INHALATION ANESTHESIA

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INTRODUCTION

In this paper I will give a somewhat brief report of the high lights of the history of anesthesia, followed by a generalized description of the various general inhalation anesthetics, their action on the human organism, and the administration of these, with the factors governing their use. The subject which I have chosen is a wide one, on which volumes have been written. It is also a very interesting subject, and if I can but give the reader a general idea of the history, theory, and administration, of anesthetics, man's most remarkable discovery in his fight against pain, my aim will have been accomplished.

Definition: Inhalation anesthesia is the dulling of the senses, especially that of feeling, by the administration of volatile, chemical substances, which are absorbed through the respiratory tract.

The History of Anesthesia

The history of anesthesia originated as long ago as the the first time that man experienced pain, which indeed must have begun with the first forms of human life. Instinctive in the haman being is the desire to relieve their pains and sickness, and anything else causing discomfort or danger to their existence.

Pain was naturally the driving force behind the development of anesthesia. It is therefore interesting to study the earliest records of the sufferings of mankind, their remedies for pain, and the stages of development through which have evolved our modern methods of anesthesia.

Anthropoligists have discovered skeletons of what they believe are the most primitive forms of man; the Neanderthal man, and the Pithecanthropus Erectus are examples. These skeletons have been studied by the anthropologists , aided by modern laboratories, physicians, chemists and physists. It has been discovered that these primitive people suffered from gout and other forms of arthritis, intracranial diseases, cavities in the teeth, and fractures and tumors of the bones. It would be interesting to know what they did for their pain. There have been found many primitive skulls with round holes produced by the trephine, and among the arrow heads were found knives, saws, and lancets, which show that even they must have practised some forms of surgery.

The omnipresence of pain is recorded by writings in stone, and in crude pictures, which were dug out of the past by geological excavations. Ancient art on the walls of Assyrian and Egyptian temples and tombs, on vases, and in the mural decorations of Pompei, shows repeatedly the suffering of the peoples of that time.

Tales which have been handed down to us from mythology and folk lore show us that man's methods of relieving pain in primitive time was ever changing because of man's changing conception of the causes of pain. The onset of pain, as if it were dropped on them from nowhere, was terrifying and mysterious to man. They simply could not understand it. B Because it was so mysterious to them, they had to interpret the pain in pictorial thought to give some reason for it; so the unseen powers were transformed into invisible demons, and they regarded pain as the work of these demons. This was man's first conception of pain. The demon of the ear ache had gigantic ears, the demon of a toothache was imagined as a gnawing worm, and an "evil bird" picked incessantly at their sore spots.

Their first method of relieving pain was to scare the demons away. They wore rings in their noses and ears. They tattooed gruesome figures on their bodies. They wore tiger claws and charms. They also threatened the demons with word and incantations. There were designated certain men in the tribe, who were supposed to be able to commune with the demons. They employed all manner of fantastic ways to rid the body of the demon. They would plead, then curse and threaten, and wrestle with the devil, often inflicting more pain on the poor patient in their efforts to rid him of the devil.

Later man's idea of the cause of pain changed from earthly demons to gods. They began to believe that instead of pain being inflicted by prankish devils, it was inflicted by offended dieties. When they became sick they believed it was the anger of the gods brought on them by their negligence in observing some sacrigice, or by the doing of an evil deed. For instance, in mythology Zeus was enraged at Prometheus for the theft of fire from Olympus, and sent Pandora to earth who opened the box containing pain and disease which spread over the world. Therefore priests replaced the shamans. The gods were also believed to be able to relieve pain if sacrifices were made, and supplications offered.

In the chronicles of Ancient Rome, the priestess Pythea inhaled carbondioxide which was supposed to be generated in a cavern. She was removed to an altar before the convulsive stage took place,ad her mumblings were interpreted as the faithful voice of Apollo. (Memphis marble and vinegar were used as a local anesthetic by the early Romans.)

Almost all of the ancient countries had shrines scattered from boundary to boundary to appease and ask help from the dieties; and they all have their mythological tales of the vengeance or benevolence of their dieties.

In the beginning of the Christian era, God sent his Son who had incomparable healing influence. After His death, the healing faculty passed to the church, and was assumed by priests, monks, and nuns.

By 910 A.D. the power of cure by touching was reserved for kings, who received their privileges when crowned by a pope. Then later, as in an instance when a particularly successful king died, the people believed that a piece of clothing or some article touched by the king had curative powers. There develped a faith in relics, and these$ people would go to any end to secure the coveted articles. From this there developed the idea that faith was all that was needed to relieve pain - faith in almost anything. Reading the Bible and Scriptures with faith that it would cure became a widespread practice.

Following this, superstitions developed regarding healing. All sorts of practices were resorted to which arose from the superstitions of the people. For example, one of their practices was to tie the painful part to a tree that the ache might be absorbed by the trunk.. They would also carve arms and legs from wood and burn them, believing that this would cure a pain in the affected extremity.

Early in man's history it was discovered that sleep was a pain-killer. It was perhaps this discovery that led to the scientific relief of pain. It is unknown at what period man discovered that artificial sleep could be effected by the use of roots, bark, hervs, and blossoms, but they have come down to us even in mythological tales.

