International Journal of Pediatric Otorhinolaryngology 87 (2016) 83–86

Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: http://www.ijporlonline.com/

Emergent airway management in the labor and delivery suite

Paul C. Bryson [a, *], Kathy Abode [b], Carlton J. Zdanski [b]

[a] Cleveland Clinic Head and Neck Institute, Cleveland, OH, USA
[b] The North Carolina Children's Airway Center, The University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

ARTICLE INFO

Article history:
Received 5 February 2016
Received in revised form
14 April 2016
Accepted 12 May 2016
Available online 24 May 2016

Keywords:
Neonatal airway
Congenital airway abnormalities
Pediatric airway management

ABSTRACT

Introduction: Congenital airway obstruction is of varied etiology and uncommonly encountered. Prenatal care and imaging have enhanced detection of these abnormalities and allow for multi-disciplinary care planning for airway management at delivery. Despite the availability and advances in prenatal imaging, unanticipated airway obstruction may not be identified until the time of delivery.
Methods: Case series.
Results: Four airway emergencies were encountered in the labor and delivery suite over an eight-month period. Clinical history is correlated with autopsy findings. Congenital upper airway and laryngotracheal anomalies are reviewed. Recommendations to improve timely and efficient airway management in the labor and delivery suite are discussed and a protocol for a multi-disciplinary neonatal emergency airway response team is offered for consideration.
Conclusions: The development and implementation of a multi-disciplinary emergency newborn airway protocol is both realistic and feasible. While it did not improve survivability in our small group, it did reduce response time. It, or a protocol like it, is recommended for institutions caring for high-risk pregnancies and with Neonatal Intensive Care Units with high acuity patients.

1. Introduction

Congenital airway obstruction is of varied etiology and uncommonly encountered. Prenatal care and imaging such as gestational MRI have enhanced detection of these abnormalities and allowed for multi-disciplinary care planning for airway management at delivery. Despite the availability and advances in prenatal imaging, unanticipated airway obstruction may not be identified until the time of delivery. Herein are discussed airway emergencies encountered in the labor and delivery suite over an eight-month period. Clinical history is correlated with autopsy findings, congenital upper airway and laryngotracheal anomalies are reviewed, recommendations to improve timely and efficient airway management in the labor and delivery suite will be discussed, and protocols developed for an emergency airway response team are reviewed.

2. Methods

Case series with corresponding autopsy findings. IRB approval was obtained.

3. Case histories

3.1. Patient 1

A female infant was born at 38 weeks gestation via scheduled caesarian-section. Her gestation was complicated by fetal anomalies diagnosed by prenatal ultrasound including: ventriculo-septal defect, pulmonary atresia, polyhydramnios, and intra-uterine growth restriction. It is unclear if prenatal palliative care consultation was obtained. At birth, cyanosis of the child was immediately observed and attempts at intubation were unsuccessful. Otolaryngology was paged emergently. Direct laryngoscopy demonstrated fused vocal folds and intubation was not possible. While preparing for tracheotomy, the esophagus was purposefully intubated in the event that a possible tracheo-esophageal fistula existed so that some ventilation might occur. These attempts were unsuccessful. Upon opening the neck, the subglottic airway terminated into a blind pouch and the trachea was absent.

Autopsy findings demonstrated pulmonary and tracheal agenesis, type III laryngeal atresia with fused vocal folds (Fig. 1), and absence of the pulmonary vasculature. Cytogenetic analysis demonstrated a chromosomal deletion corresponding to that seen in DiGeorge Syndrome. Following this event, after debriefing with

* Corresponding author. 9500 Euclid Ave., A-71, Cleveland, OH 44143, USA.
E-mail address: brysonp@ccf.org (P.C. Bryson).

http://dx.doi.org/10.1016/j.ijporl.2016.05.016
0165-5876/

pediatric otolaryngology and the neonatal intensivists, the presented airway protocol was implemented.

3.2. Patient 2

A female infant was born at term via caesarian-section. No fetal anomalies were observed at 15-week ultrasound, but there was documented oligohydramnios. At birth, multiple fetal anomalies, poor respiratory effort, cyanosis, and the inability to pass an endotracheal tube were noted. Otolaryngology was emergently called to the labor and delivery suite where direct laryngoscopy, bronchoscopy, and esophageal intubation were unable to establish an airway or allow the neonate to be ventilated. Attempted tracheotomy revealed proximal tracheal stenosis. Response time for this emergency was markedly improved and equipment procurement was more easily facilitated.

Autopsy findings demonstrated proximal tracheal stenosis, abundant mucus plugging of remnant trachea and proximal bronchi, and persistence of a pharyngoglottic duct (Fig. 2) [1]. These findings combined with syndactyly, urogenital abnormalities, and cryptophthalmos lead to a final diagnosis of Fraser syndrome.

