Reemergence of the Natural History of Otolaryngologic Infections: Lessons Learned from 2 American Presidents

James Naples, MD¹, Marissa Schwartz, MD¹, and Marc Eisen, MD, PhD¹

No sponsorships or competing interests have been disclosed for this article.

Abstract
Presidents George Washington and Theodore Roosevelt suffered complications of epiglottitis and otomastoiditis, respectively. The introduction of antibiotics and vaccinations against Haemophilus influenzae and Streptococcus pneumoniae has significantly reduced the incidence of these otolaryngologic infections, such that the natural history of the disease is rarely encountered. However, antibiotic resistance and pathogenic evolution has raised concern about increased virulence of these common organisms. A retrospective evaluation of the complications suffered by Washington and Roosevelt provides valuable insight to the natural history of common otolaryngologic infections that may reemerge as a result of organism evolution in response to antibiotics and vaccines.

Keywords
history, mastoiditis, epiglottitis, antibiotic resistance, vaccines

Received February 24, 2017; revised April 18, 2017; accepted April 21, 2017.

Manifestations of acute infections are commonly managed by otolaryngologists. Acute otitis media and infections of the upper airway, for example, are 2 common sources of infection that contribute to many physician visits each year. The development of antibiotics in the 20th century saw the morbidity and mortality of these types of infections plummet. Antibiotic use, as well as abuse, has resulted in concerns of antibiotic resistance and potential for evolution of more virulent pathogens. Vaccinations may also contribute to pathogen evolution and increased virulence.¹² As a result, management of these conditions may also evolve.

One of the most prudent ways to understand the future direction of these treatments may be to look retrospectively through the lens of history at the preantibiotic era. Through this journey, we will review part of the medical history of American presidents George Washington and Theodore Roosevelt, who were afflicted with epiglottitis and otomastoiditis, respectively. Both had complications from their otolaryngologic infection that are uncommonly encountered in today’s era of antibiotics and vaccinations. The goal is to review the documented outcomes of President Washington’s and President Roosevelt’s infection and discuss the complications they experienced. We will not provide a full review on the details of their infections and management as this is previously documented for Washington and sparsely recorded for Roosevelt. We have searched the scientific and biographical literature to tell our story, and through these high-profile, illustrative cases, we hope otolaryngologists recognize that the complications suffered by Washington and Roosevelt may reenter the domain of relevance as concerns build over antibiotic resistance and evolving pathogenic organisms.

Presidents George Washington and Theodore Roosevelt
George Washington (1732-1799) lived in an era that had not yet benefited from the advancement of the scientific revolution. Thus, medicine was largely unrefined, and technology was not yet advanced enough to improve diagnostic measures beyond the observer’s capabilities. The events that surround his death are well documented, and while there is still some uncertainty regarding the exact cause of Washington’s death, most accounts of his death describe acute bacterial epiglottitis and upper airway obstruction.⁵ The evidence to support that diagnosis is based on the rapid decline in Washington’s condition. His symptoms of sore throat, dysphagia, and muffled voice were present for fewer than 24 hours before he succumbed to his illness (Figure 1).⁶ During this acute illness, specific remedies were applied to improve Washington’s condition such as bloodletting and various orally applied treatments that included gargling of sage tea and vinegar, as well as the application

¹University of Connecticut Health Center, Farmington, Connecticut, USA

Corresponding Author:
James Naples, MD, University of Connecticut Health Center, 263 Farmington Ave, Farmington, CT 06030, USA.
Email: jnaples513@gmail.com
of “bran” to the back of the throat. More aggressive treatments such as a tracheostomy were suggested by the youngest of the consultant physicians, Dr Elisha Cullen Dick. However, tracheostomy had not yet been performed in the United States at this point, and Dr Dick was outranked by more senior physicians who elected not to perform one.

