Traumatic complete tracheal resection: multidisciplinary approach to manage an impending catastrophe.

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Abstract: Tracheobronchial laceration (TBL) involving the carina is a rare but potentially life threatening airway emergency. It constitutes 0.4 – 2% of thoracic trauma. Despite advances in imaging and radiological findings are suggestive of the tracheobronchial tree, bronchoscopy remains the gold standard of diagnosis. TBL resulting from blunt trauma commonly results from an impact in an airway pressure gradient over the tracheobronchial carina. The anterior membranous part of the trachea is the most common site of rupture which leads to an anterior tracheal rupture near the carina, which can occur and be catastrophic because of air leaks throughout the mediastinum compressing the great vessels. Definitive treatment entails surgical repair. Intraoperative ventilation can be complicated requiring high frequency jet ventilation, distal tracheal intubation, and cardiopulmonary bypass in severe cases. Intraoperative cross field ventilation may be required in ECMO. 

Case Report: A 9 year old, 36 kg, previously healthy female presented to the OR after a blunt chest injury. She was intubated at the scene with a 7.0 cuffed endotracheal tube (ETT) secured at 21 cm, secondary to respiratory distress with desaturation to 70%. She was hemodynamically stable upon arrival. Chest X-ray showed right main stem intubation and pneumomediastium. CT chest was consistent with intrathoracic tracheal injury, bilateral pneumothoraces and a distal tip of the ETT below the carina in the mediastinum. Patient was emergently taken to the operating room (OR). A right femoral arterial line was obtained in addition to already existing 3 large bore peripheral intravenous catheters. Patient received an intraoperative flexible bronchoscopy through the ETT, which revealed a 6 cm longitudinal tracheal laceration extending from the carina to the anterior and posterior tracheal walls and the left main bronchus. The anterior and posterior cartilaginous rings were separated. The ETT was adjusted to approximately 1 cm above the carina and sutured to the tip with 18 cm. Bilateral chest tubes were placed and ECMO was initiated for pulmonary protection. A detailed discussion involving anesthesiologists, surgeons and the ECMO team was held and cross field ventilation was deemed as the best surgical approach. Patient returned to the OR on POD #1 for an exploratory thoracotomy. Intraoperatively, the patient had sustained multiple mediastinal hematoma and inflammation. A complete disruption of the carina and a free-floating left main bronchus at the talus was the observed. The oral ETT was withdrawn slightly and a sterile 6.0 cuffed ETT was passed through the trachea and placed into the left main bronchus by the surgeon. Soluble left side ventilation was undertaken briefly. Reconstruction of the base and repair of tracheobronchial laceration was performed. Complete repair was verified with flexible bronchoscopy (FOB) that demonstrated viable flap tissue and an intact tracheobronchial tree.

Discussion: Pediatric tracheobronchial lacerations secondary to blunt injury are rare but potentially life threatening with mortality rate as high as 30%. Initial efforts should be directed towards identification of the location and extent of the laceration, and repair of the carina, and given a child’s pliable chest wall, can result in fatal disruptions of both the airway and major blood vessels. The clinical presentation is varied and severity of injury and include dyspnea, dysphagia, hoarseness of voice and hemoptysis. Associated findings include subcutaneous emphysema, pneumomediastinum, hemothorax, or pneumothorax and can cause death. Airway damage may take up to 10 days to 2 months after the trauma. Although chest X-ray and CT scan are the initial diagnostic tools for detection of TBL bronchoscopy is the gold standard for identification of the location and extent of the laceration. The essence of airway management in these cases is to bypass the lesion and ventilate the lung distally. This can be accomplished by creating a lumen ETT or probably double lumen ETT. The surgical reconstruction remains the definitive treatment of choice and the foremost anesthetic issue faced is inadequate ventilation despite an airway. Management is complicated by the need to share the airway. Effective and open interdisciplinary communication is paramount. The best clinical approach uses use of single lung ventilation; manual negative pressure jet ventilation, high frequency jet ventilation, and cardiopulmonary bypass in the most severe cases.

The cross field tube was then withdrawn and the oral ETT was advanced and the position verified with FOB. Intraoperative monitoring of ECGO waveform confirmed the success of the procedure. The patient tolerated the procedure well and the hemodynamics stayed stable throughout.

Conclusion: This case highlights the challenges experienced by the anesthesiology team in managing an acute tracheal laceration. It emphasizes the importance of multidisciplinary involvement to create a management plan that will lead to the most successful outcome and the availability of back up plans to manage any catastrophe to prevent adverse outcomes.

References:
7) Braund J, Waldman J. Emergency and Trauma. 2010; 17: 68-73