoscopic tracheoplasty under the guidance of the two-dimensional images from the camera is indeed a challenge. The key to overcoming this challenge is the excellent thoracoscopic suturing skills that we developed during our previous VATS bronchial sleeve resections [5] and extensive VATS lobectomy practices. In addition, the tracheal edges to be anastomosed could be easily seen by swinging the cross-field endotracheal tube placed in the distal tracheal stump. We encountered little difficulty during the tracheoplasty.

This report demonstrates that totally thoracoscopic tracheoplasty is feasible for the treatment of tracheal tumors.

References


Operative Wound Implantation of Inflammatory Sarcomatoid Carcinoma of the Lung

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We describe a patient with iatrogenic chest wall implantation of inflammatory sarcomatoid carcinoma. A 43-year-old man underwent right partial lung resection for hemopneumothorax, with large bullae and an alveolar accumulation of histiocytes found on pathology. Three months later, a subcutaneous tumor appeared at a thoracoscopic port site. Needle aspiration of this tumor suggested a malignant neoplasm; therefore, a right upper lobectomy and chest wall resection were performed, and a pathologic diagnosis of sarcomatoid carcinoma was made. Pathologic reexamination of the original sample suggested that the tumor had been implanted in the patient’s chest wall at the time of the first operation.


Inflammatory sarcomatoid carcinoma is a very rare lung cancer that was first reported by Wick and colleagues in 1995 [1]. It often invades pulmonary vessels. The prognosis is poor for patients with this malignancy. We report herein a patient with inflammatory sarcomatoid carcinoma of the lung accidentally implanted into the operative wound during an operation for hemopneumothorax.

A 43-year-old man without significant medical history presented with dyspnea. He smoked 1.5 packs per day and worked at an insurance company. Chest roentgenology revealed a right hemopneumothorax (Fig 1A). Preoperative computed tomography showed multiple bullae, but no lung nodules were identified (Fig 1B). The patient underwent a partial right lung resection by video-assisted thoracoscopic surgery with the use of three access ports. Pathologic examination revealed large bullae and an accumulation of histiocytes in the alveoli. Malignant change was not detected.

Three months after the operation, a fist-sized subcutaneous tumor appeared in the patient’s chest wall at a surgical trocar site (Fig 1C). Computed tomography revealed a heterogeneous subcutaneous tumor, 6 cm × 4 cm, at the fourth intercostal space (Fig 1D). The use of 18F-fluoro-2-deoxy-D-glucose positron emission tomography demonstrated increased uptake at the tumor site.

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