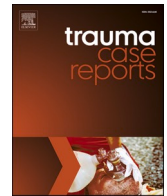




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Case Report

Traumatic laryngeal fracture: A case report

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ABSTRACT

Background: The blunt laryngotracheal trauma is a potentially life-threatening infrequent cause of injury that can present with subtle symptoms which often lead to delay in diagnosis if not suspected.

Case presentation: The authors report a case of a 16-year-old adolescent admitted to the emergency room after a bicycle accident with isolated blunt cervical trauma subsequent to headphones use. The patient presented with odynophagia, hemoptysis, edema, tenderness, linear ecchymosis in the anterior cervical area and no signs of respiratory distress. Cervical computed tomography scan revealed an aligned left side thyroid cartilage fracture. The patient progressed with a complete clinical recovery and at 3 month-follow-up reported no symptoms.

Conclusions: Laryngeal fracture is a rare entity in patients with blunt cervical trauma. A high level of suspicion along with a systematic approach is essential for rapid recognition and early treatment, regardless of the severity of the presenting symptoms, in order to preserve airway and voice functions and improve outcomes.

Introduction

Laryngeal fracture is a potentially fatal, rare traumatic injury in childhood. There is a clinically concerning increased incidence of these type of injuries, with varying incidences from 1:30,000 to 1:37,000 and a mortality rate that ranges between 2.04% and 15% [1–5]. Although rare, it has been reported to be more frequent in boys than in girls, with an average age of 9.5 years [2,5]. Its low incidence is most probably due to its protected position by the mandible, spine and sternum. It can be secondary to direct penetrating or blunt trauma to the neck region in the context of motor vehicle accidents, strangulation, assaults and sports-related injuries. Blunt trauma caused by motor vehicle collisions is by far the most common mechanism of laryngeal injury, occurring when the neck hits the steering wheel, dashboard or windshield [1,3,6,7]. It is often present in association with esophageal, recurrent laryngeal nerve and maxillofacial injuries, reason why awareness of this diagnosis and knowledge of its treatment is mandatory when managing these patients [2,7]. Common presenting symptoms of laryngeal injury are respiratory distress, hemoptysis, voice alteration (hoarseness, stridor), dysphonia, odynophagia, dysphagia and aspiration [2,3]. Physical findings include edema, laryngeal tenderness and cervical pain, hematoma, ecchymosis, subcutaneous emphysema, loss of anatomic landmarks (thyroid cartilage prominence), open neck wound, vocal cord immobility, bony crepitus and pneumomediastinum. Although the most prevailing presentation is acute, patients can manifest up to 48 h post-injury and none of the symptoms is pathognomonic or correlated with the severity of the injury [3,8]. A late recognition of this entity in patients admitted to trauma centers is common and often result of subtle initial symptoms, unawareness of its existence by physicians or severe presentation of associated injuries. Delayed diagnosis can threaten the three primary

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laryngeal functions (respiratory, phonatory and deglutitive functions), leading to worst outcomes and increased morbidity and mortality [6,8]. Therefore, diagnosis in a timely manner is important for treatment and prognosis.

Case-report

A 16-year-old adolescent was admitted to the emergency room in a tertiary trauma center after a bicycle frontal collision with a motor vehicle. The patient was conscious, oriented, Glasgow Coma Scale of 15, hemodynamically stable, presenting neck pain, odynophagia, hemoptysis, with no associated signs of dysphonia, hoarseness, stridor, dyspnea, respiratory distress or need of supplemental oxygen administration. His physical examination was normal except for edema, tenderness and an erythematous line across his anterior neck at the level of the cricoid cartilage, with no palpable subcutaneous emphysema. It was possible to correlate the erythematous line to the headphone cord he was using at the time of the accident. The patient had his phone in his pocket and had his earphones in inside the helmet, being pulled across his neck at the time of the impact. Cervical computed tomography revealed an aligned longitudinal fracture of the thyroid cartilage, obliteration of the left pyriform sinus and extraluminal air in the supraglottic and glottic regions - Schaefer Classification 2 (Fig. 1). Otorhinolaryngology consultation was requested and a direct laryngoscopy demonstrated a submucosal ecchymosis of the vocal folds with mobility preserved and no evidence of trauma to the surrounding larynx and hypopharynx. The patient was initially admitted to the pediatric surgery ward for monitoring and did not require surgical airway management. In subsequent evaluations, a bilateral vocal cord hematoma was detected at 24 h post-injury and left vocal cord paresis on the third day post-injury, but no new imaging findings were seen in the repeated cervical computed tomography at 48 h postinjury. He was discharged 7 days post-injury, fully recovered. Antibiotics (cefuroxime), methylprednisolone and proton pump inhibitors were administered for a total of 7 days. At 3-month follow-up, the patient presented asymptomatic.

