

# Esophageal Rupture With the Use of the Combitube: Report of a Case and Review of the Literature

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The Combitube (Tyco-Kendall, Mansfield, MA) is a supraglottic airway device that has been used as an adjunct in the management of a difficult airway after failed attempts at endotracheal intubation both during cardiopulmonary arrest and in the setting of acute trauma (Fig 1). This device has replaced the previous esophageal obturator airway due to several reports of esophageal rupture.<sup>1-3</sup> It has been successfully used in emergent airway management and probably presents a lower risk of esophageal rupture than the esophageal obturator.<sup>4</sup> An analogous device is the pharyngo-tracheal lumen airway which has been previously studied successfully for emergent airway control.<sup>5-7</sup> The Combitube is inserted blindly through the mouth and can adequately ventilate the patient whether it is placed in the trachea or more commonly, in the esophagus. If the patient is intubated through the trachea the Combitube can be used similar to an endotracheal tube with the distal cuff volume titrated to air leak. With esophageal intubation the proximal

cuff is inflated and should also be titrated to air leak. The correct insertion of this device requires some degree of training and skill.

To our knowledge there are 2 previous reports of soft tissue injury with the use of the Combitube. The incidence of esophageal injury with the use of this equipment has not been fully evaluated. Klein et al reported a case of esophageal rupture associated with the use of the Combitube.<sup>8</sup> In this study they performed successful placement of this device in 8 patients in a controlled operating room setting by the same anesthesiologist. The ninth patient was reported to suffer an esophageal rupture that was confirmed by a contrast swallow study. They attributed this complication to increased intraluminal pressure distal to the tube and also to poor patient selection. Richards in 1998 reported a case of piriform sinus perforation during esophageal-tracheal Combitube placement in a 71-year-old female in the prehospital setting.<sup>9</sup> He recommends caution when using this device even in the controlled setting.

We present a case of esophageal rupture associated with the insertion of the Combitube in the prehospital setting.

## Report of a Case

The patient was a 22-year-old male who reportedly suffered blunt head trauma from a direct blow to the head with a baseball bat. Upon arrival of the emergency medical service to the trauma scene, he was notable for a depressed mental status, scoring 3 on the Glasgow Coma Scale (GCS), but hemodynamically stable and afebrile. Secondary to his depressed mental status and difficulty to maintain an adequate airway, the decision was made to secure his airway via intubation at the scene. EMS providers attempted several times to pass an oral endotracheal tube, but were not successful. A Combitube was inserted without any apparent complication. The Combitube balloons were inflated, and ventilations were accomplished using the Combitube distal port.

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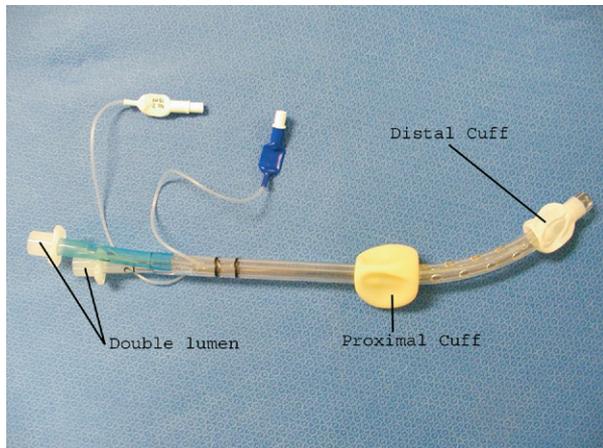
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**FIGURE 1.** The Combitube.

