

## History of local anesthesia

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**Dr. Andrew I. Spielman, D.M.D., Ph.D.**, Professor of Molecular Pathobiology, Director of the Rare Book Library and Historical Archives, New York University College of Dentistry, New York, NY, USA.

[ais1@nyu.edu](mailto:ais1@nyu.edu)

**Dr. Forrai Judit, D.Sc.**,

Semmelweis University, Institute of Public Health, Department of History of Medicine, Budapest, Hungary

[forrajud@gmail.com](mailto:forrajud@gmail.com)

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### Abstract

The history of local anesthesia involves three separate inventions: the pharmacological agent, the *local anesthetic*, the *syringe*, and the *hollow needle*. Each evolved separately and has its history. They were assembled for the first time in 1827 as a syringe with a needle, and in 1884, in combination with cocaine as the first anesthetic injected locally.

**Keywords:** pain, anesthesia, anesthetic, injection, needle, syringe

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*The history of local anesthesia involves three separate inventions: the pharmacological agent, the local anesthetic, the syringe, and the hollow needle. Each evolved separately and has its history. They were assembled for the first time in 1827 as a syringe with a needle, and in 1884, in combination with cocaine as the first anesthetic injected locally.*

*A breakthrough in injectable anesthesia came in 1656 when Sir Christopher Wren (1632-1723), a British architect, scientist, and physician, and the Honorable Robert Boyle (1627-1691), the chemist, injected wine, and ale into the vein of a large dog. They used a syringe made of animal bladder, attached to a goose quill as a needle. The dogs became drunk, demonstrating the effect of alcohol and how blood circulation, freshly described by William Harvey, worked in practice (1).*

*Just over a decade later, in 1667, Johann Sigismund Elsholtz (1623-1688), a physician in Berlin, described intravenous injection with a syringe and reported the feasibility of blood transfusion from animals to humans (2). That same year, Jean Baptist Denys, the court physician to Louis XIV, performed transfusions from animals, calves, and sheep to humans in the hope of conferring the calm characteristics of the donor animal to the recipient. Denys subscribed to the theory of "vitalism" that purported that blood carried personal characteristics from a meek animal to a human needing calming. Denys could not have known about blood groups, a discovery awaiting Karl Landsteiner in 1900. The death of one of Denys' patients and the subsequent high-profile trial that eventually acquitted him led to a ban on blood transfusions and set back transfusions for centuries. The tools for transfusion, a primitive form of a syringe, however, survived.*

*Although a precursor of the modern syringe was known since Ancient Egypt and used for tissue irrigation, the syringe as a pressing device behind the principle of hydraulic lifting in a confined space (Pascal's Law) was invented by the French polymath Blaise Pascal in 1650. The modern (stiletto) syringe using Pascal's Law was created in 1827 by Adam Neuner, chief physician of Darmstadt, Germany (3). The Luer German instrument maker perfected this. In 1906, Guido Fischer, a German dentist, created a new design, the "Fischer syringe," with a better seal. The "cartridge" syringe we use today was developed by Harvey Samuel Cook, an army surgeon, in 1917.*

With the syringe developed, what was still missing was the hollow needle. The first subcutaneous injection of morphine was made by Francis Rynd (1801-1861), an Irish physician who developed a hollow steel needle. Up to that point, drugs were delivered orally or topically. He published using his invention on March 12, 1845, in the *Dublin Medical Press*. Still, the article only states that supraorbital neuralgia was treated by “four punctures of an instrument made for the purpose” (4). Eight years later, in 1853, Charles Gabriel Parvaz (1791-1853), a French surgeon, and Alexander Wood (1817-1884) of Scotland independently proposed a fine bore needle attached to a syringe to deliver small amounts of morphine. This was the first proper hypodermic syringe as we know it today.