Unlike Washington, Theodore Roosevelt (1858-1919) lived most of his life during and after the scientific revolution. Medicine had advanced to a point where modern-day hospitals existed and physicians had improved understandings of disease processes. Despite medical advances, this was still the preantibiotic era, and in February 1918 following a trip to the jungle in South America, Roosevelt encountered medical illnesses that some described as “the beginning of the end” for him. He developed a thigh abscess and concurrent acute otitis media of the left and right ear that evolved into otologic abscesses. After a general anesthetic and surgical drainage of the thigh infections,
deliberations were made about whether or not to operate on the ears, at which time mastoidectomy would have been standard procedure. The situation was so concerning that the otologic surgeon and hospital staff remained overnight in the hospital awaiting an impending emergency. However, the decision was made not to operate, and ultimately the infection resolved—not without consequence. He had complete deafness in the left ear and an unsteady gait that, he reported, “compelled him to learn to walk again.”

The outcomes of these otolaryngologic infections in Washington and Roosevelt are fortunately rare in our current era of medicine. Washington unquestionably succumbed to upper airway obstruction as a result of his infection, and Roosevelt appears to have experienced acute otomastoiditis complicated by labyrinthine fistula of the left ear that resulted in sensorineural hearing loss and acute unilateral vestibular loss. While these complications are interesting from a historical perspective, they represent the natural course of these disease processes, which is rarely encountered in the postantibiotic era. It is the natural course of these diseases that is important to understand if we are going to see their reemergence.

Discussion

Interesting parallels exist in the decision making for treatment of Washington and Roosevelt. Complications appeared to have occurred due to failure to pursue aggressive management in the form of tracheostomy and surgical mastoidectomy. Whether or not outcomes would have been different with more aggressive management cannot be determined; however, what we can say is that, historically speaking, their treatments were consistent with each era’s documented management of these infections. The stories and circumstances of President Washington’s and President Roosevelt’s infections have been retold over centuries, which suggest that their stories may have contributed to our understanding of these “historical” complications. However, the pathogenicity of these infections is evolving, and new, unforeseen treatment challenges may present as complicated infections. Interestingly, these complications may best be understood through the perspective of the past.

In the present era, the incidence of acute bacterial epiglottitis and otomastoiditis is declining. Antibiotics are undoubtedly part of the reason for reduced incidence of the diseases, and the introduction of vaccinations against Haemophilus influenzae and Streptococcus pneumoniae, once the most common organisms causing acute epiglottitis and otitis media, respectively, has also contributed to the decline in disease incidence. While these advancements indicate progress, vaccines and antibiotics have forced the evolution of causative bacteria. The causative organism of epiglottitis has expanded beyond Haemophilus influenzae, and new serotypes of Streptococcus pneumoniae are becoming prevalent. These changes have created significant concern among physicians about development of organisms with increased virulence, which clinically requires more aggressive treatment. Some reports have shown that since the introduction of the pneumococcal vaccine, the number of cases of otomastoiditis requiring surgical treatment has increased despite the overall reduction in incidence.

While Washington and Roosevelt would have benefited from antibiotic therapy, the mortality rate in epiglottitis despite modern-day treatments can reach 7% in adults. In addition, the complication rate of otomastoiditis in the inpatient setting has reached nearly 10% in some reports, with labyrinthine fistula as the most common extracranial complication. These findings demonstrate that significant complications, similar to those experienced by Washington and Roosevelt, can occur despite modern-day antibiotics therapy. There are many potential reasons for the reemergence of these complications, and antibiotic resistance warrants consideration. This discussion raises the possibility of a future in which infrequent complications of otolaryngologic infections become relevant again. There is not enough information available to definitively determine the future status of these acute otolaryngologic infections, and we anticipate that scientific and medical progress will prevail despite the future challenges. However, Washington’s and Roosevelt’s documented history of complicated otolaryngologic infections provides perspective on complications that are more than simply a historical interest.

Author Contributions

James Naples, conception hypothesis and design of work; acquisition, analysis, and interpretation of data; drafting and approval of manuscript; presentation of work; Marissa Schwartz, conception hypothesis and design of work; acquisition, analysis, and
interpretation of data; drafting and approval of manuscript; presentation of work; **Marc Eisen**, conception hypothesis and design of work; acquisition, analysis, and interpretation of data; drafting and approval of manuscript; presentation of work.

**Disclosures**
Competing interests: None.
Sponsorships: None.
Funding source: None.

**References**