Classical historians have made much of the sufferings of ancient heroes, and of the epidemics which inflicted the world. In Homers "Odyssy" he caused Helen of Troy to put some drug into wine "to lull all pain and anger, and bring forgetfulness of every sorrow." Some believed this to be mandragora, and others believed it to be opium.

Five hundred years after Homer, Herodotus, an historian of Greece, told of an old Scythian custom of inhaling fumes of a variety of hemp, which produced and exalted mental state which was followed by sleep.

China was probably the first to use Indian hemp, or Marijuana. It is known that the ancient Chinese used various drugs to make less agonizing the horrible tortures of criminals, or to use them to make them confess their crimes. The ancients early noticed the promptness in effect of volatile substances when inhaled.

By the time of the beginning of Christianity, there had been developing in Greece the study of the sciences, and the records of the first Greecian physicians as Galen and Demosthenes, were preserved for the foundations of modern medicine. By this time it was apparent by their references that the use of mandragora was well known, and that in Rome it was used extensively to relieve the victims of crucifiction.

During the Middle Ages, certain monks knew how to prepare "Sleep Sponges" or pillows impregnated with Mandragora. St. Benedict, it is recorded, being about to amputate a leg of Emperor Henry II , put the patient to sleep on a Mandragora pillow so that the operation would cause no pain.

In the thirteenth century Hugo de Succa used an oil "of opium, of the juice of unripe mulberry, of hyocyamus, of juice of hemlock, juice of the leaves of mandragora", and other herbs. These were boiled with a sponge. When used the sponge was soaked in hot water and applied to the nose. To waken the patient another sponge soaked in vinegar was applied to the nose. This was used as late as the 15th Century.

The use of the herbs however, did not become general, because of the ignorance of the common people of their existence; and also because the action of them was so uncertain, many deaths having occurred from their use. The doctors and patients became distrustful of them and they became temporarily abandoned.

The subject of hypnotism in producing insensibility to painful stimuli must not be disregarded. The origin of the practice of hypnotism dates far back in man's history. In ancient India, Egypt, Persian, China and other far east countries, hypnotic effects were in duced by wierd incantations and ceremonies.

Much later in Ireland, we find the record of Greatrakes, the "Irish Stroker", who produced sleep by the result of his magnetic touch.

In the 18th Century in France, hypnotism was brought to its greatest climax in the curative field by Anton Mesever. He introduced his find by declaring that by using magnetism he could produce a "vital fluid" for the relief of all pains. The magnet was known at that time, and had long been part of the magician's equipment.

Mesmer declared that the cosmic energy which made life possible was most plainly manifested in magnets. All that was necessary was to place two magnets against the body of the sick person, and the healing current would flow through and put an end to the pain.

Due to Mesmer's belief in his theory, and to his dynamic personality, people believed him, and came by the hundreds to be cured. Before long he had more patients than he could possibly handle. It was then that the idea of mass magnetism occured to him. Taking a wooden rod, he made passes over it with the magnet, thus giving the rod his own magnetic energy. He then could stand and point the rod at hundreds of them and watch the magnetic forces work. Then Mesmer discovered that it was not the wand but some magnetic power within himself, and that he could heal people by merely touching them with his hand. This became known as "animal magnetism." From this he progressed to the thought that touching them was superfluous, and all he needed to do was to "will" the pain to go away.

His practice became so large that Mesmer had to devise a way that his curative methods would reach the needs of a vast multitude. So he transferred his "healing fluid" to inanimate objects. The first object was a great wooden tub in Mesmer's house. This was called a baquet. It contained a double series of bottles which he charged with animal magnetism. The bottles were connected with a steel rod from which conductors were brought in contact with the painful spots of the patients. With fingertips touching the patients sat around the magnetic baquet in complete silence for an hour. Then there was a "crisis" which began with convulsive twitchings followed by a trance, from which they awakened free from pain.

Again the demand exceeded the supply, so Mesmer sold Mesmerized pocket "baquets" for home use; he magnetized mirrors which had healing powers when looked into, he magnetized musical instruments which had the power to cure all within hearing distance; he magnetized gardens, parks, shrubs and whole forests.

Mesmer's success was widely acclaimed by France, and he was requested to pass his powers on to other people so that the secret would not die with him. They offered to build him an institute and give him a pension. Mesmer accepted, but made a condition. The condition was that he must secure official scientific recognition of his discovery.

Most physicians of his day, however, regarded him with contempt. The Medical Society was ordered to study the art by King Louis XVl, and though they seriously worked on it they could not find a scientific explanation, so it was not to be recognized. Mesmer therefore refused to impart his secret .

Mesmer's work went on until the French revolution when most of his distinguished patients died under the guillotine, and Mesmer himself had to flee from France. By 1815, when Mesmer died, his work had passed into complete oblivion.

One of Mesmer's desciples, who had paid Mesmer 400 louis for instruction in magnetism, was Count Maurice de Puysegur of Busancy. He carried on the experiments of Mesmer, and one day discovered that he could produce an artificial sleep in which a patient in a trance would do anything he suggested. Puysegur was very much surprised , and experimenting further he produced the same result in a number of cases.

The news of Puysegur's experiments spread widely, and came to the attention of medical men. One of the first to use it was Baron de Potil who tried somnambulism to make operations painless.

