

THE HISTORY OF ANAESTHESIA

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The term anaesthetic has been defined as an agent which is capable of deadening the sensibilities and so relieving pain and permitting otherwise distressing surgical operations to be performed without discomfort to the patient. The name "anaesthetic" was first applied by Dr. Oliver Wendell Holmes: it includes both local and general anaesthetics.

"So God empal'd our Grandsire's (Adam's)
lively look,
Through all his bones a deadly chillness
strook,
Siel'd up his sparkling eyes with iron bands,
Led down his feet (almost) to Lethe's sands;
In briefe so mumm'd his soule's and bodie's
sense,
That (without pain) opening his side from
thence
He took a rib, which rarely He refin'd,
And thereof made the mother of Mankind."

Thus we see from the poem of the sixteenth century poet an impression of, from sacred records, the first operation tempered by anaesthesia. It has been claimed that in the "deep sleep" that the Creator "caused to fall upon Adam" is the very essence of the idea of anaesthesia, and it has come down to us from the dim ages of the past. According to Casper Hoffmann, primitive man employed digital compression of the carotid arteries to produce anaesthesia. This method was practiced by the ancient Assyrians before performing the operation of circumcision. Curiously enough the literal translation of the Greek and Russian terms for the carotid is "The Artery of Sleep."

The ancient Egyptians used Indian hemp and the juice of the poppy to cause a patient to become drowsy before a surgical operation. Pliny relates that they applied to painful wounds a species of rock brought from Memphis, powdered, and moistened with sour wine, which is the first record we have of local anaesthesia with carbonic acid gas.

The "sorrow-easing drug" which, as we are told in the fourth book of the "Odyssey," was given by Helen to Ulysses and his comrades, consisted of poppy juice and Indian hemp. It is indeed actually stated that she learned the composition from Polydamnia, the wife of Thone in Egypt. It is possible that the "wine of the condemned," mentioned by the Prophet Amos, may have been a preparation of these drugs. It is probable that the "wine mingled with myrrh" which, according to St. Mark, was offered to Christ before nailing Him upon the Cross, was

indeed given with the object of lessening His sensibility to pain.

The earliest reference to anaesthesia by inhalation is contained in the works of Herodotus, who states that the Scythians produced intoxication by inhaling the vapour of a certain kind of hemp, which they threw upon the fire or upon stones heated for the purpose. This was probably *Cannabis indica* (or Indian hemp).

Pindar states "Machaaan eased the suffering of Philoctetes with a narcotic poultice." Theocritus also alludes to *Lucina*, the goddess of the obstetric art, as "pouring an insensibility to pain down the limbs of a woman in the throes of labour." Thus we find the early Greeks used certain methods for deadening sensibility to pain.

There is no medicinal plant known around which cluster more mysterious and quaint associations than around mandragora. The Babylonians employed it more than 2,000 years B.C., and a figure cut from the root was used at that period as a charm against sterility. The ancient Hebrews also believed it to possess these properties judging from the story of Rachel related in the Book of Genesis. The early Egyptians employed mandragora, which they called the "phallus of the field," as medicinal agent, both as an anodyne and an anaesthetic.

Theophrastus is the earliest writer on botany to allude to the virtues of mandragora, among which he mentions its property of inducing sleep, and its use as an aphrodisiac in love potions. The Greeks gave it the name of "circeum," derived from that of the witch Circe, and believed that an evil spirit dwelt in the plant; for, when uprooted, it was said to utter such frightful shrieks that no mortal man might hear them and live. To prevent this catastrophe, it was usual in gathering the plant to take a dog and let him be sacrificed to the rage of the demon. The supposed likeness of the root to the human form gave rise to many of the superstitions connected with mandragora, and it was believed in early times that there were actually two distinct species viz., male and female. These roots were carved to resemble the human form and were worn as charms to ward off disease.

The first mention of mandragora as an anaesthetic, is made by Dioscorides, (100 A.D.). He recognized the difference between the hypnotic and anaesthetic effects of the drug. Respecting the latter he says "three wine-glassfuls of a liquid preparation of the root are given to those who are about to be cut or burnt, for they do not

feel the pain." He also refers to a substance called "Morion" believed to be the white seed of the mandragora root, which is mentioned also by Pliny as a narcotic poison.

