A Brief History of Clinical Airway Management

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Given the remarkable advances that have occurred in clinical airway management in recent years, clinicians may wonder how airway management was performed in earlier times. In fact, the art of clinical airway management is as old as medicine itself.

Egyptian tablets dating back to 3600 BC appear to depict tracheotomy operations, and reference to the procedure can be found in ancient Hindu scriptures dating from 2000 BC. Alexander the Great (356-323 BC) is reputed to have saved a soldier from suffocation by making a tracheal incision using the tip of his dagger. In AD 100, the Greek surgeon Antyllus described tracheotomy as a "horizontal incision between 2 tracheal rings to bypass upper airway obstruction," and in AD 160, the Roman physician Galen wrote, "If you take a dead animal and blow air through its larynx (through a reed), you will fill its bronchi and watch its lungs attain the greatest dimension." (Figure 1 illustrates a description of the operation in a 17th-century textbook.)

Despite such reports, according to Sittig and Pringnitz, before 1800 only 50 lifesaving tracheotomies had been described in the entire medical literature. Common clinical use of the procedure would have to wait until pioneers such as Armand Trousseau and Friedrich Trendelenburg refined and popularized the operation. In 1833, Trousseau reported on his

Dr. Doyle has no conflicts of interest to disclose.
experience with 200 diphtheria patients treated with tracheotomy. In 1871, Trendelenburg performed a tracheotomy to prevent blood inhalation during surgery on a patient’s upper airway.

**Moving Away From Invasive**

As experience with tracheotomy grew, clinicians began to consider ways to make the procedure less invasive. In 1880, Scotsman Sir William Macewen described how to relieve airway obstruction by passing an oral tube into the trachea. He practiced blind, digital intubation using cadaver models and eventually was able to use this technique clinically. A few years later, New York physician Joseph O’Dwyer developed a system of metal tubing that could be passed blindly to relieve airway obstruction in children suffocating from the pseudomembrane formed in diphtheria infections (Figure 2). George Fell subsequently developed an apparatus that could be attached to the O’Dwyer tube system to allow for positive pressure ventilation. Fell and others used this combination to provide temporary respiratory support in some patients who were apneic from morphine and other drugs that suppress respiration, as well as to treat patients with pneumothoraces and to allow for thoracic surgical procedures. In Germany, Hans Kühn modified O’Dwyer’s tube system to create a flexometallic endotracheal tube, with a matching introducer, intended for blind insertion. O’Dwyer lived to see his lifesaving airway equipment obviated by Emil von Behring and others who, in 1890, discovered the antitoxins for diphtheria that provided a desperately needed treatment for the deadly infection. In 1901, von Behring was awarded the first Nobel Prize in Medicine.
One significant drawback of O’Dwyer’s intubation system and its variants was that they had to be placed blindly. Direct laryngoscopy solved that problem by allowing clinicians to observe the glottic structures they were attempting to maneuver.

### Birth of Laryngoscopy

However, it was not a physician but Manuel Garcia (1805–1906), a voice teacher from London, who is generally credited with discovering laryngoscopy. In 1855, Garcia described how he could perform “autolaryngoscopy” using a dental mirror in combination with a second, larger mirror to direct sunlight into his mouth. This arrangement allowed him to see his larynx and trachea—a feat fortuitously made possible by Garcia’s absent gag reflex.

### The “Autoscope”

Others had been working toward a similar solution. In 1929, an English medical student named Benjamin Guy Babington created a device he dubbed the “glottiscope,” but the invention did not have the impact it deserved. Toward the end of the 19th century, Alfred Kirstein of Berlin, Germany, developed the self-named “autoscope” (Figure 3), consisting of a spatula, hood, and handle, which he was inspired to create after learning how an endoscope intended for esophagoscopy had inadvertently slipped into the trachea. To assist in

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**Figure 3.** Line engraving of Alfred Kirstein performing laryngoscopy with his laryngoscope.

viewing the airway, Kirstein also invented what he called a “forehead-lamp for reflected light,” a sort of premodern spelunking headlamp. In 1897, a 68-page translation of Kirstein’s *Autoscopy of the Layrnx and the Trachea* was published in the United States. The article included a description of the device, case studies, and a dozen illustrations of the procedure.

