

Early Diagnosis of Pediatric Laryngotracheal Rupture Following Minor Blunt Trauma

Maria Ramos-Fernandez*, Joakyna De Santiago, Javier Baez and Joanna Mercado

Department of Emergency Medicine, University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico, USA

Abstract

Laryngotracheal rupture is a rare but life-threatening condition that most commonly occurs after trauma to the chest or neck. Mechanism of injury involves large amounts of force. Therefore, injury is rare with low-impact trauma. It is important to keep in mind that physical exam and symptoms on presentation do not necessarily correlate with the severity of the injury.

Case Presentation: 14 year-old male who presented to the Emergency Department (ED) fast track area with neck discomfort after minor blunt trauma to the anterior aspect of neck, while running. Patient went home, developed throat pain, mild hemoptysis and hoarseness. Therefore, mother decided to bring him to the ED. On physical exam, patient was found with mild subcutaneous emphysema of the neck and upper chest. Neck for soft tissue and chest radiograph confirmed the clinical impression of suspected tracheal rupture in view of subcutaneous emphysema and pneumomediastinum. Patient was transferred for ENT evaluation where neck CT showed complete laryngotracheal rupture. Patient required surgical management for lesion repair.

Conclusion: Emergency Physicians should have a high level of suspicion in the presence of neck minor trauma where there may be a possibility of laryngotracheal injury. The patient's outcome depends to a great degree on early diagnosis.

Background

Laryngotracheal injuries are rare and carry a high mortality rate [1-3]. Unrecognized tracheal injury has been reported to have up to 92% mortality [4]. Tracheal rupture commonly results from acceleration-deceleration injuries from motor vehicle accidents, blows to the neck or strangulation. They may also occur as a rare complication of endotracheal intubation [5]. Patient usually present with symptoms such as hoarseness, pain, dyspnea or stridor, cough and odynophagia. Possible physical exam findings may include tenderness to palpation of larynx or trachea, ecchymosis or hematoma of the neck. However, the most significant finding is the presence of subcutaneous emphysema of the neck that may extend into the chest area [6]. The diagnosis of isolated tracheal rupture is very important for treatment and prognosis [3,4]. Only an urgent surgical exploration can ensure a long-term good outcome [1,2]. We present the case of a pediatric patient with tracheal rupture who arrived with minimal symptoms and reported an atypical and unusual mechanism of injury.

Case Presentation

A 14 year-old male without past medical history arrived with his mother to the Emergency Department fast track area complaining of throat pain. He was ambulating unassisted, and stated anterior neck pain and mild hoarseness, after he received neck trauma with a rope while running. Upon evaluation patient had, stable vital signs and adequate peripheral oxygen saturation. He was awake, alert, oriented, with no respiratory distress, drooling, stridor, or dysphagia. Physical exam was remarkable for abrasion marks over anterior aspect of neck, subcutaneous emphysema from sub-mental region to clavicles, but bilateral equal breath sounds. Other systems were unremarkable. Clinical findings raised concern for possible tracheal rupture. Since patient had stable vital signs and protecting his airway, he was placed on oxygen therapy and radiologic images were obtained. They revealed significant subcutaneous emphysema with pneumomediastinum (Figure 1). Patient was then transferred uneventfully to trauma center

for ENT evaluation, where he was diagnosed with tracheoesophageal tear at level of C4-C5 (Figure 2).

Discussion

Tracheobronchial rupture is rare. It is commonly associated with penetrating neck and chest trauma. However, the literature describes, an increasing incidence among blunt trauma patients [7-10]. It is particularly seen in high energy mechanisms like for example motor vehicle collision. Only 265 cases are reported in the literature between 1873-1996. Of those cases, only 19% had tracheal injury alone and the rest had bronchial involvement [9]. The low incidence might be explained by the protection of trachea through its anatomical location behind mandible, sternum, and the first four ribs. Another reason could also be the structural cartilaginous support that makes the trachea flexible, elastic and mobile [11]. This flexibility is particularly more prominent on pediatric patients, making rupture less common [12,13].