These allusions serve to prove how frequently anaesthesia was practiced by the physicians of ancient Greece, to whom the narcotic property of mandragora, which is allied to atropa belladonna, or deadly nightshade, was well known.

With reference to mandragora, Sir Benjamin Ward Richardson once prepared a draught according to one of the recipes given by Dioscorides, and took it. He states that the phenomena repeated themselves with all faithfulness, and so we see there can be no doubt that, in the absence of our more convenient anaesthetics, "Morion" might still be used with some measure of efficacy for general anaesthesia.

The father of Arabian medicine, Avicenna, used mandragora, both as an hypnotic and an antiseptic. Galen and Paulus Aegineta alluded to its paralytic sensation.

The Hindus inhaled the fumes of burning hemp in the year 977 as an anaesthetic. The Chinese physician, Hoa-Tho, called it "Ma-yo" (Indian hemp).

In the fifteenth century the method for producing insensibility to pain was that of inhalation of the volatile principles of drugs, which had been handed down by tradition.

Reginald Scott, in a work written in the sixteenth century, gives this recipe for an anaesthetic: "Take of opium, mandragora bark and henbane root equal parts; pound together and mix with water."

We find from the history of the Egyptians, Chinese, Greeks and Hindus that mandragora and Indian hemp were the chief drugs of anaesthetic value. The writers and poets of the day mention them. Boccaccio, mentions them in his "Decameron." Brook's History of Rameus and Julietta printed in 1562, with its tragic ending supplied Shakespere with the plot for his Romeo and Juliet.

Local anaesthesia was not unknown during the middle ages. Cardow recommends the inunction of a mixture consisting of "opium, celandine, saffron, and the marrow and fat of man, together with oil of lizards." Bernard mentions that it was customary in Salerno to mix crushed seed of poppy and henbane. These were applied as a plaster to deaden sensibility to parts about to be cut; while Bartolinus states that local anaesthesia was produced by freezing, thus foreshadowing the use of ether and ethyl chloride as local anaesthetics.

During the seventeenth century the use of nar-

cotic drugs for producing anaesthesia appears to have subsided, and few agreed to these drugs until the middle of the eighteenth century, when new interest was aroused, because of the results of the famous Boerhaave's experiments with opium as an anaesthetic; both by internal administration in powder and by inhalation of its vapour.

During 1560, Valverdi revived the method of compressing the carotid arteries; James Moore also used this method of producing anaesthesia in 1784, and it was tried by Hunter, but their results could not be regarded as successful.

We readily see that from the dawn of creation anaesthesia has been practiced to some degree. At last a series of discoveries in chemistry created a new era in the history of anaesthesia.

Joseph Priestley's discoveries in 1767 of the methods for liberating and collecting gases, and his demonstrations that certain gases could be absorbed and compressed in water, led to the introduction of aerated waters; carbonic acid gas being the first given. Priestley also discovered nitrous oxide in 1776 and in 1798 he eased an aching tooth by inhalation of nitrous oxide gas.

In 1818 Faraday pointed out, in "The Quarterly Journal of Science and Arts," that the inhalation of the vapour of sulphuric ether produced effects similar to those caused by nitrous oxide. About this time Professor Thompson, of Glasgow, used to amuse his students by allowing them to inhale ether and nitrous oxide until they became intoxicated, and sometimes unconscious, or when they were rendered insensible to the prick of a pin. In these cases the gas or ether was inhaled from a bladder. Strange it is, indeed, that very little improvement has been made on this method of administration to the present day.

It is an interesting fact that in the face of all these experiments, no one among the investigators who stood on the very threshold of a great discovery ever ventured over it.

In 1766, Mesmer, who was a pupil of Hehl, professor of Astronomy at Vienna, and an advocate of the efficacy of the magnet for cure of disease, met Gassner, and observed that the priest effected cures without the use of magnets, but by manipulation alone. This led him to believe that he possessed some kind of force with which he could influence others. He believed that this force dominated the nervous systems of men. So pleased was he with his experiments, he decided to move to Paris in 1778. Here he astonished the French by the fact that he could put human beings in a state of artificial sleep or trance, which was called "Mesmerism." Braid later called the act "hypnotism." There are records of

operations having been performed in India by Esdaile upon his patients during their hypnotism.

