

The Discovery of Modern Anaesthesia—Contributions of Davy, Clarke, Long, Wells and Morton

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Summary

While many may argue as to who deserves the most credit for the discovery of modern anaesthesia, events in the late 18th and early 19th centuries led to the introduction and development of modern anaesthetic techniques.

English physicist and chemist Humphry Davy [1778-1829] first became aware of the sedative and analgesic properties of nitrous oxide in 1795. Although he never experimented with the drug during a surgical procedure, he was the first to suggest that it would be beneficial in relieving pain during surgical procedures. The mind-altering properties of nitrous oxide and ether were often abused for recreational purposes, and the term ‘ether frolics’ was coined to describe such use. While physician William Crawford Williamson Long [1815-1878] first used ether during general surgery, medical student William Edward Clarke [1819-1898] was the first to use ether for dental extraction in 1842. Dr. Long neglected to publicize his findings until 1849, thereby denying himself much of the credit he deserved. Dentist Horace Wells [1815-1848] successfully used nitrous oxide for dental procedures, but a public demonstration which he held in January 1845 turned out to be a fiasco. Medical student William Thomas Green Morton [1819-1868] was the first to publicly demonstrate the effectiveness of ether for general surgery on October 16, 1846. This article seeks to give rightful credit to each of these individuals for their unique contributions to the discovery of modern anaesthesia.

Key words Humphry Davy, William T.G. Morton, Horace Wells, William Edward Clarke, Crawford Williamson Long, Discovery of Anaesthesia, Ether, Nitrous oxide

Introduction

Few medical specialties can claim a history as colourful and controversial as anaesthesiology. Various practices before the mid-18th century using alcohol, narcotics, hallucinogens, ischaemia, nerve compression, refrigeration, or haemorrhagic shock, the first hint of an effective analgesic was provided by Englishman Humphry Davy. Unfortunately, neither he nor his contemporaries followed up on his suggestion. It was only after nitrous oxide and ether enjoyed recreational use that their inevitable use as anaesthetics would emerge. Modesty, ignorance, and lack of assertiveness contributed to the controversy over the discoverer of anaesthesia.

Humphry Davy [1778-1829]

Born on December 17, 1778, in Cornwall, England, Davy had very modest beginnings. The son of a wood carver, he grew up in rural and industrial surroundings. He finished school at age 15 and was apprenticed to

an apothecary-surgeon at 17. Davy was a good writer, and wrote many poems in both English and Latin. A self-taught man, he greatly admired Sir Isaac Newton. Achieving similar fame was his life’s mission. He experimented with the effects of inhaling nitrous oxide and, at Thomas Beddoes’s urging, became an assistant and then superintendent of the Pneumatic Institute in



Fig.1 Humphry Davy [1778-1829]. Reproduced courtesy of the Wood Library-Museum of Anesthesiology, Park Ridge, Illinois, USA

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Clifton, Bristol. Within a year, he published a book describing the analgesic effect of nitrous oxide: 'As nitrous oxide in its extensive operation appears capable of destroying physical pain, it may probably be used with advantage during surgical operations¹. He coined the term *Laughing Gas* for nitrous oxide. For half a century no one paid attention to his prophetic prediction. At 22, Davy accepted a post at the Royal Institution in London. He was a brilliant lecturer and was able to instill in his audience respect and enthusiasm for science. His research focused on isolating and examining the chemical and electrical properties of elements such as sodium, potassium, chlorine and boron. He discovered that flames would not pass through metallic gauze and thereupon invented the miner's lamp. He was knighted in 1812 and elected President of the world's oldest scientific society, the Royal Society, in 1820. His meteoric rise from country boy to brilliant scientist did not go well in class-conscious England. Much admired but disliked, he died a lonely man in Geneva, Switzerland on May 29, 1829 at the age of 50.

William Edward Clarke [1819-1898]

Born on February 22, 1819 in Lebanon, Connecticut, Clarke's father and both grandfathers were prominent physicians. His last name is occasionally spelt Clark and his middle name is sometimes listed as Edwin. While a student of chemistry, in Rochester, New York, he used ether recreationally as was common among city-folk throughout the United States. Wandering lecturers and demonstrators would hold gatherings where individuals from the audience were encouraged to inhale ether or nitrous oxide while providing much entertainment to on-lookers. One man who witnessed such use of ether, in Clarke's presence, was William T. G. Morton, the person most commonly credited with the discovery of anaesthesia. In January 1842, while a student at Vermont Medical College, Clarke, in the presence of his preceptor, Professor E. M. Moore, administered ether to Miss Hobbie, dentist Elijah Pope performed a dental extraction. Miss Hobbie's first name has not been traced, but she was probably related to one of the two medical students known to Clarke - Joseph C. Hobbie or Allen Hobbey. (Hobbie has variously been spelt Hobbey and Hobby.) Professor Moore believed the patient had experienced a hysterical attack and warned Clarke not to continue such treatments. Had Clarke not taken his advice, he might have been recognized worldwide as the

