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“Gentlemen this is no humbug”

The desire to relieve pain has been a never-ending quest for humans and is, therefore, responsible for the birth of the specialty “anesthesiology.” From the earliest records when opium sponges were used to relieve pain until today, the desire to relieve human pain and suffering has been second to none.

Inhalational Anesthetic Agents

The road to developing modern inhalational anesthetic agents started with ether (Table 1.1). The abovementioned words were used by John Warren, a surgeon, to describe a successful “public” demonstration of ether anesthesia administered by William Morton (Figs. 1.1 and 1.2) at the Massachusetts General Hospital on October 16, 1846. The patient was Edward Gilbert Abbott. Warren performed a painless surgery on Abbott’s neck tumor, even though Abbott was aware that the surgery was proceeding. This marked the inauguration of the specialty “anesthesiology.”

The quest for a pleasant and rapid-acting inhalational agent leads to the discovery of chloroform which was first used by J. Y. Simpson for obstetric anesthesia. However, the administration of chloroform for obstetrics was brought into fame by John Snow who administered the agent for Queen Victoria’s deliveries. Ether (unpleasant) and chloroform (liver and cardiac toxicity) were replaced by ethylene gas (high concentration requirement and explosive potential), which was in turn replaced by cyclopropane (more stable). Finally, came the era of fluorinated inhalational agents (increased stability, decreased toxicity). Trifluoroethyl vinyl ether (toxic metabolite) was the first fluorinated anesthetic agent to be used which was followed by halothane (hepatitis),

methoxyflurane (nephrotoxicity), enflurane (cardiac depression, convulsant properties), and finally isoflurane (synthesized by Ross Terrell in 1965, clinically used in 1971).

John Snow (1813–1858, England) was popularly known as “the first anesthesiologist” (Fig. 1.3). His research leads to the development of the concept of minimum alveolar concentration (MAC). He administered ether and chloroform in various concentrations to anesthetize animals and determined the concentration to prevent movement to a sharp stimulus. He also described the stages of ether anesthesia and invented the ether face mask. Joseph Clover (1825–1882, England) was a leading anesthesiologist in London after Snow’s death. He favored a nitrous oxide-ether sequence for anesthesia and introduced pulse monitoring during anesthesia. He designed the Clover-respirator bag (to deliver known quantities of chloroform), introduced airway management skills and use of airway cannulas, and designed a portable anesthesia machine.

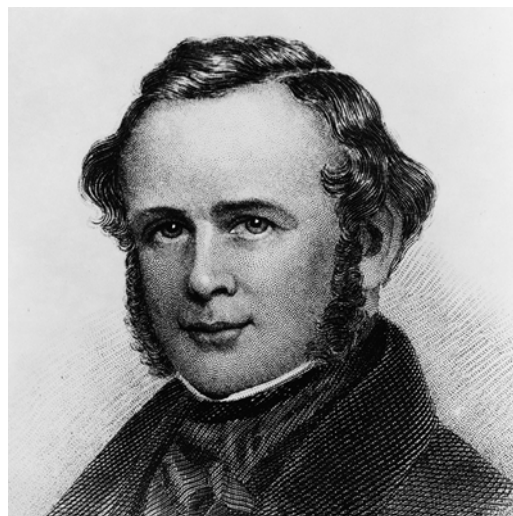
The Story of Nitrous Oxide

Joseph Priestly, an Englishman and one of the greatest pioneers of chemistry, first prepared nitrous oxide in 1773. Horace Wells (Fig. 1.4) of Hartford, CT, was one of the first to recognize the anesthetic potential of nitrous oxide. On December 10, 1844, while attending an exhibition where nitrous oxide was made available to the audience for inhalation, he noticed that Samuel Cooley, one of the guests, was unaware that his leg was injured while dancing. The next day Horace Wells allowed Gardner Colton, a dentist, to extract his tooth under nitrous oxide inhalation. Horace Wells described his procedure as a success. A few weeks later Wells tried to simulate the same procedure for dental extraction in a medical student in Boston. The medical student screamed and Wells was labeled as a failure. He finally committed suicide in 1848. After his death, Colton led the revival of nitrous oxide, one of the oldest anesthetic agents, which is still being used.

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Table 1.1 Ether milestones

William E. Clarke	January 1842, Rochester, NY	Teeth extraction of Ms. Hobbie by dentist E. Pope
Crawford W. Long	March 1842, Jefferson, Georgia	Neck tumor excision of Mr. Venable. Fee charged \$2.00
James Y. Simpson	November 1847, Edinburgh, Scotland	Among the first to use ether and then chloroform for labor pain relief

**Fig. 1.1** William T. G. Morton 1819–1868 (courtesy of the Wood Library-Museum of Anesthesiology, Park Ridge, Illinois)**Fig. 1.2** A replica of William Morton's ether inhaler as used at the first public demonstration of ether anesthesia on October 16, 1846 (courtesy of the Wood Library-Museum of Anesthesiology, Park Ridge, Illinois)**Fig. 1.3** John Snow 1813–1858, the first anesthesiologist (courtesy of the Wood Library-Museum of Anesthesiology, Park Ridge, Illinois)**Fig. 1.4** Horace Wells 1815–1848 (courtesy of the Wood Library-Museum of Anesthesiology, Park Ridge, Illinois)

Intravenous Anesthetics

Phenobarbital, a barbiturate, was the first intravenous induction agent developed. It was synthesized by Emil Fischer and Joseph von Mering in 1903. Phenobarbital caused prolonged periods of unconsciousness and was associated with slow

emergence. Hexobarbital, a short-acting barbiturate, was clinically introduced in 1932. This was replaced by a more potent and rapidly acting barbiturate, thiopental, which was first clinically used in 1934.

