Thoracoscopic Tracheal Resection and Reconstruction for Adenoid Cystic Carcinoma

Wenjie Jiao, MD, Dezhang Zhu, MD, Zhaozhong Cheng, MD, and Yandong Zhao, MD
Department of Thoracic Surgery, The Affiliated Hospital of Qingdao University, Qingdao, China

We describe a novel technique of thoracoscopic circumferential tracheal resection and end-to-end anastomosis. A 60-year-old woman presented with wheezing and progressive dyspnea. Computed tomography scan revealed a mass at the lower trachea, and a nitinol mesh stent was implanted by bronchoscopy. After 2 weeks, a complete thoracoscopic tracheal resection and reconstruction was performed. The postoperative course was uneventful. The final pathologic examination confirmed the diagnosis of primary adenoid cystic carcinoma of the trachea.

Primary tracheal adenoid cystic carcinoma (ACC) is a rare neoplasm, and circumferential tracheal resection with primary anastomosis in an open surgical technique has been widely adopted for it. Here, we present a minimally invasive surgical method to treat a patient with tracheal ACC. To our knowledge, it is the first report of this kind.

A 60-year-old woman with wheezing and progressive dyspnea was referred to our hospital. She presented with a 2-year history of exertional dyspnea, cough, and wheeze, and was treated for asthma. Computed tomography revealed a 2-× 2-× 2-cm circular mass in the trachea that was 5 cm distal to the vocal cords and 3 cm proximal to the carina (Fig 1A). A nitinol mesh stent was implanted in the trachea by bronchoscopy, and the dyspnea was relieved (Fig 1B). On admission, routine laboratory studies including pulmonary function tests were the normal. After 2 weeks, the patient was proposed for thoracoscopic surgery.

The patient was placed in a left lateral decubitus position, and double-lumen intubation was performed. The first 1.5-cm incision was performed in the seventh intercostal space in the midaxillary line, and was used for introducing a 10-mm 300 thoracoscope. The second incision (utility incision), 4 cm long, was made in the third intercostal space in the anterior position just between the latissimus dorsi and pectoralis major. The third 1.5-cm incision was performed in the fourth intercostal space in the postaxillary line, and was used mainly for the second sterile endotracheal tube. The fourth 1.5-cm incision was performed in the fifth intercostal space in the preaxillary line, and was used mainly to pull down lung tissue to get good exposure (Fig 2A). We completed the whole operation without visual access through the incision and without rib spreading. We use electronic hook, curved suction apparatus, and other conventional long instruments, combined with thoracoscopic equipment.

The first action was to retract the lung down by orbicular-ovate grasping forceps using the fourth port. The azygos vein was transected, and a paratracheal lymph node dissection was performed. Cautious dissection minimized the risk of damage to the recurrent laryngeal nerves. The trachea was dissected, and the mass of the trachea was completely exposed.

The trachea in the distal portion of the mass was first divided (Fig 3A). A sterile single-lumen endotracheal tube was directly intubated into the left main bronchus via the third 1.5-cm incision in the fourth intercostal space. And then, the nitinol mesh stent was unloaded from the trachea. The sterile single-lumen endotracheal tube was fixed to the chest wall to maintain good visual fields. The trachea in the proximal part of the mass was

Accepted for publication June 27, 2014.
Address correspondence to Dr Jiao, 16 Jiangsu Rd, Qingdao, China 266003; e-mail: xwkjiao@126.com.
then divided. Complete excision of the mass and the circular trachea was performed (Fig 2B).

The reconstruction was made by end-to-end anastomosis with running sutures. The cartilaginous portion of the trachea was sutured with two 2-0 Prolene (Ethicon, Somervile, NJ) sutures, and a knot was formed before suturing (Fig 3B). After suturing the cartilaginous portion, the second sterile single-lumen tube was extracted and the first double-lumen intubation was inserted again, and then the membrane portions were sutured (Figs 3C, 3D). A knot pusher was used to tie the suture knots after the anastomosis. Coverage of anastomosis was not needed. A chin stitch was not placed. Intraoperative frozen specimen examination revealed an ACC of the trachea with tumor-free surgical margins. Intraoperative blood loss was 200 mL, and operative time was 280 minutes.

