

Bacterial Tracheitis in Children: A Varied Entity

Alba Miranda Azola M.D.¹, Kevin D. Pereira, M.D., M.S.(ORL)¹, and Tulio A. Valdez M.D.²
¹ Division of Pediatric Otolaryngology, Department of Otorhinolaryngology – Head and Neck Surgery, University Of Maryland Medical Center
² Department of Pediatric Otolaryngology, Connecticut Children’s Medical Center

Abstract

Objective:

To highlight the different presentations of bacterial tracheitis (BT), an potential life-threatening cause of airway obstruction in children.

Design:

Case series.

Methods:

A review of medical records of 4 cases of BT who presented with differing signs and symptoms was performed.

Results:

Clinical manifestations of 4 patients with BT are presented with corresponding endoscopic appearances of the airway. Two patients were afebrile and nontoxic, and 2 had an elevated white cell count. Three had different degrees of stridor. One had a respiratory arrest. Cultures grew Staph aureus in 2 and Moraxella catarrhalis in 1 and were mixed in 1 patient. None required intubation. All were successfully treated with antibiotics and bronchoscopic debridement of the membranes.

Conclusions:

Bacterial tracheitis needs a high index of suspicion because of its varied presentations. Certain forms have less severe clinical manifestations. These forms also require aggressive management as they can result in airway obstruction from membranes and edema.

Introduction

The most common cause of stridor in children presenting to an emergency room during the fall and winter is viral laryngotracheobronchitis, otherwise known as croup. This is a fairly benign condition that rarely requires hospital admission or active airway intervention. However, when a stridulous child does not respond appropriately to the typical initial medical management with steroids and racemic epinephrine, bacterial tracheitis (BT) should be considered in the differential diagnoses. BT is defined by the presence of thick, adherent tracheal membranes that are not effectively cleared by coughing, thus capable of acutely obstructing the airway (1). Hopkins et al (2) reported that BT was 3 times more likely to cause respiratory failure than epiglottitis and viral croup combined.

Classically, a child with BT appears toxic, with high fevers and rapidly worsening stridor that fails to improve after nebulized racemic epinephrine. Recent literature has raised awareness of a less severe clinical presentation of BT, which tends to elude diagnosis. The term *exudative tracheitis* has been proposed as an alternative nomenclature for the presence of thick tracheal membranes in a non toxic patient (1). The heterogeneous and sometimes subtle signs and symptoms of this changed entity can lead to missed or delayed diagnosis and therapy. A high index of suspicion, timely diagnosis and urgent surgical intervention play a key role in preventing potential morbidity. We present 4 cases that highlight the diverse clinical presentations of BT along with a brief review of the current literature.

Case 1

A 7-year-old girl was admitted to the pediatric service with hoarseness, mild stridor and cough following an upper respiratory tract infection prodrome. On admission, airway x-rays showed narrowing of the subglottis and cervical trachea consistent with croup and was treated with nebulized racemic epinephrine and dexamethasone. The following day, she developed a fever, leukocytosis and biphasic stridor. Endoscopic evaluation of the airway under general anesthesia showed an inflamed larynx with purulence in the subglottis and trachea (Figs. 1A, B).



Fig. 1A



Fig. 1B

Purulent membranes from the trachea and bronchial orifices were debrided, suctioned, and sent for culture. Antibiotic therapy with clindamycin and ampicillin/sulbactam was started. MSSA was isolated from cultures. She returned to the operating room after 48 hours for second debridement of the membranes. The patient was discharged home 5 days after the second procedure.

Case 2

A 9-year-old girl with a history of CP and MR s/p laryngeal separation for recurrent aspiration pneumonias presented to the ER with increased work of breathing and 2 days of fevers. Thick, blood tinged, purulent secretions were suctioned from her stoma. WBC of 12.4 and chest x-ray showed bilateral air trapping. Tracheoscopy revealed large amount of purulent secretions coating the distal trachea and inflammatory changes in the mucosa (Fig. 2A). Debridement and culture of secretions was performed and vancomycin was started. MRSA was isolated from cultures. A week later, a second tracheoscopy showed resolution of infectious process (Fig. 2B).