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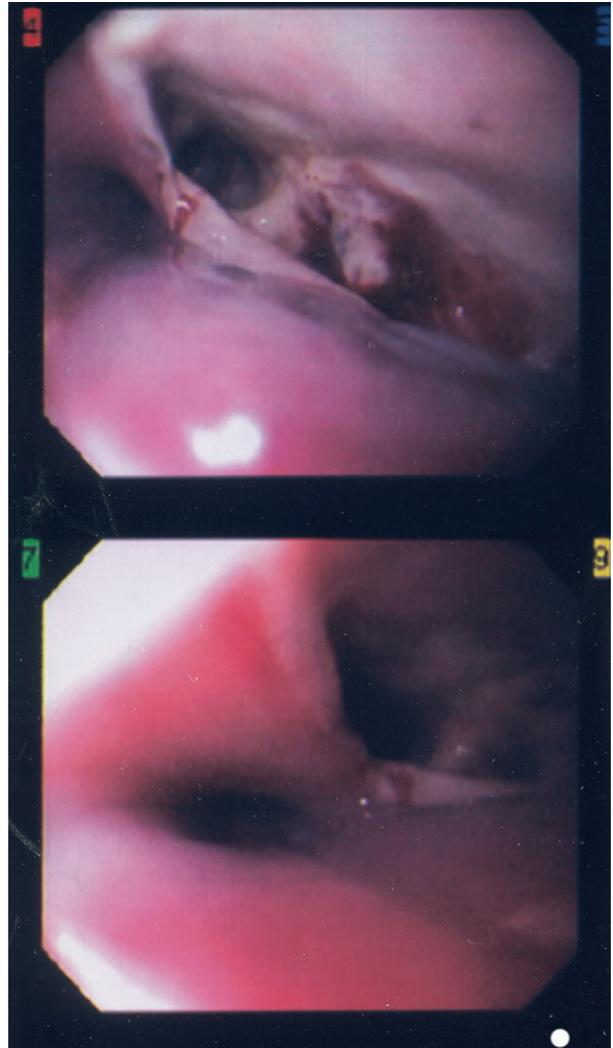
Upon arrival at our level-1 trauma center, the patient was hemodynamically stable, afebrile, and ventilating well via the Combitube. A standard advanced trauma life support protocol-driven trauma resuscitation was undertaken. Upon physical exam, the patient had no evidence of trauma below the neck. He remained GCS 3 without active hemorrhage. Initial plain film radiographs were performed, consisting of normal pelvis/neck plain films and the portable anterior-posterior chest film shown in [Figure 2](#). Pertinent findings on the chest radiograph include the lateral deviation of Combitube and the location/size of the balloon. Therefore, the Combitube was uneventfully exchanged for an oral endotracheal tube by the staff trauma anesthesiologist, and the patient was taken to the computerized tomography (CT) scanner.

CT scan of his head revealed a unilateral basilar skull fracture involving the mastoid air cells of the temporal bone. Significant intraparenchymal hemorrhage was also evident. Air was visualized intracranially in the temporal



**FIGURE 2.** Chest radiograph showing the inflated Combitube balloon in the esophagus. Arrow indicates inflated proximal cuff of Combitube.

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**FIGURE 3.** Top and bottom panels, large esophageal perforation seen at the level of the cervical esophagus.

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fossa and the soft tissues of the neck. This air was attributed to fracture of the mastoid air cells. He was admitted to the trauma intensive care unit for further resuscitation and monitoring. Bilateral ventriculostomies were placed by neurosurgery consultants without complication. On postinjury day 2, his mental status had improved to a GCS of 14 and he met criteria for extubation and was uneventfully extubated. On postinjury day 3, he suffered a spontaneous respiratory arrest, prompting positive pressure mask ventilation and reintubation with an oral endotracheal tube. CT scans of the head, neck, and chest were repeated. No evidence of intracranial change was present. The neck and chest revealed significant increase of air in the neck, with extension to the superior mediastinum. Esophagoscopy was performed to rule out a tracheal or esophageal disruption. Subsequently a large esophageal perforation of the cervical esophagus was identified ([Fig 3](#)). This perforation was measured to be 18 cm from the incisal edge of the maxillary central incisors. A nasogastric tube was placed under endoscopic guidance, and the patient was taken urgently to the operating room for washout and drainage.

In the operating room, a transverse low cervical incision was made and subplatysmal flaps were raised. Dissection was carried bluntly along the midline until the cervical trachea and esophagus were recognized. The location of the esophageal perforation was identified on the right posterior lateral aspect of the cervical esophagus. It was noted to be very inflamed and friable. Frank necrotic tissue was debrided and the site was extensively lavaged and drained. No grossly purulent material was encountered. A second drainage catheter was placed into the superior mediastinum tissue plane where air dissection had occurred. The skin incision was then loosely approximated with several interrupted sutures. No attempt at primary esophageal repair was undertaken due to extensive necrosis, inflammation, and infection. The patient was kept intubated and returned to the intensive care unit having tolerated the procedure without evidence of surgical or anesthetic complication. His mental status improved during the following 3 days. However on postoperative day 3 he acutely decompensated, prompting a repeat CT scan of the head. This showed increased intracranial hemorrhage. The ventriculostomies were replaced, and RB was taken to angiography, which revealed a zone 1/2 right vertebral artery aneurysm. Attempts to control this aneurysm were undertaken with angiographic coils, but the patient died from the massive intracranial hemorrhage despite intervention.

