

## Abstract

**Objectives:** To discuss outcomes of pediatric tracheostomy patients who presented with hemoptysis at a large academic center.

**Study Design:** Retrospective cohort study.

**Methods:** Medical records were reviewed for all pediatric patients who received a tracheostomy at a tertiary pediatric referral center from November 2014 to September 2016. Patients who were found to have a tracheostomy complication or present with hemoptysis were identified. Demographic information as well as diagnostic, therapeutic, and mortality data were collected.

**Results:** Of the 74 patients who received a tracheostomy, only 2 (2.7%) were found to develop hemoptysis. Mean presentation was 148 days status post tracheostomy. Of these 2 patients, 1 received a chest x-ray and neither received a chest CT. Both underwent tracheoscopy. In one of the patients, the trachea appeared healthy and a source for hemoptysis could not be identified. The other patient was found to have a brisk bleed complicated by cardiac arrest which ultimately resulted in fatality before the patient could be taken to the OR for emergency surgery. Mean follow-up for all tracheostomy patients was 325 days.

**Conclusions:** Hemoptysis following tracheostomy is a rare, but potentially lethal complication that could suggest an underlying tracheoinnominate fistula. Early evaluation of hemoptysis is crucial to ensure proper intervention can be implemented in a timely manner. A retrospective review allowing for quantification of tracheostomy-associated hemoptysis in the pediatric population is useful as previous reports have largely been limited to individual case studies.

## Introduction

- Hemoptysis is a rare, but potentially life-threatening symptom associated with various underlying respiratory tract abnormalities in children.
- Of these underlying problems, infection and tracheostomy-related complications have been reported as the most common etiologies.<sup>1</sup>
- Tracheoinnominate fistula (TIF) represents a rare complication of tracheostomy that can lead to massive hemoptysis. TIF should be treated emergently with open or endovascular repair to prevent exsanguination.<sup>2</sup>
- TIF has been reported to occur with a frequency of approximately 0.7% in mostly retrospective studies and case reports of critically ill adult populations.<sup>3</sup> However, limited data exist with regard to pediatric hemoptysis and TIF incidence.
- To the best of our knowledge, this is the first modern study to review and quantify outcomes of pediatric tracheostomy patients presenting with hemoptysis.

## Methods and Materials

- A retrospective chart review was performed to examine medical records of pediatric patients who received a tracheostomy at Nationwide Children's Hospital from 2014 to 2016.
- Patients who presented with a complication of hemoptysis status post tracheostomy placement were identified.
- A more detailed chart review was performed for these patients to determine the circumstances of the hemoptysis and associated outcomes.

## Results

- Of the 74 tracheostomy patients, 45 were male, 29 were female, and all were under the age of 18. Mean follow-up was 325 days. Only 2 (2.7%) patients developed hemoptysis (Table 1).
- Patient 2 was a 14 year-old male with a history of cerebral palsy, hydrocephalus, dysphagia, asthma, and scoliosis who suffered from chronic upper airway obstruction with aspiration of sialorrhea and inability to handle secretions leading to several code blue events.

## Results, continued

- He received a 6.0 Cuffed Adult Shiley tracheostomy tube and had an uncomplicated immediate postoperative course.
- One month status post trach placement, he was admitted for acute respiratory distress and found to have a partially obstructing granuloma. His trach was changed to a 7.0 Adult Bivona and he was discharged 1 week later.
- Nearly 5 month status post initial trach placement, he presented as a transfer from an outside hospital with massive hemoptysis.
- Otolaryngology was consulted and tracheoscopy was performed which showed a collection of blood in the distal trachea and mainstem bronchi.
- During this initial evaluation, the patient's rhythm changed to pulseless electrical activity. The ACLS protocol was initiated with chest compressions.
- An endotracheal ventilating balloon was placed in conjunction with interventional cardiology to achieve tamponade of the bleeding vessel.
- Unfortunately despite resuscitative efforts the patient subsequently expired.

	Patient 1	Patient 2
Number of days s/p tracheostomy	157	138
Chest X-ray Findings	Tracheostomy tube unchanged. Low lung volumes, but no definite new focal consolidation.	Not performed.
Chest CT Findings	Not performed.	Not performed.
Tracheoscopy Findings	Healthy trachea with no granuloma, granulation tissue, mucosal irritation. No source identified.	Brisk bleed unable to be controlled with endotracheal ventilating balloon tamponade.
Outcome	Discharged.	Cardiac arrest with failed resuscitation leading to mortality.

Table 1. Diagnostic findings and outcomes for patients presenting with hemoptysis.

## Discussion

- Consistent with previous reports<sup>1</sup>, hemoptysis following tracheostomy was found to be a rare, but serious complication.
- One study from 1962<sup>4</sup> examined tracheotomy outcomes of 294 pediatric patients and found 7 cases of postoperative bleeding. 2 of these patients died of hemorrhage on postoperative day 1 and 13, respectively. Although this study is of historic significance, advances in technology and operative technique make the present study valuable.
- A 2010 study by Silva and Chi<sup>5</sup> described a 7 year-old female with a history of tracheostomy and ventilator dependence since birth who presented with profuse spontaneous bleeding managed with tamponade via the cuff of a 5.0 endotracheal tube and innominate artery ligation.
- The results of this study, in combination with limited reports in the literature, suggest that true hemoptysis in pediatric tracheostomy patients is a rare complication. However, early evaluation is essential to ensure proper intervention can be implemented quickly.
- Limitations of this study include the retrospective analysis with a small sample size and lack of multivariate analysis.

## Conclusions

- This study provides an overview of outcomes associated with hemoptysis in pediatric tracheostomy patients.
- While hemoptysis is a rare complication, the potential for an underlying TIF warrants early evaluation and prompt intervention if indicated.

## Contact

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