Clinical manifestations of tracheal injury involve non-specific symptoms such as: dyspnea, cough, hemoptysis and cyanosis [8,14]. After literature review, the key clinical signs include subcutaneous emphysema, pneumomediastinum, pneumothorax, and respiratory

***Corresponding author:** Maria Ramos-Fernandez, Department of Emergency Medicine, University of Puerto Rico, Medical Sciences Campus, San Juan, Puerto Rico, USA, E-mail: mariaramos@gmail.com

Received August 28, 2013; **Accepted** October 10, 2013; **Published** October 15, 2013

Citation: Ramos-Fernandez M, Santiago JD, Baez J, Mercado J (2013) Early Diagnosis of Pediatric Laryngotracheal Rupture Following Minor Blunt Trauma. Trop Med Surg 1: 146. doi:10.4172/2329-9088.1000146

Copyright: © 2013 Ramos-Fernandez M, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.



Figure 1: Emergency Department x-rays shows subcutaneous emphysema. No pneumothorax noted.

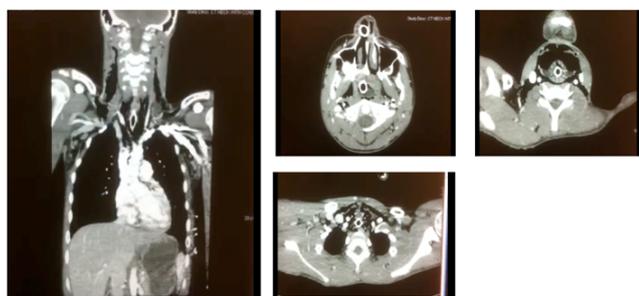


Figure 2: CT Scan shows laryngotracheal disruption with subcutaneous emphysema.

distress, [11-13,15-19]. Those findings should raise a clinical suspicion for tracheal injury, even in the setting of a minimal mechanism of trauma such as the one described. Stridor and hoarseness were also reported in the literature [13,20,21].

There are four proposed mechanisms of blunt trauma tracheobronchial injury. The first is related to the increase of airway pressure in the presence of a closed glottis, leading to a linear rupture of membranous trachea, [9,10,15,18]. This is also described as an explosive or burst injury [8]. A second mechanism is the crush injury that results in a decrease in the AP diameter and related compression of lungs laterally that result in tracheobronchial disruption after tensile force exceeds its elasticity [5,15]. The third proposed mechanism is the acceleration/deceleration injury that might be seen on motor vehicle collisions due to movement of trachea from its fixed point between the cricoid cartilage and the carina [10,15,21]. The fourth postulated mechanism is the direct blow to a hyperextended neck resulting in a crush injury to the airway as it is compressed against an object and the vertebral bodies, [13,15].

We found several case reports about tracheal lesions associated with minor traumatic mechanisms. Natarajan et al. presented the case of a 61y/o male with anterior tracheal rupture after a 6 feet fall [14]. Corsten and Berkowitz presented two pediatric patients of 29 months and 5 years, with tracheal rupture after falling from a bench and against a drawer respectively [12]. A more recent case from Fette [18] was an 8y/o boy with tracheal rupture after he hit the water surface with an over extended neck. All cases are similar in the less expected, low energy mechanism of injury. However, this case can be classified as rare because of the low energy mechanism, but also due to the severe injury extension such as involvement of cervical trachea and esophagus. Similar injuries are described in literature related to high energy trauma, (Martel), with an incidence between 1%-2% [7]. However, patients had associated injuries in 50%-100% of the cases

reported. Therefore, this case is unique also in the isolated nature of the injury [7,9]. Mortality can range from 20%-50%, [6,15] of those patients that reach the hospital. This is often due to associated injuries. Morbidity can range from 10%-25% often due to failure of early recognition and the complications of airway obstruction, atelectasis, and stenosis [9,15]. Currently, there is still controversy about early vs. delayed repair and conservative vs surgical management among specialists, but they all agree in that early recognition is essential to improve morbidity and decrease mortality. When a patient comes to the emergency department, physicians should have a low threshold for extensive evaluation that include images on any patient presenting with neck trauma, even with trivial mechanism, and particularly in those presenting with subcutaneous emphysema, stridor, hoarseness with or without respiratory symptoms. As seen in this case, external injuries could be minimal or even absent on patient arrival, not correlating with the severity of damage [18]. Clinical suspicion is a key aspect for prompt diagnosis and subsequent management.