Dr. John Elliotson and Dr. James Esdaile of Edinborough were the most ardent supporters of somnambulist operative surgery. Esdaile went to India where he acquainted people with his ability. He acquired fame by removing scrotal tumors from the native without pain. The Hindu populatioh even acclaimed him as a saint.

However, he was looked on with scorn by the British medical men, and Esdaile as well as his patients were called lunatics and "quacks". They believed that the patients had beed drugged with hashish and other narcotics to induce insensibility to pain.

Mesmer has been named "The Last of the Magicians", for the world by the time of the Renaisance was becoming more and more scientific minded. It was no longer possible to believe in a simple faith in magic and religion. The advance of science now became the popular subject of conversation.

With the advance of scientific research ahd synthetic Chemistry came the real beginnings of surgical anesthesia. At the close of the eighteenth Centry a man named Joseph Priestly discovered oxygen and Nitrous Oxide.

Joseph Priestly was born near Leeds in 1733, and in his youth was a school master and a minister. When he had an hour or two to spare he would go to a near by brewery and watch the air bubbles rise to the surface in fermenting beer. Although it was a familiar process, no one thought about the cause of it.

This started Priestley on his career of studying chemistry. He devised instruments with which he could collect and store the bubbles and study their composition. He perfected his apparatus so that he could isolate various gases in the pure state. The first gas he isolated was carbonic acid gas. Following this were the discoveries of oxygen, sulphurous oxide, ammonia and fluorine.

One day he treated iron filings with nitric acid, and hit upon nitrous oxide which later was used as the first gaseous anesthetic. Priestly had discovered how much brighter a flame burned in the presence of oxygen, and wondered what the effects of inhalation of oxygen would be. He tried it himself. His reports on these experiments were important to the art of medicine, because they disclosed a new way of of administering medications. The inhalation of oxygen and other gases became common in the treatment of repiratory disturbances.

Priestly would have gone farther in his experiments, but he found it necessary to resume his place in the church due to the dissention between the Unitarians and the traditional orthodox faith. From that time till his death he found little opportunity to continue his beloved chemistry.

Although when Priestly first began his experiments, chemistry was looked on with scorn by the majority of the medical men, before long they began trying fases on their patients. "Pneumatic Medicine" soon became widespread. Gases were used for relief of asthma, catarrha, and any difficulty in breathing. This method was then tried in other diseases, such as cancer, hysteria and paralysis, but with little success.

At the end of the 18th Century inhalation of gases was quite common, but as yet no one had attempted the inhalation of Priestly's Nitrous Oxide. It had been branded as dangerous by a prominent American physician, and no one had doubted his word.

In 1795 Humphry Davy, then 17 years old, took the risk. Davy was apprenticed to John Bingham Borlase, a prominent surgeon of Penzance. To Davy's surprise, when he first inhaled the gas there was no sign of sudden death as prophesized by the other physicians, but an agreeable sense of lightness came over his body. The agreeable sense increased, and helt extremely cheerful, and wanted to laugh, in fact he could not help but do so. He believed therefore, that he had discovered that the gas induced artificial pleasure, and that he could give the world a source of articial laughter.

A short time following this experiment, Davy chanced upon the anesthetic properties of the gas. When he was haveing a good deal of pain in cutting his wisdom teeth, he tried inhaling nitrous oxide to relieve the pain. It was so successful that he experimented with the gas in relieveing other pains as well.

Early in Humphry Davy's career he was made Superintendent of a laboratory in Dr. Beddois pneumatic institute, where he had at his disposal the most modern equipment, and was here that he continued his experiments in collaboration with Dr. Beddois. Davy did most of his experimenting with Nitrous Oxide on himself, and several times almost died from an overdosage. By 1799 and 1800, he became well enough acquainted to use it for the relief of pain from head aches, and even for the extraction of one of his wisdom teeth.

From his experiments at Dr. Beddoes institute, he was led to suppose that the gas might be used in surgical operations. In his book "Medical Vapours" he wrote " as Nitrous Oxide seems capable of destroying physical pain, it may be used in surgical operation when there is no great effusion of blood." The value of his suggestion was not recognized for nearly fifty years. Davy had very nearly become the discoveror of surgical anesthesia.

At this time rumors began to spread of doctors who had not had very good results from the administration of the gas to their patients. They noticed a lowering of the pulse rate and attacks of giddiness. Many physicians discontinued the use of the gas, and there developed a general antagonism toward its use, and Davy discontinued his experiments with Nitrous Oxide.

While Humphry Davy was doing his research in Dr. Beddois laboratory, he had a young assistant named Michael Farraday, who soon made a name for himself in the world of chemistry. While experimenting with gases and also with vapors which are liquid at normal temperatures, he discovered the soporific properties of ether vapor.

Ether was first discovered in the 13th Centruy by Raymond Lully, an alchemist, who called the fluid "sweet vitriol", but his discovery was not recognized. Two hundred years later, in the beginning of the 17th centruy Parcelsus, a migratory physician rediscovered ether, having mixed sulphuric acid with alcohol and heating the mixture. He tried this fluid on chickens. He reported - "It has an agreeable taste so that even chickens take it gladly, and thereafter fall asleep for a long time, awaking undamaged. In view of the effect of this vitriol, I think it especially noteworthy that its use may be recommended for painful illnesses, and that it will mitigate the disagreeable complications of these." However, the importance of his discovery was not recognized at that time.

