Case Report

Successful Repair of Combined Disruption of the Trachea, Esophagus and Spinal Cord Following Blunt Chest Trauma: Case Report

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A 32-year-old man sustained a long longitudinal rupture of the trachea and injury of the lamina muscularis of the esophagus and spinal cord. Emergency operation was begun under naso-tracheal intubation placed at the proximal portion of the ruptured trachea, and a sterile single-lumen flexible endotracheal tube was then intubated through the ruptured site following postero-lateral thoracotomy. The site was closed with eight interrupted sutures with the endotracheal tube in position, and five further sutures were placed during brief periods of apnea while the endotracheal tube was temporarily extubated. Following an uneventful post-operative course, the patient subsequently underwent anterior spinal fusion with a bone graft.

Key words: Trauma, Disruption, Trachea, Esophagus, Spinal cord

Introduction

The combination of tracheal disruption together with injury of the esophagus and spinal cord due to blunt chest trauma is extremely rare but potentially fatal. Herein we report on successful management of ventilation along with the technique of repair in a case of tracheal disruption combined with esophageal rupture and fracture-dislocation of the spinal cord following blunt chest trauma.

Case Report

On February 24, 1994, a 32-year-old man dozed off while driving a long-distance truck which collided with the rear of a motor vehicle, catapulting the driver forward, bringing the truck steering wheel into violent contact with the driver's anterior chest. On admission the driver was alert, but complained of dyspnea although he had been administered oxygen with a face mask, and exhibited slight cervical emphysema and partial tetraplegia. The blood pressure was 99/54, heart rate was 72 and regular. X-ray and CT scan (Fig. 1) revealed bilateral pneumothoraces, severe contusion of the right lung, subtle pneumomediastinum, fracture of the left fourth to eighth ribs and fracture-dislocation of C6. Emergency bronchoscopy (Fig. 2) and esophagoscopy revealed a longitudinal rupture 4 cm in length along the membranous segment of the trachea ranging from the eleventh to sixteenth cartilaginous ring with herniation of the esophagus into the tracheal...

Fig. 1 A Chest X-ray film: bilateral pneumothraes (arrowheads).
B CT scan: Subtle pneumomediastinum around the trachea.

Fig. 2 Bronchoscopic findings (1 = protrusion of esophagus into the tracheal lumen; 2 = hematoma).

lumen. Diagnosis of longitudinal laceration of the trachea combined with injury of the lamina muscularis of the esophagus was established, and emergency thoracotomy was performed following bilateral chest tube insertion and skull traction.

In the operating room, the patient was nasotracheally intubated with the distal end of the tube located at the proximal portion of the rupture site under observation with a flexible bronchoscope. Spontaneous respiration was preserved throughout the procedure and there was only minimal air leakage from the bilateral chest tubes. Right posterolateral thoracotomy was then performed at the fourth rib bed. When thoracotomy was done, a massive hematoma was noted around the lower trachea and esophagus. Following removal of the hematoma and separation of the trachea...
from the esophagus, severe air leakage occurred from the disrupted site. Immediately a sterle single-lumen flexible endotracheal tube was inserted through the rupture site under direct vision from the surgical field, and anesthesia was maintained by ventilation with this tube. The site was closed with eight interrupted sutures at the cranial portion using absorbable sutures (4-0 Maxon) with the endotracheal tube in place. The endotracheal tube was then temporarily removed and five further sutures were placed during brief periods of apnea while the patient was temporarily extubated, reintubation being carried out to continue ventilation every time a suture was placed. Following the final extubation, the 5 sutures were tied off. Thereafter ventilation was performed with the endotracheal tube which had been previously introduced nasotracheally. Injury to the esophagus was then confirmed to exist only at the lamina muscularis, and it was simply sutured with 4-0 Maxon. The thorax was washed with a large quantity of warm saline and an air leak test was performed. The site was then patched with pleura to prevent fistula formation, and the chest was closed after insertion of a 28 Fr. chest tube. The operating time was 211 minutes and the total volume of bleeding was 322 ml.

The patient was sedated and intubated for two days post-operatively, and then underwent tracheostomy to prevent increase of intratracheal pressure. The postoperative course was uneventful and bronchoscopy 2 months later revealed complete cure and no stenosis of the site. The patient successfully underwent anterior spinal fusion with a bone graft 6 weeks later and rehabilitation thereafter.

Discussion

Although extended tracheobronchial injuries rarely occur following traffic accidents, these conditions are potentially fatal. Pneumomediastinum and cervical emphysema are the most sensitive chest roentgenographic markers for tracheobronchial injuries. However in the present case, the herniation of the esophagus from the ruptured membranous section of the trachea had prevented a massive air leak (Fig. 2), and consequently there was only minimal subcutaneous emphysema (Fig. 1). This prevented the early diagnosis of disruption of the trachea.

St Cyr et al. reported on a successful repair in a case with complex tracheobronchial injury under intubation with a double lumen endotracheal tube. However, in the present case, the rupture was extremely extensive, and there was a high possibility of further disruption if blind intubation with a double lumen endotracheal tube were employed. For these reasons a single lumen endotracheal tube was first placed at the proximal site under bronchoscopic guidance. Furthermore, spontaneous respiration was preserved until operative-field intubation was performed through the rupture site, as the probability of jeopardizing ventilation with positive pressure ventilation was extremely high due to massive tidal volume leaks through the tracheal rupture when the herniated esophagus was removed from the ruptured site. Following separation of the trachea from the esophagus, a sterile flexible endotracheal tube was inserted through the ruptured site toward the distal trachea, and ventilation was successfully maintained with this tube.

Fistula formation and stenosis often occur following anastomosis of the trachea, mainly due to impaired blood supply at the ruptured site. Thus, reinforcement of the suture line with a pericardial fat or intercostal muscle patch is recommended to minimize the risk of this complication. However, since the site in the present case was situated in the posterior portion of the trachea, it was successfully patched with pleura. Consequently no major complication occurred.

Our experience suggests that injury to the trachea should always be suspected even in cases demonstrating minimal subcutaneous emphysema following blunt chest trauma, and repair of tracheal rupture can be accomplished by undertaking intubation with a single lumen endotracheal tube, rather than a double lumen endotracheal tube which has a high feasibility of causing further disruption of the site under blind intubation.

REFERENCES

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