Complete Laryngotracheal Separation From Blunt Trauma: A Case Series and Discussion of Surgical Techniques

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INTRODUCTION

Complete laryngotracheal separation is a rare injury, comprising only a minute fraction of admissions to trauma centers. Most commonly cited mechanisms for injury include motor vehicle accidents, assaults, suicide attempts, sports accidents and occupational injuries. Blunt trauma accounts for the majority of laryngotracheal separations. Many people die instantaneously from total separation. However, if the separation does not occlude the airway, injuries often go unrecognized during initial resuscitation efforts. If the patient is conscious and not requiring immediate intubation, symptoms may include respiratory difficulty when lying flat, voice changes and stridor. Signs such as anterior neck bruising may be present, and radiographic studies will demonstrate subcutaneous emphysema or possible fractures in the trachea or adjacent cartilage structures.

Laryngotracheal injuries are graded I to V with grade I representing minor hematoma or laceration without detectable fracture up to a grade V, complete separation. Minor injuries can be managed conservatively, but unstable airways and displaced fractures mandate urgent surgical exploration and repair. If significant injury is recognized during primary evaluation, orotracheal intubation should be avoided to prevent further tracheal damage. Several authors have utilized endoscopy and awake tracheostomy following positive CT scan findings. Due to the rarity of complete separation, surgical techniques for repair are not widely published.

Case 1: Attempted Hanging

A 55yo male prisoner was brought to our trauma center following a failed hanging attempt. Upon his initial presentation, he was not having any difficulty breathing, swallowing, vocalizing, or managing his secretions. Anterior neck ecchymosis and crepitus were present, prompting further evaluation with CT scan of the neck. Along with subcutaneous air, a displaced trachea was also noted. Endotracheal intubation was not attempted.

Initial approach was made under local anesthesia with patient lightly sedated. Area of separation was encountered and an ETT placed for administration of general anesthesia. Anterior trachea was approached with 2.0 prolene sutures to take tension off of the area. Dissection was avoided laterally. The posterior wall aligned with placement of the anterior sutures. Tracheostomy was performed in the standard location, which was distal to the level of the anastomosis. Full fenestration was made, and skin edges were sutured directly to the trachea circumferentially to limit respiratory secretions from batthing area of repair. He was successfully decanuluated one month after initial injury, and required no further surgical interventions. Voice quality returned to baseline.

Case 2: Motor Vehicle Collision

A 46 year-old male who was in a high-speed motor vehicle collision was brought into the trauma bay, where he was noted to only be able to whisper to communicate. He had extensive subcutaneous emphysema on his neck, along with bruising and swelling. Endotracheal intubation was performed in the operating room prior to otolaryngology consultation.

Formal neck exploration was carried out under EMG monitoring of the recurrent laryngeal nerves. Sponaneous signals were observed from the left recurrent nerve. The trachea was discovered to be completely separated between the cricoid and thyroid cartilages. Prolene sutures were used to approximate the laryngeal complex through the trachea. The stitch was placed around the first tracheal ring in the center and on both sides. The incision was noted to have a nondisplaced fracture. To take the tension off of the incision, a hole was drilled into the midline inferior aspect of the thyroid cartilage and the midline suture passed through the cricothyroid membrane and through this hole to allow for the closure to be dependent on the inferior aspect of the thyroid cartilage rather than the cricoid. We then secured the lateral two sutures in a manner to oppose the lateral trachea to the cricoid. Tracheostomy was performed distal to the repair with full fenestration and maturation of the stoma to avoid contact of respiratory secretions with the anastomosis. The patient self decanuluated 3 weeks after the repair. His left vocal cord remained paralyzed. He was transferred to rehab with a hoarse voice, but no trachostomy.

Case 3: The Karate Chop

Our third case resulted from an open-fisted blow to the neck that was described by the patient as a “karate chop.” The 34 year-old male presented to the emergency department several hours after the original injury with difficulty breathing. Initial exam revealed a hoarse voice and extensive subcutaneous emphysema over the neck and anterior chest wall. He was stable enough on presentation to avoid aggressive measures at securing an airway. CT scan suggested disruption of the anterior wall of the trachea. He was instructed not to speak and was admitted to the trauma ICU for close observation.

Overnight he acutely decompensated and was rushed to the operating theatre. The distal end of the trachea was discovered completely separated at the level of the second tracheal ring. An endotracheal tube was secured to the distal end of the trachea with prolene sutures by the trauma surgeons prior to consulting otolaryngology. During our exploration, the posterior trachea was primarily reapproximated under agnic anesthesia. A 6.0 Shiley trach was then sutured in place prior to the first and second tracheal rings where the injury occurred. A fenestration was performed exactly the size of the trach and skin edges were sutured to the trachea. Again, this was designed to keep respiratory secretions from being in continuous contact with the repair. He was transferead to an out of state facility per family request. According to the patient, he required no further procedures and was decanuluated approximately 2 months after the injury. His voice quality was superb.

Discussion

Blunt trauma resulting in complete laryngotracheal separation is rare, and most of these patients die prior to hospital arrival secondary to airway compromise. Due to its rarity, only a handful of single case reports have been published describing outcomes from patients that survive such an injury. To our knowledge, this is the first case series in the United States to be reported that presents both surgical technique and long term outcomes on multiple patients. Many authors advocate placement of a surgical airway early in the patient’s course of treatment. Ye et al in China describe placement of a low tracheostomy, but there are no published descriptions of the tracheostomy technique. We feel that our method of placing a low tracheostomy with complete fenestration and maturation by approximation of the skin edges to the trachea provides the best environment for healing of the tracheal anastomosis. All three of our patients were successfully decanuluated within two months of the injury, and two had good voice quality. Our one patient with a persistent hoarse voice had injury to the recurrent nerve at the time of the laryngotracheal separation event. None of the patients required further procedures. We believe this to be at least partially related to early surgical intervention, and lack of unnecessary dissection.

Conclusion

Although a rare injury from blunt trauma, complete tracheal separation is a dangerous complication that can be successfully treated with early recognition. Voice changes and anterior neck crepitations were consistent signs in our patients. Early intervention was achieved on all patients, and after anastomosis was performed, a distal tracheostomy was made with maturation of the stoma. We feel that this technique helps to divert respiratory secretions away from repair. Excessive dissection was avoided, and suture placement was limited to only those sutures necessary to approximate the trachea and achieve a tension-free anastomosis. Our outcomes on this limited case review suggest that these techniques can be implemented to obtain both a good voice quality and freedom from long-term tracheostomy dependence.

References