

Tracheal Tear during Esophageal Blunt Resection

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We experienced a case of a posterior membranous tracheal tear which occurred during esophageal blunt resection (transhiatal esophagectomy). Possible causes and respiratory management are discussed.

Case Report

A 58-year-old female was admitted to our hospital with complain of dysphagia for one month's duration. Preoperative laboratory investigation and respiratory function test showed no remarkable findings. Chest X-ray demonstrated an old tuberculosis in the right upper zone. Esophagoscopy examinations were performed twice. The biopsy showed squamous cell carcinoma. CT scan demonstrated that the tumor was adherent to the membranous trachea. She was scheduled for total esophagectomy and total laryngectomy with stomach reconstruction under general anesthesia.

She was premedicated with 0.5 mg of atropine and 75 mg of hydroxyzine intramuscularly. Anesthesia was induced with 200 mg of thiopental and 8

mg of vecuronium and the trachea was intubated with 37 Fr. double-lumen endobronchial tube (DLT), which was fixed properly. Anesthesia was maintained with 66% nitrous oxide in oxygen, 1–1.5% isoflurane and intravenous fentanyl supplement. Muscular relaxation was maintained with intravenous infusion of vecuronium. Monitors included ECG, arterial line, CVP line, urethral catheter, and pulse oximetry.

After the gastric mobilization, the operating procedure was changed to esophageal blunt resection. Then, cervical incision was made and total laryngoesophagectomy was started. During this procedure, the tense swelling in the trachea was pointed out. The endotracheal cuff was deflated immediately, but a little air leakage from the trachea was recognized. This was identified as the cuff of the tracheal tube herniating through a 15 mm long tear in the membranous trachea. The tracheal tear gradually increased toward the tracheal carina. Total laryngectomy was performed immediately and the DLT was extubated. We tried to intubate left main bronchus with a 7.5 mm ID spiral tube under the guidance of a bronchofiberscope, but did not succeed. Finally, we intubated right bronchus blindly with a 6.5 mm ID short-cuffed endobronchial tube. After the spontaneous respiration returned,

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Table 1. The data of arterial blood gas

	30 min after intubation mechanical ventilation	30 min after tracheal tear assisted one lung ventilation	60 min after tracheal tear ventilation	10 min after the operation was completed spontaneous breathing
F _I O ₂	0.33	1.0	1.0	?
pH	7.422	7.407	7.394	7.376
P _{CO} ₂ (mmHg)	40	39	38	37
P _O ₂ (mmHg)	224	247	328	112
base excess	1.4	-0.2	-0.5	-3.3

it was assisted at about 5 cmH₂O of peak inspiratory pressure and high-frequency jet ventilation was superimposed for a while. Table 1 showed the data of arterial blood gases. After the total esophagectomy, pharyngogastrotomy was performed. The cervical and abdominal incisions were closed under the spontaneous respiration and the endobronchial tube was extubated. After the extubation, about 40 mm long tear in the membranous trachea was repaired with endotracheal approach. During this manipulation, 0.5% isoflurane in 100% oxygen was insufflated with a 8 Fr. catheter through the tracheostomy. The hemodynamic and respiratory parameters remained stable throughout the procedure (table 1). After the operation was completed, she was transferred to the ICU.

Until the third postoperative day, broncheal suction was performed carefully with a bronchofiberscope. On the third postoperative day she was able to spit out sputum by herself and the restoration of the tracheal tear was recognized. On the seventh postoperative day she was transferred to the ward.

Discussion

There were several reports of tracheal and bronchial injury during general anesthesia¹⁻⁶. In a few cases, the injury was caused by cuff pressure of DLT⁴⁻⁶. However these reports suggest that tracheal tear as a complication of

intubation is rare.

On the other hand, there were some reports of tracheal tear during esophageal blunt resection¹⁻³. This complication may occur during the resection of the upper thoracic esophagus from the posterior membranous trachea. This is especially so if the esophageal lesion is adherent to the trachea³. Smith et al.⁴ concluded that patients undergoing esophagectomy was at greater risk from rupture of the membranous trachea because of weakness caused by surgical dissection.

In this case, a possible cause was considered that the tracheal tear was occurred by surgical resection. Because the preoperative CT scan demonstrated that the tumor was adherent to the trachea. And, an overdistended endotracheal cuff caused by the diffusion of nitrous oxide was also responsible for the tracheal tear because we saw the cuff herniated through the tear. In addition to these, repeated biopsies under esophagoscopy may be a cause of weakness of the membranous trachea.

It is important to prevent progressive tear on the occasion of tracheal injury. High pressure of the endotracheal cuff and positive pressure ventilation must be avoided. Henry et al.³ reported that a endotracheal tube was advanced into the left main stem bronchus, and severe hypoxemia during one lung ventilation was improved by oxygen inhalation with a 14 Fr. Foley catheter to the nonventilated lung. In our case, the

airway was maintained by the use of a endobronchial tube to the one lung. At first the tube was tried to be inserted into the left bronchus, but was inserted blindly into the right main bronchus. We preferred spontaneous respiration adding assisted ventilation because airway pressure must be kept as low as possible. High-frequency jet ventilation also was used to support good oxygenation at low airway pressure. Tsui et al.⁷ reported high-frequency jet ventilation in the anesthetic management of a patient with tracheoesophageal fistula.

The tracheal tear was repaired through the tracheostomy without thoracotomy. As spontaneous breathing was adequate, oxygen was given through a 8 Fr. catheter into the trachea. And the manipulation was performed without any trouble.

We experienced a case of a tracheal tear during esophageal blunt resection. One lung ventilation under spontaneous breathing resulted in success to carry out the anesthesia without severe hypoxia.

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