With both syringes and needles available, the first use of cocaine as a local anesthetic was likely used in 1864 during the American Civil War. Officially, on November 26, 1884, Charles Nash, a dentist, was the first to anesthetize the infraorbital nerve of Richard J. Hall, a surgeon at Roosevelt Hospital in New York, while working painlessly on an upper incisor. That same year, in November 1884, William S. Halsted (1852-1922), a surgeon at Johns Hopkins University in Baltimore, performed the first mandibular nerve block using a 4% solution of cocaine.

One of the first local anesthetics was Amylocaine (Stovaine), synthesized in 1903 by Ernest Fourneau (1872-1949) (fourneau = stove in English) at the Pasteur Institute. It was first used in 1904 for local anesthesia and epidural injections. The very next year, it was replaced by Procaine (Novocaine), a better anesthetic used for both local and regional anesthesia.

The effect of the local anesthetics was short-lived, though, and it diminished as blood circulation diluted and removed the active ingredient from the operation site. To increase the anesthesia time at the injected area, Heinrich Braun, a surgeon in Leipzig, 1903, came up with the idea of mixing the anesthetic with the newly isolated suprarenal hormone, adrenalin which caused vasoconstriction (5). When the synthetic version of adrenalin was manufactured by Friederich Stolz at Farbwerke Hoechst, the longer-lasting local anesthetic was born. Epinephrine (Suprarenin), isolated in 1901 by the Japanese scientist Jokichi Takamine, became marketed in 1906 as a vasoconstrictor by the German pharmaceutical company Hoechst.

A more widely used local anesthetic, Procaine (Novocaine), an aminobenzoic ester, was synthesized by German chemists Alfred Einhorn (1856-1917) in 1905 (6). It was the only local-regional anesthetic used until 1943 when Lignocaine (Lidocaine) was synthesized by the Swedish chemist Nils Löfgren (1913-1967) and clinically tested by Thorsten Gordh (1907-2010) as a substitute to avoid allergic reactions Novocaine induced in about 8% of the population. That same year, Novocaine was first used by Heinrich Braun (1862-1934), a German surgeon. It was safer and non-addictive, unlike cocaine. Recent additions to local anesthetics include bupivacaine (1963) and ropivacaine (1993).

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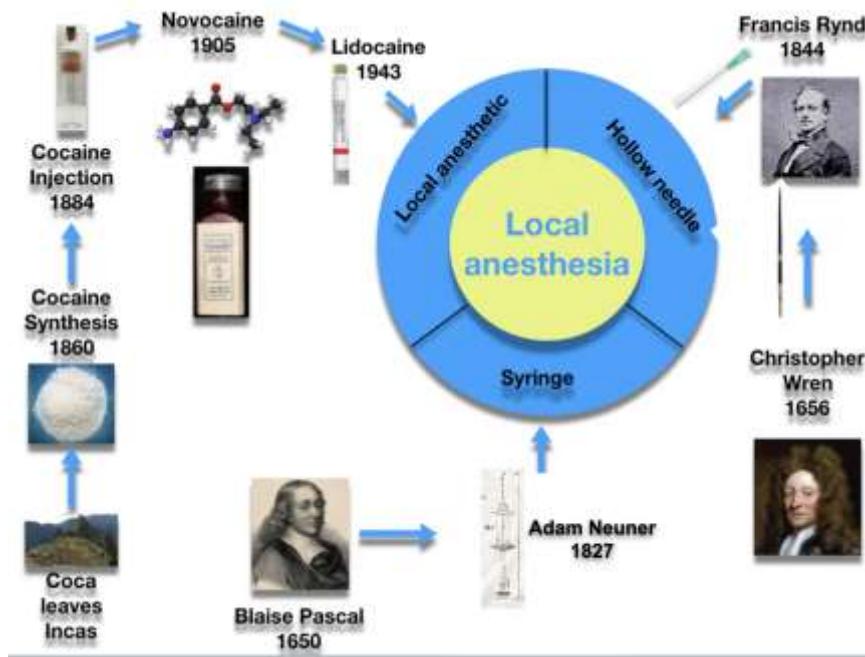


Figure 1. The evolution of local anesthesia