Alcohol was used as an anaesthetic in 1842 by Robert Collier, a scientist of New Orleans. He observed the actions of a plantation worker, who while stirring a vat of rum, became unconscious, fell and broke his hip. This Collier reset and the worker declared that he felt no pain during the process.

We grant that Humphrey Davy had observed the anaesthetic properties of nitrous oxide as early as the year 1800, but forty years elapsed before his theory was put into practical use.

The glory for the discovery of modern anaesthesia is shared by three men. The world is indebted to Horace Wells for nitrous oxide gas; to W. T. G. Morton for ether; and Simpson for chloroform.

On December 11, 1844, Wells was present at an exhibition of the effects of nitrous oxide gas given by a young scientific lecturer named Colton. Among the persons who were invited to inhale the gas for the amusement of the audience was a man named Cooley, who wounded his shin severely by falling against the benches and was not aware of the wound until he saw the blood. This incident made such an impression on Wells that he at once proceeded to test the anaesthetic effect of the gas on himself. Being troubled with a raging toothache, he inhaled the gas and had it extracted by another dentist named Riggs.

Dr. Wells soon recovered to know what he was about, discharged the blood from his mouth, and exclaimed, "a new era in tooth pulling. It did not hurt me as much as the prick of a pin. It is the greatest discovery ever made." After further successful trials, Wells went to Boston, where assisted by Morton, he gave in the presence of a number of medical practitioners and students an exhibition of "painless tooth pulling," under the influence of nitrous oxide gas. But the experiment on this occasion, as Wells himself confesses, was not quite a success; the gas bag having been removed too soon. The whole thing was denounced and Wells was hissed out of the room as an imposter.

Disgusted by his failure to establish his claim as the discoverer of anaesthesia, his mind became affected and on January 4, 1848, while wandering about the streets of New York he was arrested and charged with throwing vitriol, but while in jail he opened his radial artery; having first inhaled nitrous oxide to make his death painless. This sad event closed the career of Horace Wells, to whom at least belongs the credit of establishing and producing insensibility by nitrous oxide, thus establishing the principle of anaesthesia.

Morris gives us the first account of ether as an anaesthetic in a letter read before the Society of Practitioners in London, on December 18, 1758, in which he advocated the use of ether both internally and externally.

It has already been shown that Faraday in 1818 called our attention to the anaesthetic properties of sulphuric ether, and proved when it was inhaled it produced a drowsiness like that of nitrous oxide. After Wells' failure at Boston nothing was done for a time to investigate the use of nitrous oxide as an anaesthetic.

In 1839, at Anderson, S.C., a group of students were amusing themselves with ether vapour and in their excitement seized a young Negro boy and saturated a handkerchief with the drug and forced him to inhale it. At first his struggles added to the amusement of his captors, but they became serious when the boy exhibited signs of death. After an hour or two of anxiety on the part of his captors he, however, regained consciousness and felt none the worse for his episode.

Three years later Wilhite, who had participated in the experiment with the boy, became the pupil of Dr. Crawford W. Long, who was practicing in Georgia. The doctor and the pupil amused themselves quite a bit by inhaling ether vapour, and, in 1842, Dr. Long performed an operation on James Venable, who was suffering with an encysted tumor, and with his consent used ether. Three months later he removed another tumor from the same patient in a similar manner. He also performed operations of the same nature in 1843 and 1845, but the District in which he lived was so far removed from the centers of medical learning that the experiments remained unknown and unpublished until after the anaesthetic properties of ether had been proved elsewhere. Long, himself, did not consider ether practicable, owing to the shortness of the anaesthetic state, and, therefore, abandoned its use.

In 1844, Dr. E. E. Marcy, a surgeon of Hartford, Conn., administered ether to a patient for the removal of a tumor the size of a walnut from the scalp. It was a success as termed by Wells, who was present at the operation.

The following is an account of the experiment performed by W. T. G. Morton on himself September 30, 1846:

"I then saturated my handkerchief with sulphuric ether and inhaled it from that. I looked at my watch and soon lost consciousness. As I recovered I felt a numbness in my limbs with a sensation like a nightmare and I would have given the world for some one to come and arouse me for I felt that I would die in that state and the world would only pity or ridicule my folly. At length, I felt a slight tingling of the blood in my third

finger, and made an effort to touch it with my thumb, but without success. At a second effort, I touched it but there seemed to be no sensation. I gradually raised my arm and pinched my thigh, but could see that sensation was imperfect. I attempted to rise from my chair but fell back. Gradually I regained powers over my limbs and found that I had been insensible between seven and eight minutes."