Discussion

Laryngotracheal injuries can be fatal owing to the potential for airway compromise and collapse, and a delayed diagnosis is frequently reported in the literature, contributing to the poor outcomes [1–3,5,6,8]. Furthermore, blunt neck injuries in the pediatric population maybe associated with significant laryngotracheal disruption and fracture, with a greater life-threatening risk given the smaller dimensions of the pediatric airway [4,5]. On the other side age also influences the pattern of injury, considering that the thyroid and cricoid cartilages ossify during early childhood, and a calcified larynx of an adult may fracture in more than one place, while a more elastic larynx in a young patient will mostly fracture at a single site. In cases of blunt trauma, the larynx is compressed between an intrusive object and the cervical spine, and recoils back into position. Depending on the degree of compressive force, a range of injury pattern can result [7]. Complete laryngotracheal and esophageal avulsion with severe laryngeal crush injury has been reported in a pediatric patient [4]. As so, the possibility of combined injuries to adjacent structures such as the esophagus, trachea and cervical spine should be addressed in patients with blunt neck trauma, since the initial symptoms are variable and nonspecific [8]. Early identification can be possible with a directed history and physical examination. Once the airway and cervical spine are found to be stable, cervical computed tomography (CT) is considered the gold standard diagnostic tool to evaluate the larynx and the surrounding structures and is also a useful therapeutic guide, differentiating patients who require little or no treatment from those with a complex composite tissue injury severe enough to warrant surgical treatment [1,6–8]. It has also been proposed to be mostly beneficial in patients with a significant kinetic energy injury and with minimal external signs, uncertainty about the extent of injury or inability to observe continuity of the endolarynx and trachea due to edema or hematoma [6]. Nevertheless, it has been reported to fail to identify injury in pediatric patients in almost 30% of the cases [5]. Fiberoptic laryngoscopy is generally diagnostic, providing excellent assessment of vocal cord function and mobility and valuable information about endolarynx integrity, but it can be challenging when bleeding or significant edema are present [6,7]. The Schaefer-Fuhrman classification allows categorization of severity of laryngeal injury and management recommendations, and it has been reported that one can predict patient outcome for voice and airway function [7,8]. Treatment goals of laryngeal trauma consist in insurance of a patent airway, immediate effective management of the compromised wounded airway, and definitive treatment [6]. In the presence of respiratory distress or increasing stridor, early

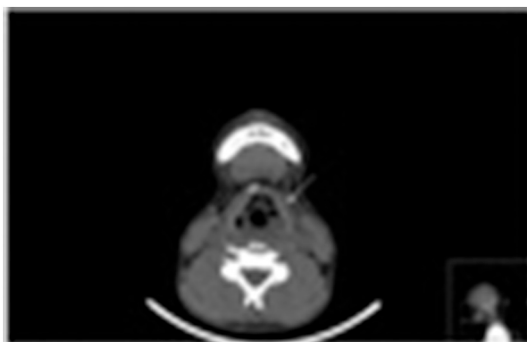


Fig. 1. A fracture line in the left thyroid cartilage.

endotracheal intubation should be performed, although can be difficult due to distorted anatomy and poor visualization, and may also further disrupt endolaryngeal structures and aggravate airway obstruction [5,8]. These patients can be emergently managed with local tracheostomy or cricothyroidotomy [3,6,7]. Conversion to tracheotomy in the first 24 h period after intubation has also been recommended [1]. Surgical reduction is indicated in displaced fractures and if there is any concern for an unstable airway, and should be directed towards maintenance of the airway and functional anatomy. It may include neck exploration, open reduction, internal fixation of a displaced fracture, soft tissue repair with laryngofissure or stenting [8]. Fracture fixation has also been advocated in nondisplaced fractures to restore structural integrity and optimize vocal fold reconstruction [6,8]. The timing of surgical management (early, within the first 24 h, versus late), is still a matter of debate, and knowledge on the influence of timing of repair on airway, phonation and deglutition functions is lacking [2,6]. Before surgical reparation of the laryngeal structures, a tracheostomy has been recommended, as well as full endoscopic evaluation with esophagoscopy, to diagnose concomitant injuries to the pharyngoesophageal region, and bronchoscopy to help ascertain the extent of the injury [7]. Nevertheless, Cheng et al. reported that significant deviation and variation from recommended management algorithms exists in pediatric patients, with the majority managed conservatively with observation or endoscopy alone [5]. Watchful waiting should be based on clinical findings and limited to nondisplaced fractures, minor endolaryngeal mucosal lacerations, hematoma, contusion or abrasion injuries with no airway compromise, relying on close clinical observation, surveillance and timely intervention, if necessary. In blunt trauma the potential acute decompensation may progress over hours as a combination of edema, hematoma or inherent instability of the laryngeal skeleton, and observation has been proposed for at least 48 h [5]. Corticosteroids may minimize edema and threat to airway compromise, and proton pump inhibitors may reduce granulation tissue formation, but there have been no randomized studies proving its efficacy [3,7]. In addition to clinical stabilization and securing airway patency, laryngeal treatment with speech therapy sessions is also considered important to help improve long-term vocalization and deglutition [1]. In the presenting case, the patient demonstrated many of the classical symptoms such as hemoptysis, neck tenderness and a linear cervical bruise. Although hoarseness was absent, it has been described to be generally associated with fractures of the thyroid cartilage, secondary to vocal cord edema, endolaryngeal lacerations, or avulsion of the vocal cords from the anterior commissure [7]. To our knowledge, this is the first laryngeal fracture caused by headphones trauma during a bicycle accident and compared to other published reports, hospital admission was longer, probably due to the finding of vocal cord transitory unilateral paresis. In our case, the patient presented with a late transitory post-injury vocal paralysis recovering after a period of 48 h. Since injury can progress in the first hours, inpatient observation and reevaluation is recommended in all patients despite clinical stability and benign physical findings. Early airway management and treatment are important determinants of good outcomes [6]. After discharge, clinical follow-up is recommended for delayed sequelae [5].

Conclusion

Although rare, anterior blunt or penetrating neck trauma demand a high grade of suspicion for laryngeal injury, since the spectrum of presentation can widely vary and early management is imperative for good patient outcomes. CT scan is highly indicated in stable patients, since it can diagnose most laryngeal fractures as well as associated injuries. The authors also pretend to generate greater awareness to the less expected danger involving the use of headphones during bicycle rides and traffic.

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Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could lead to the identification of the patient.

Declaration of competing interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

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