and is determined by the presence of mitosis, size, necrosis, and hemorrhage. Surgical resection, although technically difficult, is the treatment, although the extent of resection remains controversial. Preoperative embolization may be of benefit for radiologically vascular tumors, as in our case.

References


The Use of Extracorporeal Membrane Oxygenation Therapy in the Delayed Surgical Repair of a Tracheal Injury

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Acute tracheal injury secondary to intubation can present with varying degrees of severity. Onset of symptoms occur hours or even days after the initial injury. A 34-year-old woman required surgery for a large tracheal tear after emergency intubation. The inability to adequately ventilate combined with secondary aspiration injury required that the patient be placed on extracorporeal membrane oxygenation before undergoing surgery. This case demonstrates the use of extracorporeal membrane oxygenation to manage a patient awaiting surgery for severe tracheal tears.


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Fig 1. (A) Initial chest roentgenogram revealing endotracheal tube with massive cuff and consolidation of right lung. (B) Chest roentgenogram revealing right pneumothorax, pneumomediastium, and consolidative change involving both lungs.

Acute tracheal injury due to intubation is quite rare, with a reported 1 in 20,000 single-lumen intubations resulting in injury, 15% of which occur in an emergency setting [1]. The resulting tear can be small, managed conservatively: or severe, requiring emergent surgery, increasing the risk of morbidity and mortality.
[2]. Patients can often present with subcutaneous emphysema, pneumomediastinum, and pneumothorax. Rare manifestations include hemoptysis, dyspnea, cyanosis, and air embolism [1–3]. Bronchoscopy is often diagnostic in identifying the location and depth of the tear [1, 2].

Extracorporeal membrane oxygenation (ECMO) has been used for instance, in the treatment of such as acute respiratory distress syndrome [3] and acute tracheobronchial trauma [4, 5]. In this instance, we used ECMO as a bridge to surgery for a 34-year-old woman presenting with a large tracheal laceration and aspiration lung injury after repeated endotracheal intubation.

Ambulance officers attended the home of an unresponsive 34-year-old woman suspected to have overdosed on amitriptyline. Two attempts at intubating the patient were made, however they were complicated by vomiting, and suspected aspiration. Following two attempts, the procedure was abandoned and the patient was rushed to hospital. The patient arrived in the emergency department (ED) bag-valve-mask ventilated with an oropharyngeal airway in situ. The patient was hypotensive and tachycardic, her breathing shallow and spontaneous, maintaining saturations close to 100%. The patient was assessed as having a Glasgow Coma Score of 3 and was noted to have emesis in her mouth and over her clothing. Intubated in the ED (grade 2 view was noted), her initial chest roentgenogram showed gross overinflation of the endotracheal tube cuff (Fig 1A), with the endotracheal tube tip situated in the right main bronchus. Substantial collapse and consolidation of the right lung was also noted.

Ventilating the patient remained an issue owing to persistently low tidal volumes and air leak despite repeated cuff reinfation. The patient was reintubated and again radiography showed overinflation of the cuff. Despite anesthetic involvement and several repeated intubations, she continued to have poor tidal volumes and air leak. The patient was critically hypoxic, and acidic and requiring intermittent bag-valve-mask use to maintain saturations and noradrenaline to maintain blood pressure. The patient was then shifted to the intensive care unit (ICU) where it was now noted that right-side subcutaneous emphysema was developing. An ICU chest roentgenogram revealed right-side pneumothorax, pneumomediastinum, and overinflated endotracheal cuff (Fig 1B). This image was compared to her initial ED roentgenogram, and it was noted that the margin of the endotracheal tube cuff on the right side extended beyond the right lateral aspect of the trachea, suggesting possible tracheal tear. This was confirmed with fiberoptic bronchoscopy revealing a tracheal tear along the posterior wall, extending into the right main bronchus. With ongoing respiratory decompensation, the decision was made to support the patient with venovenous ECMO.

The right internal jugular (for venous inflow) and left femoral veins were cannulated (9F and 19F cannulas, respectively) using the Seldinger approach and venovenous ECMO was implemented with heparin tubing (Medtronic, Minneapolis, MN) and Maquet Rotoflow and Quadrox oxygenator (Maquet, Wayne, NJ) at a flow rate of 4 L/min, improving saturations from 70% to 100%. The patient’s acidosis improved and inotropic requirement declined. Once stable, the patient was taken to surgery 48 hours after ECMO commencement.