Conclusion

Laryngotracheal rupture following blunt neck trauma is rare and can be initially overlooked. However, timely recognition and treatment is important in order to decrease bad outcomes. Therefore, Emergency Medicine and Trauma Physicians should have a high index of suspicion for this type of lesion, regardless of the mechanism of trauma, and minor symptomatology. This would enable a prompt diagnosis, appropriate treatment by ENT subspecialist and decreased morbidity and mortality.

References

1. Yadav SP, Arora V, Mahajan R, Hooda S (2001) Laryngotracheal transection in blunt trauma of the neck. *Indian J Chest Dis Allied Sci* 43: 43-45.
2. Bernat RA, Zimmerman JM, Keane WM, Pribitkin EA (2005) Combined laryngotracheal separation and esophageal injury following blunt neck trauma. *Facial Plast Surg* 21: 187-190.
3. Offiah CJ, Endres D (1997) Isolated laryngotracheal separation following blunt trauma to the neck. *J Laryngol Otol* 111: 1079-1081.
4. Putra SP, Mazita A (2009) Laryngotracheal disruption caused by blunt neck injury. *The internet journal of head and neck surgery* 3: 1.
5. Karmy-Jones R, Wood DE (2007) Traumatic injury to the trachea and bronchus. *Thorac Surg Clin* 17: 35-46.
6. Atkins BZ, Abbate S, Fisher SR, Vaslef SN (2004) Current management of laryngotracheal trauma: case report and literature review. *J Trauma* 56: 185-190.
7. Reza H (2010) Management of tracheobronchial injuries: brief report. *Iran J Med Sci* 35: 3.
8. Martel G, Al-Sabti H, Mulder DS, Sirois C, Evans DC (2007) Acute tracheoesophageal burst injury after blunt chest trauma: case report and review of the literature. *J Trauma* 62: 236-242.
9. Kiser AC, O'Brien SM, Detterbeck FC (2001) Blunt tracheobronchial injuries: treatment and outcomes. *Ann Thorac Surg* 71: 2059-2065.
10. Chu CP, Chen PP (2002) Tracheobronchial injury secondary to blunt chest trauma: diagnosis and management. *Anaesth Intensive Care* 30: 145-152.
11. Hwang JCF, Hanowell LH, Grande CM (1996) "Peri-operative concerns in thoracic trauma". *Bailliere's Clinical Anaesthesiology* 10: 123-153.
12. Corsten G, Berkowitz RG (2002) Membranous tracheal rupture in children following minor blunt cervical trauma. *Ann Otol Rhinol Laryngol* 111: 197-199.
13. Feat S, Le Clech G, Riffaud L, Godey B (2002) Complete cervical tracheal rupture in children after closed trauma. *J Pediatr Surg* 37: E39.
14. Natarajan A, Sanders GM, Bosnac Sadhahalli (2006) A case of anterior tracheal rupture following trivial trauma. *Chest medicine on line* 2006.

15. Huang J, Needs RE, Miller HA, Devitt JH (1994) Unsuspected tracheal rupture in blunt thoracic trauma. *Can J Anaesth* 41: 1208-1210.
16. Rollins RJ, Tocino I (1987) Early radiographic signs of tracheal rupture. *AJR Am J Roentgenol* 148: 695-698.
17. Prunet B, Lacroix G, Asencio Y, Cathelinaud O, Avaro JP, et al. (2008) Iatrogenic post-intubation tracheal rupture treated conservatively without intubation: a case report. *Cases J* 1: 259.
18. Fette A (2008) Trachea rupture lesion in children: the two extremes. *Technol Health Care* 16: 319-329.
19. Balci AE, Eren N, Eren S, Ulkü R (2002) Surgical treatment of post-traumatic tracheobronchial injuries: 14-year experience. *Eur J Cardiothorac Surg* 22: 984-989.
20. Narci H, Gündüz K, Yandi M (2004) Isolated tracheal rupture caused by blunt trauma and the importance of early diagnosis: a case report. *Eur J Emerg Med* 11: 217-219.
21. Stark P (1995) Imaging of tracheobronchial injuries. *J Thorac Imaging* 10: 206-219.