Membranous tracheoplasty using an azygous vein pedicle graft with roundabout-field intubation: A novel surgical technique

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We report a case of leiomyoma originating from the posterior membranous portion of the trachea. We performed a membranous tracheoplasty using an azygous vein pedicle graft prepared as a patch. This technique made it possible to increase the diameter of the reconstruction and to decrease the tension on the sutures. A membranous tracheoplasty using an azygous patch has never been reported. In addition,

we used modified cross-field tracheal intubation to maintain the surgical field.

CLINICAL SUMMARY

A 59-year-old woman was referred to our hospital (Maebashi Red Cross Hospital) for further investigation of a 3-month history of progressive cough. The patient had been healthy and did not smoke. A chest x-ray was normal, but computed tomography revealed an intraluminal soft tissue mass, measuring 8×13 mm, on the posterior wall of the trachea above the carina. The lesion was located in the lumen of the trachea and did not invade the adjacent esophagus, vertebra, or fat tissue. Flexible bronchoscopy showed a submucosal tumor with a broad base, smooth surface, and spindle shape located on the membranous portion, 1 cartilage ring above the carina (Figure 1, A). A transbronchial biopsy yielded a diagnosis of leiomyoma. Because the tumor had a broad base,

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FIGURE 1. A, Flexible bronchoscopy shows a submucosal tumor with a smooth surface and spindle shape (black arrows) located on the membranous portion, 1 cartilage ring above the carina. B, Ventilation was ensured by using an armored 8F cross-field tracheal cannula through one of the two 1.5-cm access ports. The pathway of the “cross-field intubation” (dotted line). C, Azygous vein pedicle graft (arrowheads) is sutured to the margins of the defect in the posterior wall of the trachea using interrupted absorbable 3-0 monofilament (black arrows). D, Postoperative flexible bronchoscopy showed no stenosis at the anastomosis (black arrows).

FIGURE 2. A, Azygous vein pedicle graft was prepared as a patch after dividing the 3 branches of the vein. B, The graft was loosely ligated with 2-0 silk at the attachment of the vein and then rotated and sutured to the defect in the trachea. C, The left lung was ventilated by connecting a sterile, cuffed endotracheal tube to sterile anesthetic tubing brought into the thoracic cavity around the surgical field.

we thought that bronchoscopic excision would not allow complete resection and scheduled a surgical resection.

The chest was entered through the fifth intercostal space with a lateral thoracotomy under general anesthesia using a double-lumen endotracheal tube. We made a 10-cm incision in the fourth intercostal space as a utility thoracotomy, followed by two 1.5-cm incisions for access ports. A polyurethane wound retractor (Alexis Wound Retractor, Applied Medical, Rancho Santa Margarita, Calif) was used alternately with a metal chest retractor to keep the utility thoracotomy open. First, an azygous vein pedicle graft was prepared as a patch by dividing the 3 branches of the vein (Figure 2, A). The graft was loosely ligated at the attachment of the vein with 2-0 silk and then rotated (Figure 2, B). The azygous vein was divided using a mechanical stapler. Then, a spindle-shaped area of the membranous trachea (measuring approximately 40×15 mm) was excised where the base of the mass was attached. Ventilation was ensured by using an armored 8F cross-field tracheal cannula through one of the two 1.5-cm access ports. We formed a loop with the tube to further maintain the limited visual field (Figures 1, B and 2, C).

Attempted direct suturing of the defect to the remaining posterior tracheal wall proved impossible because of the area of tissue loss. We applied the previously prepared azygous vein patch to the margins of the defect in the posterior wall of the trachea and sutured it using interrupted absorbable 3-0 monofilament (Figure 1, C).

The histopathologic examination showed spindle-shaped cells organized in fascicles. Immunohistochemical staining for smooth muscle α -actin was positive. No mitotic activity was noted. Leiomyoma arising from the smooth muscle of the trachea was diagnosed. The postoperative course was uneventful. Postoperative flexible bronchoscopy showed no stenosis at the anastomosis (Figure 1, D). The patient was doing well without local recurrence 6 months postoperatively and is being followed as an outpatient.

DISCUSSION

Leiomyoma of the trachea is rare. In their 26-year series, Grillo and Mathisen¹ reported only 2 cases (1.0%) in 198 consecutive primary tracheal tumors. Most commonly, a tracheal leiomyoma grows as a polypoid mass with a stalk or broad base in the distal third of the trachea and is usually attached to the membranous portion of the trachea.² Although tracheal leiomyomas are benign, they are potentially lethal because they can cause tracheal obstruction.

Many cases involving onlay patches for defects of the membranous trachea have been reported, with the use of gastric serosa,³ pericardium,⁴ or intercostal muscle.⁵ We used an azygous vein patch because it was close to the tumor. Initially, we had planned to use an intercostal muscle flap, but it was difficult to harvest the muscle through the minithoracotomy and we did not want to destroy more of the thoracic cavity. Except in special cases, we consider the use of pericardium or intercostal muscle too bothersome. The azygous

vein needed to be divided anyway when we removed the tumor.

Ventilation was ensured by using an armored 8F cross-field tracheal cannula through one of the two 1.5-cm access ports. Because cross-field intubation sometimes obstructs the limited visual field through the minithoracotomy, we modified this intubation by forming a loop with the tube. Therefore, strictly speaking, this method is a roundabout-field intubation rather than a cross-field intubation.

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A modified technique of selective lung ventilation through a tracheostomy to facilitate conservative management of iatrogenic tracheal rupture

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We describe a modified technique of bilateral bronchial intubation through a tracheostomy to achieve conservative management of iatrogenic tracheal rupture.

CLINICAL SUMMARY

A 77-year-old woman admitted to the intensive care unit after an out-of-hospital respiratory arrest secondary to exacerbation of severe chronic obstructive pulmonary disease underwent a percutaneous dilatational tracheostomy (PCT) using the Ciaglia Blue Rhino (Cook UK Ltd, Letchworth, UK) dilator 5 days post-intubation. Immediately after the procedure, extensive subcutaneous thoracic emphysema and bilateral pneumothoraces developed in the patient. Computed tomography of the chest showed a distal tracheal tear with pneumomediastinum and pneumoperitoneum (Figure 1). The patient was transferred to the Royal Brompton Hospital, for thoracic surgical management. Rigid bronchoscopy revealed a 5-cm longitudinal tear of the posterior wall of the trachea, extending proximally from the level of the carina (Figure 2). Esophageal perforation was excluded by esophagoscopy.

Under rigid bronchoscopic control, the airway was decannulated and both main bronchi were selectively intubated with Frova intubation introducers (Cook Critical care, Bloomington, Ind) via the tracheostomy site. Frova introducers of differing colors were used to aid differentiation between right and left main bronchi where endobronchial tubes and introducers impaired visualization of the distal airways. Size 6 armored low-pressure cuffed endobronchial tubes

FIGURE 1. Computed tomography scan showing bilateral pneumothoraces and pneumomediastinum secondary to posterior tracheal tear.

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