3.3. Patient 3

A female infant was born at 35 weeks gestation via emergency caesarian-section due to fetal distress. She was prenatally diagnosed with bilateral ventriculomegaly, cerebellar vermis abnormality, and multiple extremity abnormalities. Again, it was unclear if a palliative pre-natal medicine consultation was obtained. At the time of delivery the newborn was not breathing and was poorly perfused. Attempts at endotracheal intubation were unsuccessful secondary to inability to open the child's mouth. Otolaryngology was paged to the labor and delivery suite emergently, while the child's airway was managed with positive pressure ventilation. The child became increasingly difficult to bag-mask ventilate. Surgical airway equipment was immediately available in the labor and delivery suite. Otolaryngology promptly established a surgical airway upon arrival and the neonate was taken to the neonatal intensive care unit, where the child expired shortly after arrival with a clinical diagnosis of bradycardia, poor perfusion, and disseminated intravascular coagulation.

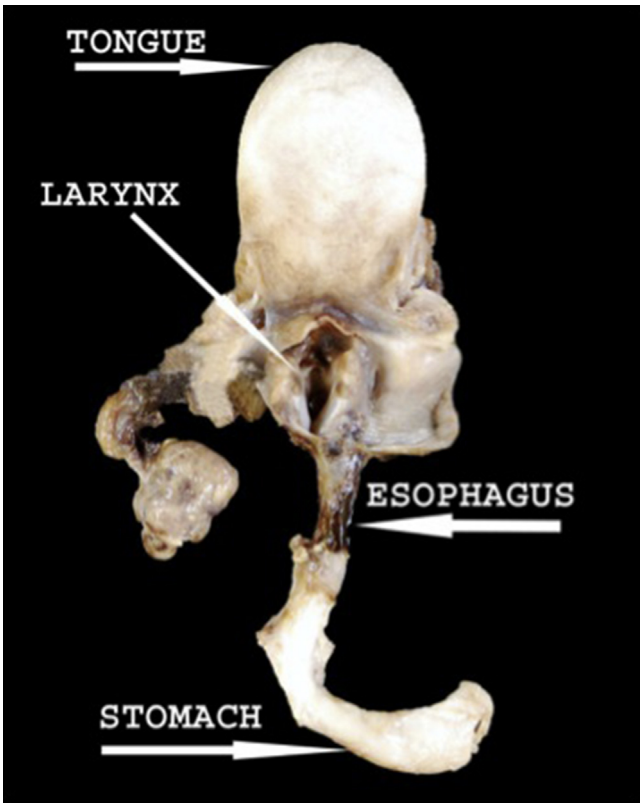

Fig. 1. Patient 1 autopsy findings: pulmonary and tracheal agenesis, laryngeal atresia with fused vocal folds, absence of pulmonary vasculature.

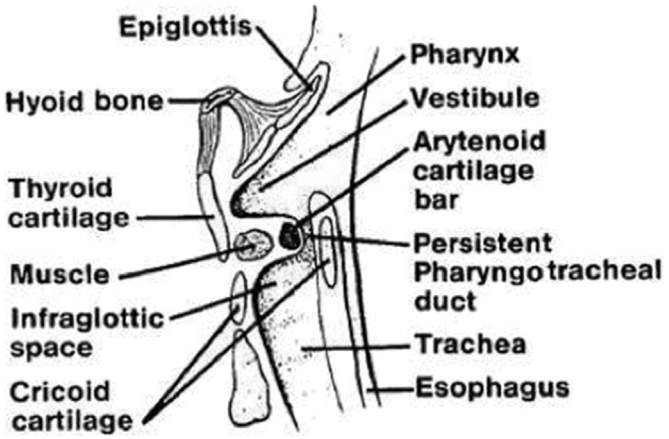

Fig. 2. Example of pharyngoglottic duct in type III laryngeal atresia. Image courtesy of Smith and Bain (1965).

Autopsy findings included generalized arthrogryposis, severely malformed brain with cerebellar hypoplasia, pulmonary hypoplasia, and midline hard and soft palate defects. Cytogenetics analysis revealed a single deletion from the short arm of chromosome 3.

3.4. Patient 4

A male infant was born at 32 weeks gestation via emergency c-section due to spontaneous preterm premature rupture of membranes. Gestation was complicated by a single umbilical artery, polyhydramnios, and esophageal atresia, all of which were found at 24 week ultrasound. Despite these abnormalities and palliative prenatal care consultation, the pregnancy continued. At birth, APGAR scores were 1 and 0. The child was intubated trans-orally but was unable to be ventilated. Otolaryngology was emergently called. Correct position of the endotracheal tube was confirmed via flexible laryngoscopy/bronchoscopy through the endotracheal tube. After 20 min of unsuccessful attempts to ventilate the neonate, resuscitation efforts were terminated and the child expired. While no surgical intervention was performed, response was prompt and equipment was immediately available.

Autopsy findings demonstrated esophageal atresia and imperforate anus. Tracheo-esophageal fistula and vertebral abnormalities were not present. Lung anatomy demonstrated uneven aeration of parenchyma and focal pulmonary hemorrhage. There were no cardiac or vascular abnormalities.

4. Discussion

Neonatal airway emergencies are uncommonly encountered by the otolaryngologist. They may be derived from any number of congenital aero-digestive tract anomalies such as laryngeal atresia, tracheal atresia/agenesis, tracheal stenosis, or arthrogryposis. Vigilant pre-natal care, ultrasonography, and gestational MRI may