

From Out of the Primordial Soup:

A Brief History of Anaesthesia

Anaesthesia has been around in one form or another since around the 12th century and in some sense hundreds to thousands of years B.C. In the last 150 years however a revolution of anaesthesia has occurred with exponential growth in knowledge and substances available for use in anaesthesia making it one of the most advanced specialities in modern medicine. The following essay considers the core roots of our speciality and looks briefly ahead to see what the future may hold.

Primitive Anaesthesia

Medieval anaesthesia was primitive and barbaric when compared to the standards employed today. The most common before the 15th century was probably the use of liberal quantities of alcohol plus or minus opium and a wooden stick to bite down upon. However some of the substances used in this period still hold strong today such as opium and some are even being 'rediscovered' such as Cannabis in chronic pain.

Arabic alchemist were perhaps some of the most advanced in their beliefs on anaesthesia in the 12th and 13th centuries employing techniques such as the soporific sponge which was a sponge steeped in hashish, opium and other herbal aromatics. When required for surgery it would be moistened and held over the face inducing a state of unconsciousness. Writings about this practice can be found in Sir Richard Burton's translation of *The Arabian nights (1)*.



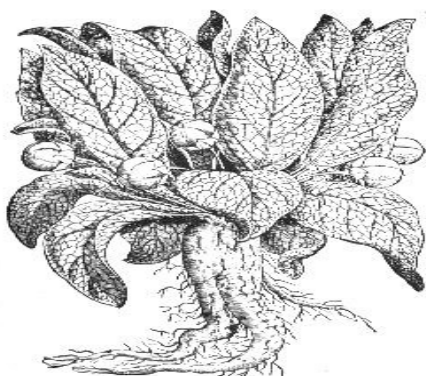
Arabic Anaesthetists preparing to use the Soporific Sponge

(2)

Formal reference to the use of an anaesthetic agent for surgical intervention occurs around 1540 when Dioscorides refers in his pharmacopoeia to:

‘Sleeping potions made from opium and mandragora root which may be used as surgical anaesthetics for such people whom be cut or cauteried’ (3)

Mandragora continued to be a popular choice of anaesthetic up to the middle ages and was a mythical and respected plant. It was felt that the mandrake plant whose roots resembled a human form would kill the person who picked it if the screams of the root were heard. For this reason the plant was uprooted in novel ways such as tying the loosened plant to the collar of a dog and allowing the dog to uproot the plant, a practice that would be frowned upon by the RSPCA no doubt.



Mandragora officinarum
Source unknown (4)

Mandrake Plant

Mandrake was usually combined with a blend of opium and hemlock and either rendered the patient unconscious or dead, as hemlock shows zero order kinetics and is a toxic piperidine alkaloid.

One of the commonest anaesthetic potions used was the 'Dwale Potion' from the medieval word dwale meaning confused or dazed. This comprised the gall from a castrated boar, lettuce, hemlock, henbane opium, mandrake and bryony.

Certainly the longest standing substance used in anaesthesia throughout history and into modern day are extracts from the opium poppy, *papaver somniferum* meaning the poppy of sleep.



(5)

Papaver Somniferum

When the walls of the opium poppy are incised a latex like substance is secreted, from which many of the useful products are derived including opium and the isoquinoline alkaloid derivatives morphine, codeine, noscapine, papaverine and thebaine.

The Sumerians were the first to cultivate the poppy as far back as 3200 B.C. There is a feeling among some medical historians that the poppy itself is integrated into human culture and that this is one of the reasons that eradication of the illegal opium trade is so difficult. The first writings of opium overdose appear around 1037 A.D when the Islamic physician Avicenna died of an accidental overdose. A famous quote, which still holds true today, was in the 17th century when Thomas Sydenham wrote:

' There is no other pain killer that is so universal and efficacious as morphine' (6)

As you can see from the above techniques the balance between life and death was even more tenuous during anaesthesia than it is today. So when did things start to change?

Evolution

From these primitive beginnings little changed in anaesthesia until the end of the 18th century. During this time a rapid evolution occurred in the practice of anaesthesia largely due to certain key individuals who shaped the foundations of our speciality as it stands today.

The discovery of ‘dephlogisated nitrous air’ or nitrous oxide as we now know it, by Joseph Priestly was the catalyst for this evolution. The discovery occurred at the end of the 18th century but the relevance of the discovery was not stumbled across until a couple of years later in the early 19th century when a chemist, Humphrey Davy, conducted some ‘physiological’ experiments with the gas.

