

Successful Management of a Threatened Airway in a Child With Near Complete Supraglottic Transection of the Larynx: Case Report

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Abstract

The laryngotracheal trauma is an extremely challenging scenario especially in children as it may be associated with a threatened airway, unstable cervical spine, the risk for major hemorrhage, and other associated traumatic injuries. We report a successful emergency airway management of a very rare presentation of an open pediatric laryngotracheal injury.

A 10-year-old 20kg male child sustained a 20 cm lacerated wound over the anterior aspect of the neck and a horizontal tracheal rent through a wire tied over the windshield of a two-wheeler, while hit by a car from the backside. The child was agitated and had noisy breathing along with coughing of blood-stained sputum and loss of voice. In view of the potentially threatened airway, a 4.5 cuffed endotracheal tube (ETT) was inserted through visible anterior tracheal rent in the emergency room, and subsequently, tracheostomy and feeding gastrostomy was done. The child was discharged 3 weeks later after decannulation and removal of feeding gastrostomy.

Keywords: Laryngotracheal trauma; Airway; Pediatric.

Introduction

The overall incidence of laryngotracheal injuries secondary to blunt neck trauma is

<1% [1] and it is even lower in children [2] as pediatric larynx is positioned more superiorly and partially protected by the mandibular

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arch and flexible because of the elasticity of the cartilaginous support of the airway.

Acutely life-threatening airway laceration, obstruction, haemorrhage, and aspiration of blood makes laryngotracheal trauma an exceptional grievous injury associated with high mortality and presents as a major challenge to anaesthesiologist.

It demands prompt decision making and a multidisciplinary approach for favorable outcomes.

We report a successful emergency airway management of severe paediatric laryngotracheal trauma with a complete laryngeal transection at a tertiary care center of north India.

Case

A 10-year-old 20 kg male child sustained an injury to the neck by a wire tied over the windshield of a two-wheeler, while a car hit

from the backside. The patient was referred to our tertiary care center from a civil hospital after primary treatment in view of the threatened airway. On examination there was a 20 cm lacerated wound over the anterior aspect of the neck and a horizontal laryngeal rent (Figure 1a), the child was agitated had noisy breathing along with coughing of blood-stained sputum and loss of voice. The child was breathing spontaneously with respiratory rate of 24/min, heart rate 112/min, blood pressure of 120/77mmof Hg, and saturation of 98%. Midazolam (1mg), glycopyrrolate (0.2mg), and dexamethasone (3 mg) were given intravenously (IV) for sedation, decreasing airway secretions and edema respectively, along with IV paracetamol, antibiotics and tetanus. In view of potentially threatened airway a 4.5 cuffed endotracheal tube (ETT) inserted through the visible anterior laryngeal rent in the emergency room (Figure 1 b and c) and cervical collar was applied to protect cervical spine.



Figure 1a



Figure 1b



Figure 1c

Figure 1(a): Lacerated wound in the anterior part of neck; 1(b&c): Endotracheal tube insertion through laryngeal rent.

The correct placement was confirmed by capnography and bilateral air entry. The child was maintaining 96–98% oxygen saturation by spontaneous breathing through the T piece attached to ETT at an oxygen flow rate of 6 L/min with no signs of respiratory distress. ETT was secured with stay sutures, compression bandages along with a rigid cervical collar were applied over the neck. Bedside thoracic compression test and extended focused assessment with sonography for trauma (eFAST) were negative. As there was no sign of active bleeding and the patient was hemodynamically stable, Non-Contrast Computed Tomography (NCCT) head and neck and CT angiography of the neck to rule out injury to major vessels of neck followed by shifting to operation room (OR) for definitive airway management were planned. The NCCT revealed defects in the skin, subcutaneous tissue, strap muscles, and anterior wall of the larynx at the level of true vocal cords (C3-C4) (Figure 2a) with surgical emphysema along deep muscle planes. CT angiography revealed no injury to major blood vessels.

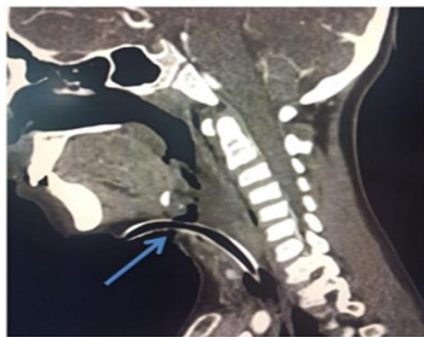


Figure 2 a



Figure 2b

Figure 2(a): Saggital section of NCCT head and neck showing tracheal rent(arrow), 2(b): Videolaryngoscopic view of glottis.