## Discussion

The small number of reported complications associated with the use of the Combitube is strongly supportive of its safety. Subsequently it has gained popularity in different parts of the world and is commonly used as part of the difficult airway algorithm in the prehospital setting. Effective application of this device does require skill, therefore prior familiarity with its use is important. It is a rapid and effective device that is easily inserted to establish an airway and prevent aspiration. One disadvantage of the original Combitube was the inability to suction the trachea when the device is placed in the esophagus. To eliminate this disadvantage, the Combitube was redesigned by creating an enlarged hole in the pharyngeal lumen that allows fiberoptic access, tracheal suctioning, and tube exchange over a guide wire.<sup>10</sup> It is usually inserted blindly without the need of hyperextension of the neck, which is especially important in patients with potential cervical spine injuries. Waltz et al recommend using a laryngoscope to lift the floor of the mouth for its insertion as a maneuver to minimize potential soft tissue trauma and more accurate placement.<sup>11</sup> The importance of rapid establishment of an airway in the setting of trauma or cardiopulmonary arrest is of paramount importance. The Combitube can be a valuable tool in the armamentarium of the resuscitating team, especially for the paramedics in the field functioning under less than ideal circumstances. The device is contraindicated in patients with active laryngeal or pharyngeal reflexes, known esophageal trauma/pathology, known ingestion of caustic

or corrosive agents, and in patients who are under 5 feet tall.

In 1987, Frass et al<sup>4</sup> evaluated the esophageal tracheal Combitube in cardiopulmonary resuscitation. In this nonrandomized prospective study they compared the effectiveness of ventilation after intubation with the Combitube (n = 19) with the traditional number 8 endotracheal tube intubation (n = 12) using arterial blood gas analysis. They report that all patients were intubated with the Combitube within 10 to 25 seconds with no tracheal placement after blind insertion. They concluded that this device provides an acceptable alternative to the endotracheal intubation whenever ideal conditions or trained staff for endotracheal intubation are not available.

More recently, Atherton and Johnson studied the ability of paramedics to use the Combitube in a prospective evaluation of 52 Combitube insertions in the prehospital setting. Thirty-six patients (69%) were intubated successfully (30 esophageal placements, 6 tracheal placements). However, 16 patients (31%) could not be intubated with the Combitube, mostly (n = 13) secondary to anatomic resistance during insertion. They concluded that it might be an effective prehospital airway device as both a backup to endotracheal intubation and as a primary airway.<sup>12</sup> However, they emphasize that visualized endotracheal intubation remains the preferred method of airway control.

In a subsequent study by Staudinger et al, 16 out of 17 successful esophageal intubations were performed using the Combitube in a hospital medical intensive care unit by nurses under supervision.<sup>13</sup> One patient underwent endotracheal intubation by the physician following failed attempts at Combitube insertion. They concluded that this device might serve as a back-up in both the prehospital and hospital settings.

In the setting of acute trauma and the need for a rapid and secure airway, several options are available. In a recent study Ezri et al investigated the difficult airway management practice patterns among anesthesiologists practicing in the United States.<sup>14</sup> In the controlled setting they concluded that fiberoptic intubation and the laryngeal mask airway (LMA) are the most popular in the management of the difficult airway. The LMA is a popular alternative to tracheal intubation introduced over 2 decades ago.<sup>15</sup> This is commonly used in the prehospital and operating room settings, especially when conventional tracheal intubation has proven difficult to achieve. The main disadvantage of this device is the failure to adequately protect against aspiration of gastric and oral contents. If ventilation cannot be achieved via the endo- or nasotracheal route then transtracheal jet ventilation (if available) can be used as a temporary measure to oxygenate the patient while preparations for alterna-

tive options such as fiberoptic intubation or surgical airway (tracheostomy versus cricothyrotomy) are undertaken.

Recommended options to resolve a critical airway event in the trauma setting include the LMA, the Combitube, transtracheal jet ventilation or a surgical airway.<sup>16</sup> Fiberoptic intubation can be a favorable option, however it is limited due to its availability in the field and difficulty of use.

In this report, the patient subsequently died from a massive intracranial hemorrhage secondary to a vertebral artery aneurysm. However, the cause of his esophageal rupture is clearly associated with the insertion of the Combitube. Although the possibility of esophageal perforation due to the multiple attempts at endotracheal intubation by the paramedics at the trauma scene needs to be considered, the use of the endotracheal tube is infrequently associated with this injury.<sup>17</sup>

Not unlike any other device used in resuscitation, the operator and equally important the subsequent hospital trauma personnel need to be aware of potential complications associated with any given intervention. The presence of subcutaneous emphysema, which is commonly observed on the CT scan in the evaluation of trauma patients is often explained by the presence of lacerations or other osseous/soft tissue injuries to the area. The possibility of esophageal injury should be considered with the use of the Combitube. The delayed detection and initiation of proper therapy of esophageal rupture will result in a higher risk of morbidity and mortality.<sup>18-21</sup> Therefore a high index of suspicion is necessary to diagnose and promptly manage esophageal injury with a known history of Combitube intubation.

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