Curare was the first muscle relaxant to be used by Harold Griffith in 1942 for an appendectomy. Succinylcholine was synthesized by Daniel Bovet in 1949 and till today is one of the most widely used muscle relaxants. In 1960s muscle relaxants with steroidal nucleus, pancuronium and vecuronium, were synthesized. The opioid “fentanyl” (chemical R4263) was synthesized in 1960 by Paul Janssen and remains one of the most popular pain-relieving agents used today. In 1977, propofol was synthesized by Imperial Chemical industries and is widely in use at present for sedation or induction and maintenance of anesthesia.

Airway and the Anesthesia Machine

Jay Heidbrink, Samuel White, and Charles Teter (American dentists) were the first to develop instruments in order to use compressed cylinders of nitrous oxide and oxygen. Then came the Boyle machines (Henry Boyle, England) and the Draeger machines (Heinrich Draeger, Germany). The first use of carbon dioxide absorbers occurred in 1906 (Franz Kuhn, Germany), which were made simpler and less bulky by Ralph Waters. In 1930, Brian Sword created an anesthesia machine with a circle system and an in-circuit carbon dioxide absorber. Airway milestones are listed in Table 1.2.

Local and Regional Anesthesia

Carl Koller was one of the pioneers in discovering the local anesthetic properties of cocaine (an extract of the coca leaf). He used it extensively in his practice to anesthetize the eyes for ophthalmic surgery. William Halsted and Richard Hall used cocaine to perform blocks of the sensory nerves of the face and arms. Both ended up becoming addicted to cocaine (a phenomenon which was not understood until later). Leonard Corning coined the term spinal anesthesia in 1885 (administered cocaine to produce blockade of the lower extremity). August Bier (credited for spinal anesthesia) and Theodore Tuffier were the first to describe spinal anesthesia with the mention of escape of cerebrospinal fluid. August Bier was also the first to report the technique of intravenous regional anesthesia with procaine, a procedure later modified by Mackinnon Holmes. Regional anesthesia milestones are listed in Table 1.3.

Finally, it is worth mentioning that Ralph Waters was the first president of the American Society of Anesthesiologists (ASA) in 1945. He is credited to raise the academic standards in anesthesia and launched extensive anesthesia residency training programs.

Table 1.2 Airway milestones

William Macewan, 1878	First orotracheal intubation with flexible metal tubes, technique advanced by Franz Kuhn, 1900, Germany
Alfred Kirstein, 1895	First direct vision laryngoscope
N. Korotkoff, 1905	Blood pressure measurement
M. Neu, 1910	First to apply rotameters in anesthesia
Sir Ivan Magill, 1920	Technique for blind nasal intubations, Magill’s airway tubes, and angulated forceps
Arthur Guedel, 1926	Cuffed airway tubes
Phillip Ayre, 1937	Ayre’s T-piece (reduce work of breathing)
Lucien Morris	Copper Kettle, first temperature-compensated vaporizer
British engineers	Tecota (temperature-compensated trichloroethylene air vaporizer), Fluotec, the first series of agent-specific vaporizers
Robert Miller, 1941	Miller straight blade
Sir Robert Macintosh, 1941	Macintosh curved blade
Glen Millikan, 1945	Developed the first pulse oximeter
F. Robertshaw, 1953	Double lumen tubes
Bain-Spoerel apparatus, 1972	Light weight breathing apparatus
A. Brain, 1981	Laryngeal mask airways (LMA)

Table 1.3 Regional anesthesia milestones

Heinrich Quincke, 1899	Described the technique of lumbar puncture
Dudley Tail and Guidlo Caglieri, 1899	Advocated use of small needles to prevent CSF escape
Heinrich Braun, 1900	Used epinephrine to prolong the effect of local anesthetics, first to use procaine, “father of conduction anesthesia”
Arthur Barker, 1907	Concept of hyperbaric solutions
Achille Dogliotti, 1931	Loss of resistance technique
William Lemmon, 1940	Concept of continuous spinal anesthesia
Lofgren and Lundquist, 1943	Synthesis of lidocaine
Edward Tuohy, 1944	The famous “Tuohy” needle
Labat and Wertheim	First American Society for regional anesthesia
Rovenstein	First American chronic pain clinic
John Bonica	Multidisciplinary pain clinic

Further Reading

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