In 1730, a chemist named Frobenius, brought attantion to ether, and pneumotologists tried it, and used it for the relief of asthma.

However, not until the time of Faraday was it discovered that ether could put people to sleep. But Michael Faraday had so many irons in the fire that he attached ltle signifigance to his discovery, and made merely a small allusion to the fact in the "Quarterly Journal of Science and the Arts." He wrote in 1818 - "When the vapour of ether is mixed with common air and inhaled, it produces effects very similar to those occasioned by nitrous oxide. By the incautious breathing of ether vapour a man was thrown into a lethargic condition which, with a few interruptions lasted thirty hours." Again this important knowledge lapsed into oblivion.

A few years after the experiment of Faraday, Henry Hill Hickman, a country physician inspired by the terrifying agonies of surgical operations, started a zealous search for a method of relieving pain in operations. He followed the ideas of Priestly, Davy, and Faraday and made new experiments of his own. First he tried oxygen, then carbon dioxide, and then nitrous oxide. He was successful in so completely anesthetizing his animals that he was able to amputate legs, ears and tails without appearance of pain to the animal.

After he had experimented long enough to convince himself that it was time for him to try it on human beings, he took his proposal to Davy and Faraday for them to use their influence to draw the attention of distinguished scientists to the matter. Unfortunately, Davy and Faraday both had taken up other interest in chemical problems, and neither of them took any interest in Hickman's proposal. As a result no committee of the Royal Society would support a proposal which Faraday And Davy had rejected, and it was not even considered desirable to have a public reading of Hickman's report.

Hickman had an opportunity to read a paper on his research before the Medical Society of London, but there he was met with scepticism and his proposal was derided as dangerous and useless.

Disappointed, but not beaten, Hickman wrote to Charles, king of France, who passed on the petition to bring Hickman's proposal to the Royal Academy of Medicine. Here again he was met with antagonism.

Hickman was still determined to make something of his belief, but he died prematurely at only twenty-nine years of age, in April 1850.

About this time in America, it was a common thing for people to go to scientific lectures, and it was a favorite stunt to demonstrate the intoxicating effects of ether upon a person picked from the audience. Before long it became a popular pastime to have parties at which the young people, especially medical students, to inhale ether or nitrous oxide to the point of intoxication.

In 1839, a group of young people were at a quilting party near Athens, Georgia, and they finished up the evening by inhaling ether. At the height of the fun, a negro boy appeared and watched, wide-eyed, the antics of the young people. One intoxicated youth dragged the negro boy into the room, and for a joke administered a handkerchief soaked in ether to the negro's nose. After a long struggle, the negro became quiet, and instead of getting up, he lay as if asleep, much alarm of the culprits. They punched a nd kicked him, but he did not awaken until medical attention was given one hour later. All those people saw that the negro boy did not become elated, but fell into a profound sleep, accompanied by a loss of insensibility, but their understanding went no further.

Three years later in Jefferson, Georgia, a doctor by the name of Crawford A. Long was the first to make use of the properties of ether which were common knowledge to all. Dr. Long and his friends often had indulged in "ether frolics". During these frolics he noticed that he often received bad bruises, but had not been comscious of pain when he received them. Observing this time and again, he began to wonder if this did not have some medical value.

Long persuaded a friend named James Venable to allow him to remove a small tumor from his neck after having inhaled ether. After the operation Venable declared that he had felt no pain. Dr. Long continued to administer ether in minor surgery cases, and recorded eight such operations in three years.

But Long had enemies who envied his popularity, and they spread rumors around the small community that he possessed a means of making people unconscious which was a dangerous poison which deprived people of their reason. His practice began to fall off, and he was avoided in the streets. The general opposition became too much for him, and he had to discontinue his use of it.

Because he was a country doctor, and his cases were few, the news of his discovery did not spread. He made no secret of it, but neither did he adventise it until others had laid claim to the honor.

In 1844, about three years after Long's experiments, Horace Wells, a dentist of Hartford, Conn., attended a lecture on "laughing gas" by C.Q.Colton, a chemist. He noticed that a young man under the influence of the Nitrous Oxide bruised himself quite seriously, but did not seem to feel any pain. Wells had long been studying the question of painless extraction of theeth, and after he had watched Colton's demonstration, he thought that if Nitrous Oxide were inhaled by a patient he could extract a tooth without inflicting pain upon the patient.

Wells tried his idea first on himself. He asked Colton to administer the Nitrous Oxide, and had John M. Riggs, a colleague of his extract one of his, Well's, teeth under the gas. Wells was overjoyed with the results, and began to extract teeth under gas almost every day.

Early in 1845 Wells went to Boston to present his descovery before the medical association. He received permission to give a demonstration before the Harvard Medical College. His experiment failed, because Wells had not learned how to regulate the dosage properly. One of the Harvard students had volunteered to inhale the gas and to have a tooth extracted. When Wells began to extract the tooth, the student yelled with pain. The audience shouted " A Humbug, A Swindler," stormed the platform and put Wells out of the lecture hall.

He felt very much disgraced, but he still did not give up hope. A short time later he gave another demonstration in Hartford. This time he gave a much larger dose, which proved to be too much, and the patient nearly died.