This same year Morton appealed to the senior surgeon at the Massachusetts General Hospital, and obtained permission to test the anaesthetic on a patient about to undergo a surgical operation. The date was Friday, October 16, 1846, and at the appointed time the amphitheater was full. Morton administered the ether successfully and the operation, which was for a congenital vascular tumor of the neck, of a young man named Gilbert Abbott, was completed in about five minutes without a single groan.

It was not until November 7, 1846 that Morton expressed his willingness to reveal the secret. On this date two major operations were performed under ether; one by Dr. Warren and the other by Dr. Hayward. From this time on, ether took its place as an anaesthetic, and the practice of anaesthesia was firmly established.

Dr. Oliver Wendell Holmes suggested the name "anaesthesia" for the condition and "anaesthetic" for the agent; which names have since been in general use.

The next great discovery which contributed to the list of anaesthetics was that of chloroform. As a chemical compound, it was discovered by Soubeiran, Liebig, Dumas, Flourens, Guthrie, Waldie and Snow. Sir James Young Simpson was the first physician to use chloroform, however, Waldie suggested its use in October 1847 to Dr. Simpson, while on a visit in Edinburgh. He promised that he would prepare some of the drug and send it to his home in Liverpool.

Simpson writes of his experiments as follows: "I have received the Chloroform from my friend Waldie and have invited Drs. Duncan, Keith, and Professor Miller, a neighbor, to participate and observe the results of self-experimentation." These experiments proved to be a success and on November 10, 1847, just one year after the established use of ether, Dr. Simpson communicated his discovery to the Medico-Chirurgical Society of Edinburgh in a paper, "A New Anaesthetic as a Substitute for Sulphuric Ether." A few days later an operation was to take place and Simpson was to give his new anaesthetic, but for some reason he was unable to be present and fortunately enough, for the patient died at the first incision. On November 15, 1847, chloroform was used for the first time for a surgical

operation in the Edinburgh Royal Infirmary. Three patients were operated on successfully under its influence.

Simpson, no doubt, was the first to use chloroform for an operation. Among those who aided him were Waldie and John Snow, who placed it on a scientific basis.

The advent of chloroform seems to have given the investigators in the field of anaesthetics new life. Dumas and Peligot gave us methyl chloride which was introduced by Deboe in 1837. Sir B. W. Richardson estimated the properties of methyl chloride above those of ether.

Regnault in 1839 discovered tetra-chloride of methane and its anaesthetic properties were first made known by Sansom and Harley in 1864, but Simpson was of the opinion that its effect on the heart was greater than that of chloroform.

Many substances have been introduced; such as ethylene, amylene, ethy nitrate, (chloral-hydrate) aldehyde, carbon bisulphide, and butylic hydride, but these have been practically abandoned for one defect or another.

Karl Koller, of Vienna, in 1884, demonstrated the effects of cocaine as a local anaesthetic. The alkaloid now known as "cocaine" was isolated as far back as 1855 by Gadeke. He called it "Erythroxyton Coca." Von Anrep made a careful study of the drug in 1880 and hinted that the alkaloid might be of use as a local anaesthetic. He experimented on animals in his laboratory and proved his contention.

Such an anaesthetic was of great importance and was universally recognized. It came into general use at once. It was of especial use for ophthalmic operations and in painful conditions of mucous surfaces and minor operations. Other substances which followed cocaine were eucaine, a synthetic product of benzoyl-vinyldiacton-alkamine discovered by Merling and studied by Vinci. He divided the drug into two forms, Alpha and Beta, but there was only one suitable for producing local anaesthesia, (Beta) official in U.S.P. X.

The synthetic product stovaine, or benzoyl-ethyl-dimethylaminopropanol hydrochloride was introduced by Fourneau and derived from tertiary amyl alcohol and is less toxic than cocaine. In Germany tropa cocaine is used and is derived from the leaves of the java coca plant. Novocaine has lately been found to possess properties suitable for use as a local anaesthetic in dental operations. It is free from toxicity and does not cause local inflammations, common to most local anaesthetics.

The history of anaesthetics will remain an unfinished work, until some one is able to synthesize a drug that will have all of the desirable properties of the ideal local anaesthetic.