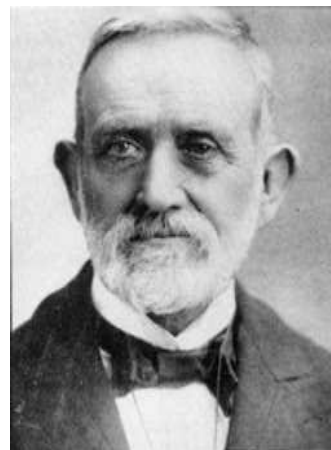


Fig. 2 William Edward Clarke [1819-1898]. Reproduced courtesy of the Wood Library-Museum of Anesthesiology, Park Ridge, Illinois, USA

discoverer of anaesthesia. But Clarke also thought little of his accomplishment^{2,3} the episode only receiving indirect attention in 1850⁴. After graduating from medical school in 1849, Clarke worked as a surgeon in Michigan and Chicago and entered military service in 1861. Two years later, he returned to civilian practice in Chicago as a surgeon and gynaecologist. He died in Chicago on October 6, 1894, unaware of his role in the discovery of anaesthesia.

Crawford Williamson Long [1815-1878]

Born in Danielsville, Georgia on November 1, 1815, Long belonged to a wealthy family of plantation owners and merchants. He graduated from medical school at the University of Pennsylvania in 1839. Like many of those credited with discovering anaesthesia, Long was exposed to the recreational use of nitrous oxide and ether.



Fig. 3 Crawford Williamson Long [1815-1878]. Reproduced courtesy of the Wood Library-Museum of Anesthesiology, Park Ridge, Illinois, USA

After training in New York, he returned to Georgia and began medical practice in rural Jefferson. An acquaintance, James Venable, suffered from two small tumors in the neck, a condition he wished could be treated surgically, but he was scared of the pain that would accompany such treatment. Considering the analgesic effects of ether and nitrous oxide, Long suggested that Venable undergo the procedure under the influence of ether. Long successfully administered ether and painlessly removed both tumors on March 30, 1842. Although he subsequently administered ether to many of his patients, he did not foresee the need to publish his results until 1849⁵. This delay allowed others to introduce the technique and claim credit as discoverers of anaesthesia. Long later said that he wished to be certain others who had used anaesthesia successfully were given a chance to make their claim. Long had a lengthy career in Georgia and died of a stroke in 1878 shortly after administering ether to a patient in labor.

Horace Wells [1815-1848]

Born on January 21, 1815 in Hartford, Vermont, Wells completed dental studies in Boston, graduating in 1836. He established a dental practice in Hartford, Connecticut. On December 10, 1844, he witnessed a demonstration by Gardner Quincy Colton of the analgesic effects of inhaled nitrous oxide. Wells inquired with Colton whether a tooth could be pulled painlessly from a patient under the influence of nitrous oxide. The very next day, Wells inhaled nitrous oxide provided by Colton while



Fig. 4 Horace Wells [1815-1848]. Reproduced courtesy of the Wood Library-Museum of Anesthesiology, Park Ridge, Illinois, USA

dentist John Riggs removed one of Wells's molars. Encouraged by this success and many others, Wells attempted to demonstrate his technique at Massachusetts General Hospital (MGH) in January 1845. He administered nitrous oxide, provided by a local manufacturer, during a dental extraction, but the patient moved and appeared to be in pain towards the end of the procedure. The patient later claimed to have felt no pain, but Wells was laughed out the operating room and thought to be a fraud. The concentration of nitrous oxide provided by the Boston manufacturer was believed to be lower than what Wells usually administered in Connecticut, explaining why this attempt failed while earlier attempts were successful. After the failed demonstration in Boston, Wells returned to Hartford and continued using nitrous oxide in his dental practice. By the end of 1846, Morton had already successfully publicly demonstrated ether anaesthesia at MGH, where Wells had failed. Wells was frustrated and angry about Morton's receiving credit for the discovery of anaesthesia and Morton's audacity in gaining financial advantage by securing a patent. Wells went to Europe for a few months and on his return tried to resume dental practice. By then, another anaesthetic, chloroform, was being used to relieve pain during labor and also for recreation. Wells began abusing chloroform and later moved to New York, attempting to build a successful practice there. While incoherent and under the influence of chloroform or other drugs, on January 22, 1848, he became upset at some prostitutes and threw sulphuric acid on them. Legal charges were brought in and Wells was imprisoned awaiting trial. He confessed to a prison physician that he had been delirious and later appeared quite remorseful. He was allowed by prison authorities to visit his home and collect personal belongings. Unknown to the guard, he also collected chloroform and a razor. He was found several days later in his prison cell, having committed suicide by lacerating his femoral artery after inhaling chloroform⁶⁻⁸.