After this he lost confidence and courage to go on. He gave up his practice as a dentist in 1847, and tried other ways of making a living. However, he met with failure in everything he tried. In 1848 he lost his reason, and committed suicide by cutting his radial artery after, ironically enough, having inhaled ether.

Early in Wells's career he had had a partner whose name was William Thomas Green Morton who was destined to become the discoverer of anesthesia for surgical use. Their partnership did not succeed financially, however, so before long they split up. By himself, Morton did fairly well financially with his practice. Morton discovered a new way by which gold crowns could be attached to the vestiges of old teeth without leaving an ugly black border around the tooth caused by the galvanic process for affixing gold crowns. However, the method was very painful, and the patients would prefer not having it done than to endure the tortures of its application. This started Dr. Morton on his search for a painless way of practising dentistry.

At this time in Boston there lived a very remarkable scientist by the name of Dr. Charles Thomas Jackson. Dr. Morton Asked Jackson about the administration of sulphuric ether locally in relieving pain in dentistry. Dr. Jackson gave Morton a drop bottle of ether to dry, but this did not prove very successful.

At this same time Wells was making a poor showing of his demonstrations of laughing gas at Harvard. Morton conceived the idea of a general anesthetic from this, but realized that he must find something better.

Morton did not know a great deal about administering gas by inhalation, and realized that Dr. Jackson would be the man to consult, but since the beginning of his experiment he had become unfriendly with Dr. Jackson so that he felt it impossible to consult him. Consequently, Morton did his own research, and found that sulphuric ether had been used to relieve respiratory disturbances, and that the anesthetic effects of ether were similar to those of nitrous oxide.

Profiting by Wells's experiments Dr. Morton tried inhalations first on animals and then on himself. He found that when he inhaled ether in large enough quantities he became aware of numbing of his senses, and then complete loss of consciousness for a few minutes - long enough, he believed, for the extraction of a tooth.

Morton persuaded two of his friends to inhale ether so he could observe their reactions. Much to his surprise, however, the young men did not lose consciousness, but passed into a stage of the utmost excitement. They yelled, waved their arms about. upset tables and chairs and behaved like demented men. Neither of the two men could be persuaded to be guinea pigs again.

Morton had trouble finding people who would be subjected to his experiment. He was advised by his friends to ask Dr. Jackson about the administration problems of ether. However, in addition to being on unfriendly terms with Jackson, Morton feared him as a possible rival because Jackson had before tried to claim priority to discoveries claimed by other men.

Dr. Morton however, did go to see Dr. Jackson but disguised the purpose of his visit, and rather cleverly brought the topic of conversation to the subject of gas administration . He found out during his visit that Jackson believed sulphuric ether to be safer than nitrous oxide, and that Jackson had done a little experimenting with highly rectified sulphuric ether. He also learned that it was impure ether that had been producing all his uncertain effects.

He experimented on himself with this and found that the effects were the same as when he had first successfully administered ether to himself.

Immediately Dr. Morton had his friend Dr. Hayden pull out one of his (Morton's) healthy teeth, and the experiment was wholly successful. On September 30th, 1846, he pulled a tooth from a patient suffering with a toothache absolutely painlessly, and with no unpleasant after effects.

Morton, for the purpose of making his discovery of personal pecuniary value, applied for a patent on October 1st, and the news spread rapidly. After Morton's practice began to grow and become and become very profitable, Dr. Jackson insisted upon 10% of the profit from the patent, or said he would put in a claim for priority which would ruin Morton's application for the patent. So Morton thought it would be wise to give in to avoid trouble.

Morton's practice succeeded beyond his expectations as a result of his painless method. Now that his aim of performing painless dental operations had been reached, Dr. Morton became possessed with the idea that his discovery could be used to surgical practice in general, and that ehter could be used in major operations.

He left almost all of his work to his assistant, Dr. Hayden, and spent much of his time getting the matter of the patent settled, and arousing the interest of Boston physicians and surgeons in his idea.

After a great deal of effort, Morton finally procured an interview with Dr. John C. Warren, senior surgeon of the Massachusetts General Hospital. Warren took an interest in Morton's idea, and not without scepticism, offered to perform an operation and give Morton(s method a trial.

On October 13th, 1846, the operation was scheduled for the removal of a vascular tumor of the neck. Dr. Warren had invited all the leading surgeons of the town to watch the operation. The operation was a great success. After the patient had been given the ether by Dr. Morton, he lay in a profound sleep, and afterwareds not only related that he had felt no pain whatsoever, but that all he could remember were wonderful dreams.

The doctors were all very much impressed, and Dr. Warren was extremely enthusiastic. Turning to the spectators he called with great excitement, "Gentlemen, this is no humbug." This was the first publicly performed painless operation.

Morton continued to administer ether for the doctors in minor surgery cases, and they were all very successful. Once , when too large a dose was given, it was noticed that the patient became very pale, the breathing stopped, and the pusle became feeble and irregular. However, when the mask was removed, the patient returned to normal. This taught an important less in ether administration. The surgeons learned that the pulse of the patient must be watched continually to determine the condition of the pati - ent.

At this time the medical men of Boston brought up a question of medical ethics, the outcome of which finally prevented Morton from receiving any of the personal fortune he hoped to gain by his discovery.