The postoperative course was uneventful. The chest tube was removed on postoperative day 3. The patient was discharged on postoperative day 14. The final pathologic examination confirmed the diagnosis of primary ACC of the trachea, and the tumor was within 1 mm of the margin interpreted as microscopic positive margins. No evidence of metastasis was identified in the lymph nodes that were excised. Adjuvant radiotherapy using a dose of 50 Gy was administered for 8 weeks after the operation. Follow-up 6 months after surgery confirmed no stenosis and no signs of recurrence by bronchoscopy and computed tomography scan (Fig 2C).

Comment

Adenoid cystic carcinoma is the second-most common primary malignant tracheal neoplasm after squamous cell carcinoma, and it is a low-malignancy neoplasm having a prolonged clinical course [1, 2]. In our case, the lesion presented as a soft tissue mass filling the lower tracheal lumen, and a pulmonary physician implanted a nitinol mesh stent by means of bronchoscopy to relieve the patient’s serious dyspnea. Decisions about the operative strategies for a tracheal tumor should depend on the size, location, and local invasion of the lesion, experience of the surgeon, and diverse accompanying conditions. Primary ACC can be usually managed by circumferential tracheal resection with primary anastomoses in an open surgical technique [3]. This is the first report of successful thorascoposcopic tracheal sleeve resection.

Anesthesia for tracheal procedures offers distinct challenges and requires careful coordination between the surgical and anesthesia teams during airway excision and anastomosis [4]. Therefore, we designed a special port through the fourth intercostal space in the postaxillary line for the second sterile endotracheal tube to maintain respiratory function and the relapse of the right lung. And then, by using a utility incision, the resection and anastomosis can be completed easily in a manner similar to the traditional open approach with skills and experience obtained from previously performing complex video-assisted thorascoposcopic surgery procedures.

Moreover, in most studies available on tracheal sleeve resection, interrupted suture is used for tracheal anastomosis. However, we thought the interrupted suture method to be time-consuming, and thread winding occurred frequently under video-assisted thorascoposcopic surgery procedures. So the anastomosis was

Fig 2. (A) Distribution of incisions for thoracoscopic trachea sleeve resection. The third incision in the fourth intercostal space (arrow) was used mainly for the second sterile endotracheal tube. (B) Photograph of the gross pathologic specimen and nitinol mesh stent. (C) Follow-up bronchoscopy 6 months after surgery showed no stenosis and no tumor recurrence.
carried out using running Prolene stitches. According to our previous experiences and other reports, the technique of running suture is safe and feasible during bronchial sleeve anastomosis [5].

Adenoid cystic carcinoma has a tendency to spread by submucosal extension, and tumor-free resection margins may therefore be difficult to achieve without excessive anastomotic tension. According to a retrospective study by Honings and colleagues [6], airway margins were microscopically positive in 55% of patients with primary ACC. Our patient had microscopic positive margins, so adjuvant radiotherapy was administered after the operation. At present, recommended treatment of ACC consists of surgical resection with postoperative radiotherapy, and provides the best chance of prolonged survival [7].

In conclusion, we consider that the surgical procedure described here is safe and effective to perform tracheal resection and end-to-end anastomosis. This minimally invasive method may present a new alternative strategy for the treatment of tumors of the lower trachea.

References

Fig 3. (A) Transection of the trachea in the distal portion of the mass. (B) A sterile single-lumen endotracheal tube was directly placed into the left main bronchus. Running suture of the tracheal cartilaginous portion was performed. (C) Extraction of the second sterile single-lumen tube and insertion of the first double-lumen intubation again. (D) Running suture of the tracheal posterior membrane was performed.