Fig. 2A

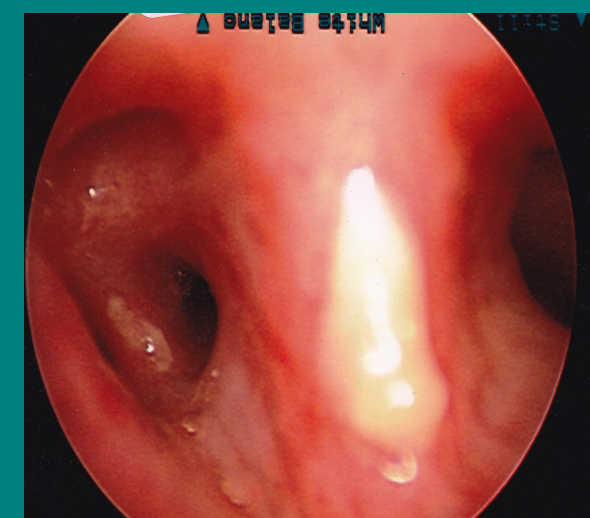


Fig. 2B

Case 3

A previously healthy 15 mo male with a 7-week history of intermittent barking cough, stridor and progressive increased work of breathing. Treatment with PPI, steroids, and racemic epinephrine failed to improve his symptoms. On admission for further workup, he was febrile to 101.6-F, had WBC of 10.2 and biphasic stridor was noted. CT chest, performed to rule out FB aspiration, was unremarkable.

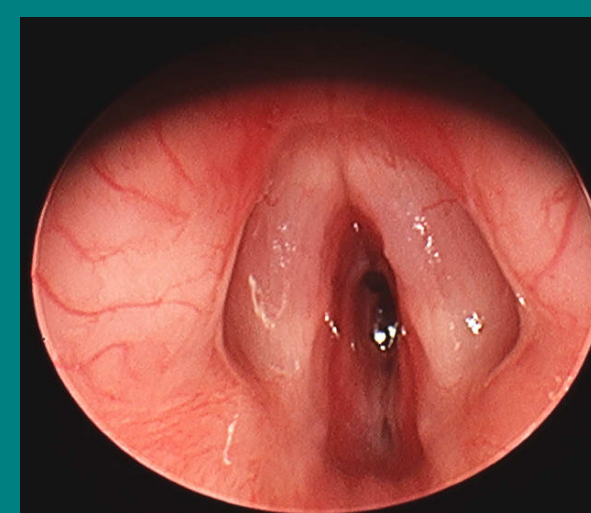


Fig. 3A

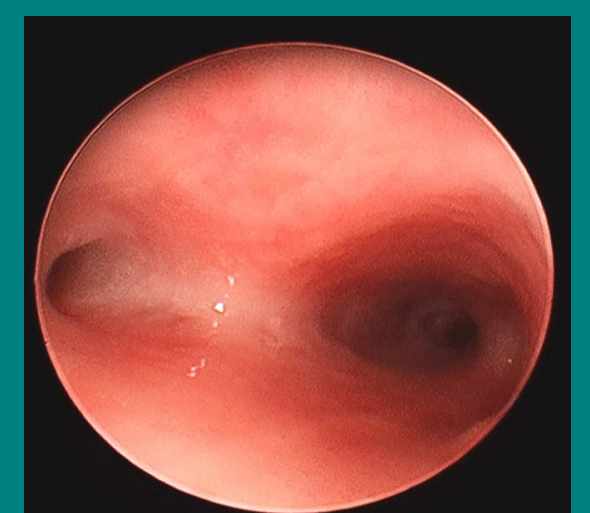


Fig. 3B

Laryngoscopy revealed thickened and congested vocal folds with edema and inflammation of the subglottis (Fig. 3A). Rigid bronchoscopy showed edema of the tracheal mucosa with tenacious secretions in the tracheobronchial tree (Fig. 3B). M. catarrhalis was isolated on cultures. The patient had rapid improvement of respiratory symptoms and was discharged with an oral antibiotic regimen of clindamycin and cefdinir. No complications or recurrence has been reported to date.