An hour before a demonstration of an amputation of a leg under ether anesthesia by Dr. Warren, the Medical Society raised a protest against using a secret remedy of which they did not know the composition, a professional tradition which is firmly adhered to.

Morton begged them to wait a day or two until the matter of the ~~patients~~ Patent was settled, because if he told them before that, the secret would be public property. But the patient was all ready for the operation, and it was up to him whether the operation was to be done with the anesthetic after he had revealed it sompo-sition, or if he refused, with no anesthetic. Dr. Morton could not bear the thought of the patient having to undergo the intense pain of such an operation, especially since she had been assured that it would be painless. He went to the amphitheatre and announced that the drug was sulphuric ether. The medical men were naturally very surprised. The operation proved to be wholly successful.

A few days later on November 3rd, 1846, Dr. Bigelow officially announced morton's discovery to the Acadamy of Arts and Sciences. Within a few months ether anesthesia began to be used in England, France, Germany and almost all the other European countries.

On November 21st, 1846, Oliver Wendall Holmes gave the method the name of anesthesia.

With the wide publicity of Dr. Morton's discovery, there began to arise numerous claims of priority to the discovery. The most prominent and persevering of those men was Dr. Jackson, who finally, because of his intense feeling in the matter, ended his days in a lunatic asylum. Another was Horace Wells, the first one to use Nitrous Oxide for the extraction of a tooth, and Dr. Long of Georgia, and others.

Morton was very anxious to claim his own priority and have the honor of being a "benefactor of mankind." However, he was continually being blocked by other claims and techniques. It was finally brought up in the Congress, but it took them years to make a decision. Morton spent the rest of his life fighting for his claims, and spent much of it in poverty.

The next great steop in the history of anesthesia was the discovery that chloroform had an anesthetic effect. A French chemist, Dumas, in 1834 first worked out the correct chemical formula and gave the substance its name.

In 1847 James Young Simptson of Edinborough introduced the use of chlorogorm by inhalation to relieve pain during childbirth. This became so very popular that he was called morning, noon and night to countless deliveries. His fame spread and praises were showered on him. However, along with the praise, he was condemned, especially by the religious people who believed that it was God's will that women suffer during childbirth. Simpson had a battle on his hands to persuade them that painless child-birthwas in accordance with God's will.

Night after night Simpson sat up studying the Bible to find phrases that he could use in his arguments. His accusers based most of their prejudice on the passage that reads in Genesis,3-16, "In sorrow thou shalt bring forth children." Simpson then pointed out in Genesis 2, 21, that God, himself, administered an anesthetic "and the Lord God caused a deep sleepto fall upon Adam and he slept; and he took one of his ribs, and closed up the flesh instead therof." He used othe phrases in his arguments. One especially effective one was "Therefore to him that knoweth to do good and doeth it not, to him it is a sin."

The conflict raged for six long years, and by degrees, Dr. Simpson's perseverence was rewarded. Before long Queen Victoria set the fashion by having one of her own children delivered painlessly. Dr. Simpson was one of the few men to make an important discovery in anesthesia who did not have to spend his days in poverty and disappointment.Only two months after the introduction of chloroform, the first death occurred. However, Europeans continued the use of chloroform for many years.

Shortly after this time Nitrous Oxide began to be used extensivelyi in dental medicine. The first dentists to use this extensively were Dr. J.A. Smith and Dr. Allen of New Haven, Connecticut. In conjunction with C.Q. Colton who had persuaded them to use it, they found the New York Dental Association for the painless extraction of teeth under laughing gas.

From the dental parlors the use of nitrous oxide spread to the province of major surgery. The first painless surgical operation under nitrous oxide took place in 1868, about the time of Morton's death .

It was sson discovered that the disadvantage of nitrous oxide in major surgery was that its effect was so transient. About this time it was tried in deliveries and for a while it almost replaced ether and choroform in the practice of midwifery.

In 1880 the Chloroform Committee of the British Medical Association declared itself opposed to the use of chorogorm as an anesthetic, and in 1893 the German Congress of Anesthetists recommended etheras preferable to chloroform.

In 1880 Dr. Billroth inproved the "combined mixture" by introducing an anesthetic mixture consisting of alcohol 3 parts, ehter 3 parts and chloroform 10 parts,and at this same time Schering, Pete and Leon Labbe recommended the drop procedure of administration.

It had been discovered that the action of chloroform was so rapid and not easily controlled, that many deaths were occuring from its use. Today this anesthetic is used comparitively little.

Since the death of Morton in 1886, pharmaceutical research had made remarable advance. More than thirty thousand synthetic drugs had been tried in medicine, and the pharmacists were continually on the lookout for new analgesic and anesthetic drugs.

In the last fifty years many different drugs have been discovered and used mor or less successfully as anesthetic agents by inhalation. The more important ones include ethylene, propylene, narcylene, cyclopropane, and vinethene. These agents will be discussed in a later chaper.

Since Morton's time, there also had been along with the development of anesthetics, great advances in the administration techniques. In 1880 Schering, Pete and Leon Labbe recommended the drop by drop administration of anesthetics. Tbis made for a more even anesthetic and more easily controllable. This method is still used .

Valuable improvements also have been made in the ether inhaler. At the present time the rubber or glass mask is placed over the patients face, fitting tightly over the mouth and nose and is connected with a gas bag into which oxygen, ether etc., are admitted in varying quantities.