Along with a nod to the virtues of cocaine as an anesthetic in laryngologic surgery, Kirstein’s preface consisted of an argument for acceptance of his technique, couched in compromise:

“It may appear a rash undertaking for me to deviate from time-honored tradition, and to open up an entirely new way for the examination and treatment of the larynx and the trachea, by teaching that we can view the interior of the air-passages directly, without the aid of optical appliances, and operate with straight (uncurved) instruments in the same manner. Nevertheless, my undertaking is doubly justified. In the first place, because of the facts themselves, which may be demonstrated at any time, and which I have made known in a series of publications. ... The fact that we have, up to this time, never viewed the interior of the larynx directly (without a mirror) is certainly not due to logical reasoning, but because we had no idea of such a possibility. ... In the second place, this method is not intended to replace the laryngoscopic method, but to add to it.”

Kirstein goes on to describe the airway anatomy and his device: “The spatula for adults is 14 centimetres long; at the tip it is about 2 centimetres wide, and it is about 1½ centimetres wide where it passes the convexity of the tongue.”

The monograph also contains helpful warnings to novices using autoscopy: “The lower half of the trachea is a region of great danger! ... During the examination of a number of healthy people the aortic arch has often seemed to protrude like a hump, as it were,
On a frigid Virginia afternoon in December 1799, three physicians gathered around a dying man who writhed in distress as he gasped unsuccessfully for air. The physicians gave the man sage tea with vinegar to gargle, but it nearly caused him to choke to death. Poultices did little to help.

It had been only a year since the medical literature of the time described a surgical procedure in which the trachea could be accessed in cases of airway obstruction. In 1799, even elective tracheotomy, let alone emergent tracheotomy, was rarely performed.

The man’s condition continued to deteriorate as he struggled for breath. One of the physicians had heard of the tracheotomy procedure but was reluctant to attempt it on such a famous person because the procedure was considered futile and irresponsible. Soon the patient became calm and expired—becoming the first American president to die.

Although arguments persist about the exact cause of George Washington’s death, one popular theory is that he died from an upper airway obstruction caused by bacterial epiglottitis.


Figure. The deathbed of George Washington.

In December 1799, George Washington developed a sore throat accompanied by fever, swelling, and difficulty swallowing. He was diagnosed with an “inflammatory quinsy.” Although one of his physicians, Elisha Cullen Dick, proposed performing a tracheotomy to aid Washington’s breathing, this suggestion was rejected by the other physicians. Instead, Washington was repeatedly phlebotomized (to a total of 5 pints of blood). Undoubtedly, this therapy contributed to his death.

Image courtesy of the Dayton Art Institute.

Modern Devices Arrive

The 1940s saw the development of 2 laryngoscopes that are still in widespread clinical use. In 1941, Robert Miller described his straight laryngoscope blade, and in 1943, Sir Robert Macintosh described his curved blade, which he hoped that by minimizing contact with the epiglottis, his laryngoscope would be less stimulating. Meanwhile in 1942, Harold Griffiths of Montreal, Canada, introduced curare as a muscle relaxant with the goal of facilitating abdominal surgery and other procedures. Tracheal intubation soon became routine in major surgical operations.

Although 60 years later variations of the Macintosh and Miller laryngoscopes remain widely used, both devices occasionally fail to provide adequate glottic views, prompting continued efforts to improve their designs. The result has been a series of innovations, including fiber-optic bronchoscopes optimized for intubation, the Bullard laryngoscope and its variants, the McCoy laryngoscope, various optical stylettes, and video laryngoscopes such as the GlideScope (Verathon) and the McGrath video laryngoscope (LMA North America).

Any history of airway management would be incomplete without mentioning supraglottic airway devices such as the Laryngeal Mask Airway (LMA; LMA North America). Archie Brain, the inventor of the LMA, went thorough a considerable variety of prototype designs...
before the clinical launch of the LMA in the 1980s (Figure 4). Many people are unaware, however, that other supraglottic airways (Figure 5) were in clinical use long before the invention of LMA, although these devices were eventually eclipsed by the popularization of tracheal intubation following the popularization of curare.

References