Case 4

A 12-year-old previously healthy girl with a 1-week history of sore throat and hoarseness was transferred after sudden respiratory arrest at home. On arrival to the pediatric ICU, she was afebrile, aphonic, and in mild respiratory distress with audible stridor. Nebulized racemic epinephrine and intravenously administered steroids did not improve her symptoms. WBC was 11.9, and chest x-ray was unremarkable. Findings on fiberoptic laryngoscopy included minimal edema of the TVC and thick dark bloody mucous in the subglottis. BT was suspected; ceftriaxone and vancomycin were started. Laryngoscopy and bronchoscopy showed edematous TVF and hemorrhagic subglottic mucosa (Fig. 4A). Tracheal wall mucosa was covered by thick, densely adherent fibrinous exudates (Fig. 4B).

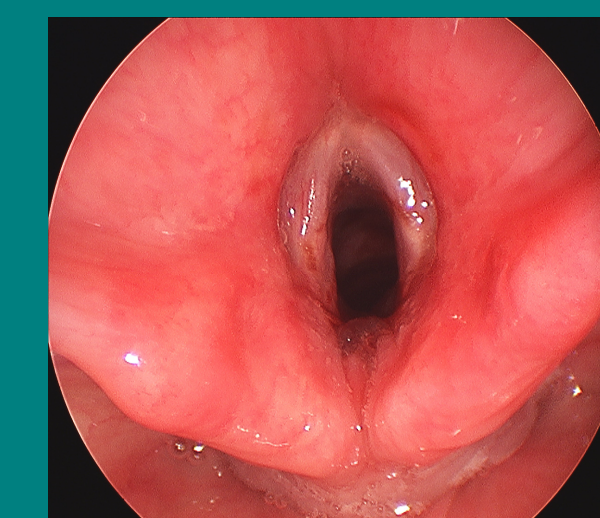


Fig. 4A

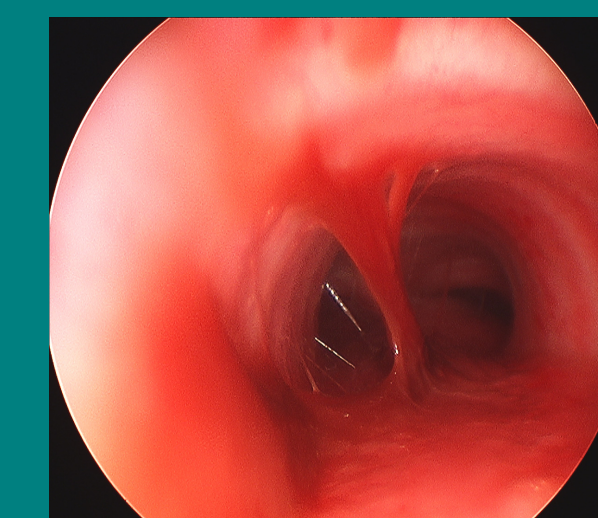


Fig. 4B

The cultures grew a combination of MSSA and alpha hemolytic Strep. Three days after the procedure, she was discharged home on ampicillin/sulbactam and had an uneventful complete recovery.

Discussion

Bacterial tracheitis was first described in 1945 by Chavalier Jackson (3) and it is defined by the presence of thick, adherent tracheal membranes. Historically, BT has been overshadowed by the more common infectious etiologies of acute upper airway obstruction, epiglottitis and croup. The introduction of the Hib vaccine in the late 1980s dramatically decreased the incidence epiglottitis in the pediatric population. Bacterial tracheitis is now gaining relevance as a life-threatening upper airway infection. BT presents as a secondary illness following an acute respiratory viral infection, thus more commonly seen during the fall and winter months. During the 2009 influenza pandemic, Hopkins et al (4) reported 6 cases of H1N1 influenza A presenting as BT. BT can affect children aged 6 months to 14 years with a peak incidence from 3 to 8 years. Younger patients are more likely to require intubation, whereas older patients tend to be less toxic at presentation.