Tracheostomy was performed at 2nd and 3rd tracheal ring with size 6 cuffed tracheostomy tube and after confirming position of tracheostomy tube anesthesia was maintained with atracurium, sevoflurane, and air in oxygen. The epiglottis was found to be detached from the thyroid cartilage, along with thyrohyoid disruption and severely affected pharynx. It was realized that the glottic inlet visible through the video laryngoscope was swollen arytenoids, disrupted from true vocal cords. The epiglottis was affixed, nasogastric tube was inserted through nose to assist repair of hypopharynx in layers and in view of the anticipated difficulty in deglutition, feeding gastrostomy was done. The patient was shifted to HDU on T-piece after reversing the residual neuromuscular blockade.

After one-month child was successfully decannulated from tracheostomy with complete return of voice.

Discussion

This is a unique case of paediatric laryngotracheal trauma with a visible glottic inlet and a spontaneously breathing haemodynamically stable child.

Different airway scenarios may provoke off-track management, but keeping in mind the basic principles of airway management, risk-benefit analysis and degree of patient cooperation, airway trauma should be managed on a patient-by-patient basis. Potential difficulties to consider are multisystem trauma, injuries to major blood vessels, cervical spine and aerodigestive tract, blood loss, upper airway obstruction, neck haematoma, pneumomediastinum, pneumo-

thorax and subcutaneous emphysema around the airway that can distort anatomy and impair tracheostomy.

As the possibilities of creation of a false passage with advancing a bougie or tracheal tube blindly beyond the vocal cords are high the safest approach to patients requiring intubation is to instrument the trachea under direct vision with the patient awake and breathing spontaneously [3].

Neuromuscular blocking agents should be avoided as muscle tone may be important for airway integrity in airway transection.

Our decision to intubate through the rent was difficult, as in children chances of placement of endotracheal tube in a false track is high as the laryngeal cartilages are more pliable, airway lumen is narrower, mucosa is loosely attached with increased risk of hematoma which may further compromise the airway and precipitate difficulty in breathing [2]. Child was kept on spontaneous breathing to avoid increase in subcutaneous emphysema with positive pressure ventilation in case of false track and muscle relaxation was given only after successful tracheostomy.

We made plan A, B and C for airway management since CT imaging in children may not detect cartilagenous injuries due to their non-calcified status and may miss significant airway injuries. Cheng et. al. proposed a management strategy for pediatric blunt laryngeal and tracheal trauma and has advised if the child is stable a CT should be done but if the child is unstable in order to secure airway immediate operative endoscopy with neck exploration is

recommended as obtaining a CT will delay life-saving airway management [4].

Three judicious approaches to airway management are suggested in case of blunt laryngotracheal trauma. First, an awake tracheostomy under local anaesthesia, however it may be difficult and is limited by patient cooperation and the time taken to assemble skilled assistance. Second, awake fiberoptic intubation which maintains spontaneous ventilation and allows simultaneous airway assessment and placement of a tracheal tube distal to any pericardial defect, but it may be difficult if blood or debris is present within the airway.

Third, fibrescope-assisted direct or video-laryngoscopy as part of a modified rapid sequence induction (with no cricoid pressure or positive pressure ventilation because both may aggravate the injury). Modified rapid sequence induction and rigid bronchoscopy is an alternative choice, because airway inspection is simultaneous with intubation but requires a high degree of operator skill [5].

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Hwang et. al. in a 26-year-old male inserted reinforced size 8 ETT via the open wound with near-complete transection of the larynx between the hyoid bone and thyroid cartilage after rapid sequence induction and then patient was reintubated orally [6].

In our case during surgical exploration, it was found that the glottic inlet visible through the video laryngoscope was swollen arytenoids, disrupted from true vocal cords and this could have led to insertion of endotracheal tube in false passage if it would have been taken out from laryngeal rent and secured orally before performing traceostomy.

Conclusion

Finally, there is no single way to manage pediatric laryngotracheal trauma, a combined team approach involving experienced anesthesiologist, otolaryngologist, and surgeon is of prime importance for prompt decision making and thereby successful management.