At the age of 21, Davy a keen chemist was employed as a superintendent of the medical pneumatic institution of Bristol to investigate the properties of various gases and their application to medicine. A quote in the diary of an observer at the time states, *‘He breathed 16 quarts of the gas over a period of 7 minutes and became completely intoxicated.’* (7)

(8)

Humphrey Davy

Davy was a remarkable if somewhat erratic chemist who was not only responsible for the above discovery but many others such as the Davy miners’ lamp and many of the properties of the Alkali Earth metals. He died May 29th, 1829 at the age of 51 from a myocardial Infarction following a prolonged illness considered to be brought on by the inhalation of many gases over his lifetime.

Despite Davy’s work it wasn’t until 45 years later in 1844 when nitrous oxide was used as an anaesthetic by Gardner Colton and Horace Wells. Colton was a travelling

scientist who gave public demonstrations of his discoveries. Wells, a practicing Connecticut dentist, was at one such demonstration when he witnessed Colton administer Nitrous oxide to a man who then bashed his shin against a stone bench and displayed no sign of pain. Excited by this observation Wells invited Colton to his dental practice the next day.

Colton administered nitrous oxide to Wells and Wells' partner John Riggs extracted his wisdom tooth whilst under the effect of the gas.

(8)

Horace Wells

No pain was experienced during the extraction and Wells and Riggs pioneered the use of Nitrous oxide as a dental anaesthetic and went on to anaesthetise many more patients for wisdom tooth extraction.

During his career Wells was to influence the life of one of the most important names in anaesthetic history, William Morton. Unfortunately the rest of Wells' career was not so illustrious and in 1848 he committed suicide after being arrested for dousing a prostitute in sulphuric acid.



(9)

*William Thomas Green
Morton*

William Thomas Green Morton was born in 1819 in Massachusetts. From a young age he aspired to study medicine but unfortunately lacked the capital to do so and so chose the less expensive option of dentistry.

He trained predominantly under the guidance of Horace Wells and together they started a dental practice that eventually turned out to be a financial failure. At this point in his life he separated from Wells and began studies at Boston medical school under the guidance of prestigious surgeon Charles Jackson. Here he began investigations into the properties of Ether. Unfortunately Morton's constitution was never strong and he suffered frequently with anxiety and stress. Early on in his studies of ether he was thwarted by a nervous breakdown and had to return to his family home for a period of respite.

After this set back he returned to his studies and was briefly reunited with Horace Wells when Wells gave an unsuccessful demonstration of the properties of Nitrous oxide as an anaesthetic for wisdom tooth extraction. The demonstration was a farce with the patient crying out and thrashing around and subsequently Well's work was rubbished.

At this point Morton's' life began to flourish as he opened his own dental practice which was a financial success and even allowed him to open a factory which specialised in making false teeth. With his continuing dental practice his interest in anaesthesia was again stimulated. The problem that he and his patients faced were that to fit the dentures the roots of the old teeth had to be removed at considerable pain to the individual undergoing the experience. He decided to return his interest back to ether which he had studied before. His experiments, which almost certainly did not have the approval of the ethics committee, ranged from testing the effects of ether on his goldfish, his pet terrier and himself.

Excited by his results from anaesthetising goldfish he was given a prime opportunity to test his research. On the 30th of September 1846 a patient named Ethan Frost came to his surgery for a painful wisdom tooth extraction and agreed to have it extracted under the influence of Ether. Morton held a handkerchief over the patients' mouth

and dripped ether onto it (without accurate end tidal measurements!). The results of the experiment were published the next day in the Boston daily evening Transcript.

NEW AND VALUABLE DISCOVERY. We noticed yesterday the discovery of a new preparation by Dr Morton which is intended to alleviate the sufferings of those who are forced to undergo painful operations in surgery and dentistry, as well as to facilitate the work of operators. The effect of this new discovery is to throw the patient into a state of insensibility and while unconscious any operation can be performed without occasioning pain. We are told by a gentleman of the highest respectability that he witnessed an experiment of the use of this most extraordinary discovery at the rooms of Dr Morton one evening this week. An ulcerated tooth was extracted from the mouth of an individual without giving him the slightest pain. He was put into a kind of sleep, by inhaling a portion of this preparation, the effects of which lasted for about three quarters of a minute, just long enough to extract the tooth. This discovery is destined to make a great revolution in the arts of surgery and surgical dentistry.

*Boston Daily Evening Transcript,
October 1st 1846*

(9)

Morton's Article caught the eye of an up and coming young surgeon, Henry Jacob Bigelow. On the 16th of October 1846 Morton gave the first ever public demonstration of anaesthesia using sulphuric ether and Morton's Inhaler in the Ether dome at Boston whilst Bigelow removed a tumour from the jaw of his patient, Gilbert Abbot.