A right posterolateral thoracotomy was performed with entry into the right side of the chest through the third intercostal space. The azygous vein was ligated and transfixed. The pleural space was opened on the right posterior aspect of the mediastinum. The right vagus nerve was transected, and the esophagus was separated from the trachea and proximal right bronchus. The membranous trachea was found to be torn from the origin of the right main bronchus extending cephalad for 8 cm, ending below the right subclavian artery. A 12 × 2 cm portion of autologous pericardium was harvested from the right pericardium anterior to the phrenic nerve and sutured to the membranous tear using 4-0 polydioxanone interrupted and continuous sutures. The proximal aspect of the tear was closed primarily using 4-0 polypropylene interrupted sutures. The third intercostal muscle was harvested and used as a pedicle flap, sutured to the posterior part of the tracheal tear. The right lung was inflated and a water test did not indicate air leak. Drains were inserted and the thoracotomy incision was closed in layers. Bronchoscopy after surgery did not show tracheal or bronchial narrowing. The patient returned to the ICU intubated on low-volume pressure control ventilation with the cuff down, remaining on ECMO.

Postoperative recovery was complicated by pneumonia and as well as sepsis, initially resulting in low tidal volumes and decreased oxygenation saturations. Serratia sp isolated from the patient’s sputum, and gram-positive cocci (resembling Streptococcus sp) from the blood were treated with intravenous Vancomycin and Meropenem, and the patient was placed on a wet ventilator circuit.

As her tidal volumes improved, ECMO was gradually weaned and the patient was decannulated several days thereafter. Despite a prolonged ICU admission and period of intubation the patient eventually made a full recovery and was discharged from hospital on day 50 in good health.

Comment
Surgery has been described as a mainstay treatment in many instances of tracheal tears; however the group of patients benefitting from surgery [1], including those with the risk of stenosis from primary closure, has not been readily defined. In this instance, the trachea was repaired with autologous pericardium and reinforced with an intercostal muscle flap to ensure healing, prevent dehiscence and reduce the chance of possible tracheal narrowing. Bronchoscopy a week after surgery confirmed no evidence of narrowing or surgical dehiscence. ECMO has seen a resurgence primarily due to higher rates of survival than previously reported [5]. For
instance, patients referred for ECMO during the H1N1 influenza A epidemic were reported to have survival rates between 76% and 79% [5–7].

In the setting of respiratory failure due to aspiration lung injury and tracheal tear, ECMO stabilized the patient before proceeding to surgery. Following surgery, ECMO was continued, with the patient ventilated with limited positive airway pressure and the endotracheal cuff partially deflated, positioned above the level of the repair to decrease the risk of mechanical dehiscence.

This case demonstrates the successful use of ECMO in the management of acute tracheal injury due to endotracheal intubation. It affirms its use as a protective strategy in managing combined tracheobronchial and lung injuries in the perioperative state. It also highlights the paramount need for clinical stability of the patient, as delay in surgery, which has not yet been identified as a risk factor affecting long-term survival, did not affect the outcome.

Fasciocutaneous free flap for pharyngoesophageal reconstruction has been used as an alternative to conventional enteric grafts. Fasciocutaneous free flap from various donor sites has been reported and reviewed [7]; it has several advantages compared with jejunal free flap in that it is resistant to ischemic injury and it does not require a transabdominal approach. We report a case of lateral thoracic perforator fasciocutaneous flap reconstruction in a patient with cervical esophageal stricture and ventriculoperitoneal shunt.

A 57-year-old man visited our clinic with a chief complaint of dysphagia. He had had weight loss of 30 kg over 1 year. His weight measured at our clinic was 63 kg. The patient had a surgical history of coil embolization, decompressive craniectomy, and ventriculoperitoneal (VP) shunt placement due to rupture of an anterior communicating artery aneurysm 7 years earlier. He did not have any other medical comorbidities. He had undergone endoscopic bougienage several times at a different hospital to manage a cervical esophageal stricture that developed 2 years earlier, after he mistook a cup of barbeque-grill cleanser for a cup of wine and drank it. Dysphagia improved after every bougienage, but always recurred in a few days. Eventually he became unable to drink even a sip of water and visited our clinic for surgical management. Endoscopic findings from the other hospital revealed corrosive stricture at the upper esophageal sphincter level. Multiple ulcer scars and cicatricial change were evident over the entire stomach. Preoperative esophagography revealed severe short segmental stricture at the cervical esophagus, but the lumen beyond the stricture was patent (Fig 1). Preoperative computed tomography (CT) scan of the neck showed the route of the VP shunt catheter. The catheter functioned well without any complications, such as coilings, knotting, or pericatheter cysts. Follow-up CT scan of the brain revealed recanalization of the previous aneurysm.

We planned surgery based on the above information. Stenting was not considered because the stricture was located just below the sphincter, the length of the cervical esophageal stricture was short, many lesions precluded the stomach as a suitable conduit, and a VP shunt, which would require externalization and subsequent relocation or replacement, made an abdominal approach more complex.