

CHAPTER 1

History of Anesthesiology

Viji Kurup, M.D.

Associate Professor
Department of Anesthesiology
Yale University School of Medicine

Paul Barash, M.D.

Professor
Department of Anesthesiology
Yale University School of Medicine

The discovery and application of anesthesia has been the single most important contribution of American medicine to mankind. All the major advances in surgery would not have been possible without the accompanying vision of the pioneers of anesthesiology. Anesthesiologists today are like no other physicians: we are experts at controlling the airway and at emergency resuscitation; we are real-time cardio-pulmonologists achieving hemodynamic and respiratory stability for the anesthetized patient; we are real-time pharmacologists and physiologists administering and titrating drug dosages to patient responses; we are internists evaluating patients perioperatively; we are actively engaged in pain management of patients on the labor floor and in pain clinics; we manage critically ill patients in the intensive care units; we are trained researchers looking for answers and delving into the mystery of the human body. Today, the boundaries of anesthesiology extend far beyond the operating room into the arena of critical care, pain, space medicine and underwater expeditions.

The story of the evolution of the specialty of anesthesia is a fascinating one, filled with visionary individuals who held on to their dreams in the face of adversity, tales of serendipity, intrigue, secrecy and controversies. The antiquated methods to control surgical pain, such as nerve compression, cold application, mesmerism and herbal remedies, paved the way for more scientific methods of pain relief. A few dentists were looking for new ways to relieve pain during dental procedures. Horace Wells, a dentist from Hartford, Connecticut, experimented with nitrous oxide and had some initial success; however, a public demonstration at the Bullfinch Amphitheatre of Massachusetts General Hospital in January 1845 failed, and this proved to be a setback for all those pursuing the goal of pain-free surgery. The first public demonstration of ether anesthesia was by William Thomas Green Morton on October 16, 1846, again at the Bullfinch Amphitheatre. This demonstration was a success, and the surgeon, Dr. John Warren, turned to the audience after the procedure and said “Gentlemen, this is no humbug.” This day is celebrated as “Ether Day” across the globe; it was a turning point in the attitudes of people towards

pain and spurred the development of anesthesia as a specialty. The inscription on Morton’s tombstone reads: “Inventor and Revealer of Inhalation Anesthesia: Before Whom, in All Time, Surgery was Agony; By Whom, Pain in Surgery was Averted and Annulled; Since Whom, Science has Control of Pain.” Although this was the first *public* demonstration, even before this date, Dr. Crawford Long from Georgia had been administering ether for surgical anesthesia since 1842, but he did not make this discovery public and remained silent until 1849. A long battle for the credit of discovery of anesthesia ensued, and has been termed “the ether controversy.” It remains unresolved even today. The other important early milestone in the history of anesthesia was the use of chloroform by James Simpson. As an obstetrician in Scotland in 1847, Simpson published his experience in the *Lancet*. Anesthesia during childbirth was a controversial issue in the 19th century due to religious ramifications of the subject. The religious debate quieted when Dr. John Snow was invited by Queen Victoria to administer chloroform for the birth of her child, a technique soon-to-be-known as “chloroform a la reine.” This was followed by the discovery of additional inhalational agents: ethyl chloride, ethylene and cyclopropane. Since the majority of anesthetics were “explosive,” the search for the ideal nonflammable anesthetic agent was on. In the 1960s the fluorinated anesthetic halothane was introduced into clinical practice. This was followed by other nonflammable inhalation anesthetics: enflurane, isoflurane, desflurane and sevoflurane. However, we have not yet discovered the “ideal anesthetic.” A number of agents are being studied, including xenon, a gas with many properties of the ideal anesthetic.

The development of regional anesthesia does not lag behind in sensationalism. The coca leaf had long been known for its anesthetic properties when applied to the mucous membranes. However, the clinical application of this anesthetic property was not appreciated until 1884, when Carl Koller, a surgical intern, recognized this. He was working in Vienna looking for a topical ophthalmic anesthetic. His friend Sigmund Freud was studying the cerebral-stimulating effects of cocaine and gave Koller a small sample in an envelope. A few grains of cocaine leaked and stuck to Koller’s finger and he absent-mindedly licked his finger. To his surprise, he found that his tongue felt numb. As Pasteur proclaimed, “Chance favors only the prepared mind.” The significance of this finding was not lost on Koller. He reported the finding in his article, which sparked a revolution in ophthalmic and other surgical disciplines. This discovery was soon followed by reports of sensory nerve blocks of the face and arm by two young American surgeons, Halsted and Hall. The self-experimentation of these surgeons led to one of the early reported cocaine addictions in the medical profession. The possibility of blocking individual nerves was attractive, and multiple nerve and plexus blocks were described. Neuraxial anesthesia was not far behind.

CHAPTER 2

Patient Safety and Outcomes

Lee A. Fleisher, M.D.