Dr. John Snow and Dr. Roth Draegu both were peoneers in improving the method of gas administration. McKesson made use of Gal's rebreathing principle by constructing a rebreathing inhaler with an automatically controlled mixing chamber.

In America, especially in the twentieth century, the development of highly specialized inhalers has made the dosage of anesthetics an extremely precise affair. Up until 1893, it had been the discoverors of the different inhalers or anesthetic drugs who administered the anesthetic, but at this time England formed the Society of British Anesthetists, whose rule it was that only specialized anesthetists could administer these agents, and various other countries followed the example.

Outside the realm of inhalation anesthesia, important discoveries were being made in other types of anesthetics. Pitha and J.T. Gwathmey were the first modern anesthetists to administer narcotics by rectum. In 1917 Eishholz discovered overtin, a substance resembling alcohol which has been extremely valuable as a rectal anesthesia.

In 1867 Claude Bernard, a French physician was the first to give a hypodermic injection of morphine before administering an anesthetic. In 1881 in Calcutta, Alexander Crombil adopted this practice, and it was further elaborated by Pitha and Nussbaum. In 1884, Dr. Koller discovered a method of local anesthesia with cocaine which had been isolated about 25 years before. This was a great contribution to the art of anesthesia, enabling the doctors to perform the minor operation without the danger of a general anesthetic. In 1905 two German chemists discovered novocaine, a substitute for cocaine which is far less toxic. Since that time various substitutes have been discovered which are more efficient in local anesthesia than cocaine. However, cocaine is still used extensively by eye, nose and throat doctors.

In 1894, a German physician hamed Carl Ludwig Schleich introduced the medthod of infiltration anesthesia with novocaine, and it has been possible to perform even major operations by this method.

In 1885 Dr. Leonard Corning, an American, introduced spinal anesthesia with cocaine by which he could produce insensibility of the lower part of the body for a period of three hours. Later, another American doctor named Robinson improved on this method. In 1899 August Bier introduced his lumbar anesthesia without puncturing the spinal cord, which proved to be much safer.

The ether spray was first used by Richardson in 1867, and has been developed and used as a local anesthetic. Ether evaporates so quickly that the part is "frozen" so that it is comparatively insensitive to pain. It is used in very minor incisions as in the opeming of boils or abcesses near the surface of the skin. Later, other substances have been used such as thethyl ether and methylene bichloride.

In 1899 there was also introduced a different method of anesthesia. By using composite of scopolomine and morphine, or of scopolamine and narcophine, Dr. Korff was able to producea state known as semi-narcosis, in whcih the patient following the operation cannot recall having felt any pain, although he may show at the time all the objective symptoms of having pain. This was used very successfully in midwifery instead of administering chloroform.

Each year brings new triumphs in almost every type of anesthesia. Each year is bringing the scientists nearer to their goal of finding the ideal anesthetics which are safe and at the same time adequate and efficient.

The discovery of anesthesia has done more to advance medicine than any other factor. Before the days of anesthesia, the surgeon had no time to operate ~~continuously~~ carefully. The surgeon who could operate the fastest was considered the best surgeon because he saved the patient that much torture. It was impossible to treat the tissues carefully, and the surgery of those day might be termed more or less as "butchery". Without anesthesia, becauses of the necessity of speed, it would he impossible to pay strict attention to the rules of antiseptic and aseptic surgery, which necessarily requires much attention and conscientiousness.

Furthermore, surgeons have had the opportunity to study more completely and carefully, the anatomy of diseased bodies in th e living state instead of in cadavers.

Source:

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Theory of Narcosis

Narcosis and anesthesia are synonymous. It was first thought that anesthesia was the result of cerebral anemia, but Claude Bernard showed that changes of blood supply in the brain were small and negligible.

Since practically all fat solvents are narcotics, it was next suggested that they dissolve fats out of nerve cells, but the difficulty of explaining the rapid recovery from anesthesia proves that this theory cannot be correct.

Hermann, in 1866, showed that all aliphatic narcotics dissolve red blood cells, and connected this fact with their lipoid solubility, and first suggested the modern lipoid theory. Richet, in 1895, conversely argued that the narcotic efficiency is inversely proportional to the solubility in water of the ageny.

Meyer and Overton combined the above two ~~methods~~ theories. This theory attributes narcosis to a phisical phenomenon, as follows:

1. Substances that are solvents in fats must exibit a ~~nar~~ narcotic action on all living cells which can absorb the drug.
2. Narcotic action must appear first and strongest in those cells which contain most fat,--the nervous system.
3. The relative power of various substances depends on the "partition coefficient". The "partition coefficient" equals $\frac{\text{Solubility in fat}}{\text{Solubility in water}}$.

This holds good only for members of the aliphatic series. It does not explain morphine or aromatic compounds which depress the central nervous system. Also, ordinary adipose tissue does not enter into this reaction in narcosis, because it is thought that the fat cell membrane is impermeable to solvents.

Meyer suggested that the agents liquify the lipoids in the nerve cell without displacing them. This leads to a cramping of the normal activity of the nerve cell, which then no longer responds to stimuli.