The most common presenting features are coughing and stridor, followed by hoarseness, fever, and tachypnea(3). Odynophagia and drooling are usually absent. Severe croup with a poor response to conventional medical therapy after 48 hours or rapid deterioration while on therapy should arouse suspicion of BT. Laboratory test findings are nonspecific; leukocytosis may or may not be present. Commonly isolated pathogens from the cultures of tracheal aspirates are S. aureus, Strep pneumoniae, and M. catarrhalis. Chest x-rays often show subglottic narrowing and a lateral views may reveal irregularities over the anterior tracheal wall, described as “the candle dripping” sign (2). Flexible laryngoscopy include exudates in the subglottis with congestion and edema of the vocal cords.

Two of our patients (patients 1 and 2) presented with the classic signs and symptoms of BT, 1 patient with MSSA and the other with methicillin-resistant S. aureus. Although patients with tracheotomies tend to get colonized with pathogenic bacteria, the incidence of staphylococcal tracheitis is low. Our third patient was seen by 3 pediatric specialists and was treated for croup, asthma, and reflux. His low-intensity stridor, waxing and waning signs and symptoms, and episodic fever suggested a prolonged and respiratory infection rather than BT. In contrast to reports in literature, which suggest a more severe infection with Moraxella and a higher likelihood of intubation, our patient had a prolonged low-grade course but responded rapidly to tracheobronchial suction and intravenous antibiotic therapy. None of our patients required endotracheal intubation. This can be explained by the fact that 3 of our cases involved older children, with 1 patient having a permanent tracheostomy. Younger patients with BT are more likely to require intubation due to a narrower airway with more submucosal soft tissue that predisposes to obstructive edema with inflammation. The term exudative tracheitis would best describe our fourth, she was afebrile and did not appear toxic, nevertheless the potential for complete airway obstruction is evident despite the paucity of clinical signs.

Treatment of BT involves single or serial endoscopic removal of tracheal membranes and antibiotic therapy guided by cultures. Intubation of these patients is not always necessary; it can potentially dislodge the thick tracheal membranes resulting in distal plugging of the ET tube. Corticosteroids are often administered to decrease airway edema. Systemic complications of BT include toxic shock syndrome, septic shock, and ARDS. These life-threatening sequelae can be prevented by timely diagnosis and prompt removal of membranes.

Conclusions

Bacterial tracheitis is a potentially life-threatening disease that requires a high level of suspicion for early diagnosis. The clinical presentation can be varied, and it should be considered in any pediatric patient presenting with a respiratory infection, stridor, and other evidence of upper airway compromise. Failure of response to nebulized racemic epinephrine and steroids or deterioration while on therapy should prompt physicians to consider this diagnosis. Treatment by endoscopic removal of membranes and antimicrobial therapy will result in complete recovery in the majority of patients.

References

1. Salamone F, Bobbitt B, Myers C. Bacterial tracheitis reexamined: is there a less severe manifestation? Otolaryngol Head Neck Surg. 2004;131:871Y876.
2. Al-Mutairi B, Kirk V. Bacterial tracheitis in children: approach to diagnosis and treatment. Pediatr Child Health. 2004;9:25Y30
3. Hopkins A, Lahiri T, Salerno R. Changing epidemiology of life threatening upper airway infections: the reemergence of bacterial tracheitis. Pediatrics. 2006;118:1418Y1421.
4. Hopkins BS, Johnson KE, Ksiazek JM, et al. H1N1 influenza A presenting as bacterial tracheitis. Otolaryngol Head Neck Surg. 2010;142(4):612Y614.