Robert D. Dripps Professor and Chair of Anesthesiology and Critical Care

Professor of Medicine

University of Pennsylvania School of Medicine

In 1885, Corning described epidural anesthesia, while August Bier introduced intrathecal (spinal) anesthesia. The introduction of various types of local anesthetic drugs with different durations of action and better spinal and epidural needles led to the development of regional anesthesia as a specialty.

Anesthesiology began evolving as a specialty among physicians in the early part of the 20th century and led to the formation of professional societies. The first organization in America was the Long Island Society of Anesthetists, formed in 1905. This organization later became the New York Society of Anesthetists and subsequently became the American Society of Anesthesiologists (ASA). Francis Hoeffler McMechan founded the International Anesthesia Research Society (IARS), which together with the ASA are the premier American organizations in anesthesiology today. After World War II, specialties within anesthesia began to thrive, and pediatric, obstetric, pain, critical care, vascular, cardiac, thoracic and other distinct fields continue to evolve.

The story about the development of the field of anesthesiology is incomplete without mentioning the immense work of former ASA President Ellison “Jeep” Pierce and the ASA leadership (1984) in championing the cause of patient safety. The mortality attributed to anesthesia has seen a dramatic decrease from 1:2,680 in the 1950s to 1:200,000 in the 1990s. Evidence is accumulating that anesthesiologists are experiencing the greatest decline in the incidence of medical liability claims of any specialty, according to the Anesthesia Patient Safety Foundation.

The art and science of anesthesiology continues to grow and evolve. We are continually challenged with advances in technology, by our own drive to make anesthesia safer than ever, and to make the perioperative experience better for our patients. Anesthesiologists today are involved in diverse areas such as molecular biology, tissue engineering, novel drug delivery techniques, nanotechnology and functional imaging research. We are pioneers in incorporating simulators as a tool for education and fostering safe practices. We are also in the forefront in studying and integrating complementary and alternative medical practices into the mainstream of medicine.

We have come a long way, but we still have a long road ahead in our quest to make the perioperative experience a safe and pleasant one for our patients. We have some answers, but there are still a lot of questions that need to be answered by painstaking research. This is an exciting and challenging phase in the growth of this specialty and all associated with it!

References:

1. Smith HM, Bacon DR. The History of Anesthesia, Clinical Anesthesia. Edited by Barash PG, Cullen BF, Stoelting RK. Philadelphia, LWW; 2006:3-26.
2. Stoelting RK. A historical review of the origin and contributions of the Anesthesia Patient Safety Foundation. *ASA Newsletter*. 2005:25-27.
3. Wetchler BV. Ellison C. Pierce, Jr., M.D., to receive ASA's highest honor. *ASA Newsletter*. 1997;61(10):21.

The specialty of anesthesiology has been lauded as one in which safety has always been of paramount importance. In the landmark Institute of Medicine report, *To Err is Human*, anesthesiology was cited as the specialty to emulate with respect to improving safety. The first study of anesthetic safety (and risk) occurred shortly after the first report of the delivery of anesthesia for an operative procedure in 1846. Subsequently, Ruth et al. helped to establish the first anesthesia study commission to analyze perioperative deaths in 1935.¹ They relied on voluntary submission of cases and determined the cause of death by majority vote. This was followed by a report by Beecher and Todd of anesthetic death in 10 institutions, published in 1954.² The cause of mortality was determined at the local institution by a consensus reached between a surgeon and the chief anesthetist. Overall, the chance of mortality was 1:75 cases. They reported that anesthesia was the primary cause of mortality in 1:2,680 cases, and was either the primary or contributory cause of mortality in 1:1,560 cases. Surgical error in diagnosis, judgement or technique was the primary cause of death in 1:420 cases, while patient disease was the primary cause in 1:95 cases. Over the past five decades, most anesthesiologists believe that anesthetic risk has decreased.

The importance of perioperative mortality in England led to the development of the Confidential Enquiry into Perioperative Deaths (CEPOD), which assessed nearly a million cases of anesthesia during a one-year period in 1982.^{3,4} Deaths within 30 days of surgery were included in the study. There were 4,034 deaths in an estimated 485,850 operations, resulting in a crude mortality rate of 0.7 to 0.8 percent. Surgery had contributed totally or partially in 30 percent of all patients. Progression of the presenting disease had contributed to death in 67.5 percent of all patients, with progress of an intercurrent disease being relevant in 44.3 percent of patients. Anesthesia was considered the sole cause of death in only three individuals, for a rate of 1:185,000 cases, and anesthesia was contributory in 410 deaths, for a rate of 7:10,000.

The accumulating data clearly demonstrate that risk directly attributable to anesthesia has declined over time. The etiology for this reduction in mortality is unclear. Numerous factors have been implicated in the improved outcome, including new monitoring modalities, new anesthetic drugs and the changes in the anesthesia workforce. However, it is difficult to document reduced risk related to any one factor. Interestingly, although newer monitoring