William Thomas Green Morton (1819-1868)

Born in Charlton, Massachusetts on August 19, 1819, Morton grew up in Massachusetts, where his family owned a farmland⁹. Morton had one characteristic that opened many doors for him. He exuded confidence and he had a knack for gaining the trust of people he dealt with. Early in his career, he was involved in many unsavory dealings, generally involving fraud and embezzle-

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ment of funds entrusted to him. His being wanted by the law in several jurisdictions did not prevent him from starting dental studies at Baltimore College of Dental Surgery in Baltimore, Maryland, in 1840⁸. Restless by nature, he moved next to Hartford, Connecticut, to study under Horace Wells. He convinced Wells that they should move to Boston and market a dental prosthesis they had jointly designed. They sought and received, assistance and advice from Charles Thomas Jackson [1805-1880], a prominent physician and chemist. In March 1844, Morton began as a student at Harvard Medical School. While the partnership with Wells did not last, Morton had watched him administer nitrous oxide and was present at Wells' unsuccessful demonstration at MGH in January 1845. Morton was also aware of Clarke's use of ether during a painless dental extraction. Using his powers of persuasion, Morton received permission to demonstrate the anaesthetic effects of his unidentified painkiller. Though he was poorly prepared and late for his appointment, the demonstration was a success, and Morton received much acclaim and recognition for this achievement, from physicians and the press. After successfully demonstrating the anaesthetic properties of ether, Morton decided not to reveal the identity of his agent, merely referring to it as "Letheon." Ether's pungent odour could not conceal its identity for long, and its use spread in the United States and Europe. During the next two decades, Morton desperately tried to recoup financial rewards for his achievement, but without success. To receive financial rewards, he had to prove that he was the sole discoverer of anaesthesia. Without the



Fig.5 William Thomas Green Morton [1819-1868]. Reproduced courtesy of the Wood Library-Museum of Anesthesiology, Park Ridge, Illinois, USA

distinction of graduating from dental or medical school, however, Morton was awarded an honorary M.D. by the University of Baltimore in 1852. For many years, Morton, Jackson, and Wells all tried to claim credit. Morton spent enormous amounts of energy and financial resources to influence the decision, apparently impoverishing himself, although evidence has emerged that he transferred at least some assets to his family to protect them from creditors¹⁰. Morton traveled to New York one particularly harsh summer to meet with magazine editors who had incorrectly quoted surgeon John Collins Warren as stating that Jackson ought to be given credit for the discovery of anaesthesia. While trying to settle this dispute, Morton was taken ill and suffered from heatstroke. On a carriage ride through New York's Central Park while delirious, he got into an argument with a bystander and landed in a pond. He died before arrangements could be made to transfer him to St. Luke's Hospital¹¹.

Conclusion

Before the development of anaesthesia, surgery was viewed by patients with fear and trepidation. Patients rarely submitted to surgery willingly. Indications for surgery included wens (sebaceous cysts), hernias, hemorrhoids, bladder calculi, abscesses, boils, obstetrical conditions and a variety of injuries incurred in battle or civilian life. Poor dental hygiene meant most people needed dental extraction some time during their lives. These procedures were short and amenable to trial with analgesic treatment. It is therefore not surprising that dentists and dental procedures played such an important role in the discovery of anaesthesia. We propose that each be recognized for his unique contribution to the discovery of anaesthesia. Sir Humphry Davy, as the man who first suggested that nitrous oxide had analgesic properties that could be employed during surgical procedures. Next, William Edward Clarke, as the first person to use ether as a general anaesthetic during dental extraction. Crawford Williamson Long should be recognized for the first to use of ether for a general surgical operation and Horace Wells for the first use of nitrous oxide for dental extraction. William Thomas Green Morton, the person who has received widest recognition as the discoverer of anaesthesia, should be recognized for the first public demonstration of ether as an anaesthetic agent during general surgery and for promoting the concept and use of anaesthesia.

The birth of our specialty occurred amidst recre-

ational use of nitrous oxide and ether. Dental procedures were common and readily amenable to experimental use of new analgesic treatment. Over four years, Clarke, Long, Wells, and lastly Morton successfully used these drugs as anaesthetic agents. Due to vagaries of their personalities and the circumstances surrounding their use of these agents, Morton has received maximum credit as the discoverer of anaesthesia, although most of this recognition occurred posthumously.

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