(8)

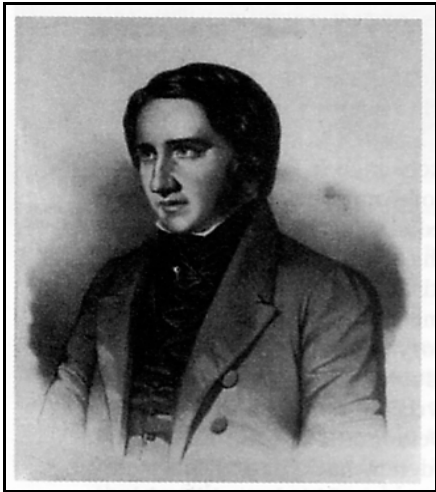
The Ether Dome, Boston, Massachusetts

As with most historical names in anaesthesia Morton's tale is not a happy one. Because he was not a physician he did not receive full credit or financial reward for his discovery and spent the rest of his life in legal battles. He died in 1868 at the age of 49, a pauper. Bigelow kindly had inscribed on Morton's headstone:

'Before whom, In all time, Surgery was Agony

By whom, pain in surgery was averted

Since whom, science has control over pain' (9)



(9)

James Young Simpson

One of the most notable names in anaesthetic history and possibly one of the most eminent physicians in the history of medicine was James Young Simpson.

Simpson was born in Bathgate in 1811.

His family were bakers by trade but sacrificed much of their earnings to allow the youngest and cleverest son, James, to go to University and be educated.

Simpson went to Edinburgh University at the age of 14 where he studied Greek, Latin and Maths for his first year before applying for Medicine in his second year. He was accepted with the handsome bursary of ten pounds per year. At Medical school Simpson was a feisty individual with a keen intellect and was never one to just sit back and accept the standard teachings of his seniors always keen to challenge accepted practice. He graduated from University with his LRCSEd and then for a

short period worked in a few general practices before embarking upon and completing his MD thesis. After this he began work for an eminent Pathologist of the time.

From this point Simpson's keen intellect and voracity for his work lead him into the field of obstetrics and gynaecology where he challenged practices and produced a veritable cornucopia of publications, presentations and teachings on the subject. His esteem rose and in 1840 he was voted the Chair of Midwifery at Edinburgh University.

Shortly into this role Simpson heard of a discovery in London from his next door neighbour which was to change the course of his life. Robert Liston had performed a leg amputation in December 1846 with the patient anaesthetised with ether (shortly after Morton's discovery). Excited by this he travelled to London to find out more and when he returned to Edinburgh his mind was filled with great ideas of applying the use of ether to the relief of pain in Labour. This was revolutionary and in many circles, unpopular.

Simpson faced opposition from many angles. On the one side of the coin his professional colleagues opposed the idea saying that it would pose great risk to the mother and would certainly harm the child. On the other side many members of the public and clergymen opposed the idea on religious grounds. Simpson fought these ideas using his intellect to oppose them.

Professionally he opposed his colleagues by using the ether in his practice and collecting data from 800 other maternity patients who had had ether for both natural and instrumental deliveries and demonstrated clearly that it did have a place in obstetric analgesia. On the religious front he produced a leaflet with an equally valid counter argument to some of the religious objections. He used direct quotes from the bible to emphasise his points including:

For everything God created is good, and nothing is to be rejected if it is received with thanksgiving, (10)

And

Anyone, then, who knows the good he ought to do and doesn't do it, sins. (11)

Simpson found however that ether took too long to work and was not efficient in terms of the volume that had to be used during the course of labour. For this reason he searched for another agent. It wasn't until a pharmaceutical colleague suggested Chloroform that his mind focused on this. In November of the year after the discovery of ether, Simpson and two colleagues inhaled Chloroform over his dining room table and needless to say all fell unconscious and slipped under the table. Simpson's first thought on recovering (other than my head hurts) was how much more potent chloroform was than ether.

A few days later Simpson had progressed from his clinical trial to patient testing and by the end of the month had anaesthetised several patients with Chloroform. Simpson had first used chloroform on a patient by November 8th 1847. 2 months later on January 28th 1848, chloroform had claimed its first victim, a 15 year old girl called Hannah Greener. Investigation into this occurred but it was unclear whether the death was due to respiratory depression or some unknown effect on the heart. It wasn't until 60 years later that Levy used animal experiments to prove that deaths from chloroform were:

'Not due to the direct respiratory depression but due to the cardio toxic effects resulting in cardiac fibrillation' (12)

Despite this discovery the popularity of chloroform rose well into the twentieth century and when Simpson died in 1870 he had already been Knighted and more than 30, 000 mourners lined the streets of Edinburgh as a mark of respect. His memory lives on with the dining room where he first used chloroform on himself being preserved to this day. Also there stands a statue in Princess place, Edinburgh, as well as a memorial plaque in Westminster cathedral. There is also an annual James Young Simpson gold medal awarded by the Royal college of Surgeons of Edinburgh and the winner gives the annual Simpson memorial Lecture.