Another theory is Traube's Surface Affinity Theory. Trabe pointed out that the efficiency of the aliphatics increases as the surface tension of the cell is depressed. The depression of the surface tension is not supposed to be concerned directly in the narcosis, but it is an index of the condensation of the anesthetic substance at the surface, which would lead to the formation of films over the cell surface as a whole; thus altering catalytic activities and permeability. Thus, with diminished permeability of cell membranes, function slows down.

Combining these two theories, we can say that "both properties tend to condense the narcotic agemt on the surface of the cell, their relative share in this being determined largely by the amount of lipoid in the cell membrane. This concentration of foreign materials on the surface and in the lipoids of the nerve cell membranes must modify the pooperties of the surface. At first it decreases the permeability of the membrane and so inter-feres with the increase in permeability involved in the stimulation during the operation. This appears to be the essential cause of narcotic action."[1]

1. Sollman, Torald, M.D.: "A Manual of Pharmocology", 5th Edition, Philadelphia and London, W.B. Saunders Company, page 654.

Source:

Ibid., pages 653 -658.

References:

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Stages of Anesthesia

After absorption , the anesthetic produces an irregular descending depression of the central nervous system. It is called "irregular" because the depression skips the vital centers in the medulla. The effects and degree of depression caused by these drugs show successive stages of depth or severity. Therefore the state of anesthesia produced in a person is divided into stages according to depth of depression. But since these effects pass without abrupt transition from one stage to another, any classification is arbitrary.

These stages are: (1) Induction, (2) Exitement, (3) Anesthesia, (4) Respiratory paralysis.

The subjective symptoms of the induction stage are about the same for both chloroform and ether, It begins with a comfortable feeling of warmth over the whole body due to early depression of the vasomotor center dilation of the skin vessels. The patient remains conscious, has a sensation of floating off into space and feels light, like "a spirit". He feels as if he can't move his limbs. Sensations of sound occur such as roaring and throbbing in his ears. Any actual sounds in the room sound louder. whispers are easily heard, therefore the operating room must be still. Tranquillity in this stage is very important to the success of the rest of the anesthesia.

It should be remembered that the induction and exitement stages of ether and chloroform are rarely seen in the operating room because of induction with nitrous oxide, ethylene, or avertin, and because of the routine premedication of all patients before anesthesia with such drugs as morphine sulphate, or one of the barbiturates, which modify many of the usual signs and symptoms of anesthesia.

The third stage, or surgical anesthesia, is divided into four progressive planes of depth of anesthesia. In the first plane, the patient does not feel pain, but jerks when deep incisions are made. The muscles have tone. This stage is used in obstetrical deliveries, and minor surgery.

In the second plane, the muscles are almost relaxed and the viscera can be handled. This stage is used for appendectomies, hernial repair, rectal surgery, etc.

The third plane is characterized by complete relaxation. It is used for the majority of operations, and if there is no reason for not doing so, most anesthetists bring and keep the patient in this stage.

In the fourth plane, from complete relaxation, the patient suddenly gets a muscular tremor, then a rigidity followed by intense relaxation. The respiration quickens, then becomes slow and shallow and stops. This marks the onset of the fourth stage, and artificial respiration must be applied to revive the patient. This stage of anesthesia must be avoided as it is almost always fatal.

This preliminary stage is known as " primary analgesia". The sensibility is impaired after the first few inhalations, and although stimulation evokes responses, there is no pain.

Then a sensation of suffocation comes on, especially with ether because its vapors are intensely irritating, and cause hypersecretion of mucous, saliva, and tears.

Next there is a confusion of thought, dullness of hearing, incoherence of speech, perspiration, and tenseness of muscles. The patient may gasp or choke, or may begin to vomit. Then the patient suddenly throws his hands up and tries to pull the mask away from his face or jerk hid head from side to side, and begins to struggle and fight. This is the beginning of the exitement stage.

The subjective symptoms of the exitement steage begin about five minutes after the start of the anesthesia with with ether and sooner with chloroform. There is violent muscular effort and the patient suddenly takes a few huge gasps which are saturated with ether unless the anesthetist pulls the mask away from the face. Some people have a very stormy second sta ge ---talking, crying, even singing and having hallucinations. Women frequently have erotic dreams or think that they are being violated during this stage, so witnesses should be present. Vomiting, retching, and coughing also may occur.

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The Signs of Anesthesia

Various physical reactions occur at various depths of anesthesia. The constancy of some of these signs are such that they are used to determine the depth of anesthesia. They are about ninety perceny reliable.

The respiratory signs are the most constant reactions. In the first stage, the volume at first is normal, increasing somewhat as the lower levels are reached. Lowering of the respiratory threshold by the anesthetic agent, and the accumulation of carbon dioxide poduces this effect. Factors which alter these reactions are emotional exitement producing hyperpnea usually, and laryngeal irritation by the anesthetic agent resulting in voluntary breath holding.

In the second stage anything may happen. The mental control is lost, so that reactions started in the first stage may be carried over into the second. Respiration is apt to be irregular unless skillfully avoided. If possible even deep breathing should be encouraged, because if the patient stops breathing for a few minutes. and then takes a few enormous inspirations, a huge concentration of the anesthetic will be inhaled, and may be fatal.

In the first plane of the third stage, the character of the respirations change, and become rhythmic and the volume increases. This rapidly becomes hyperpnic resulting in a lowering of the carbon-dioxide level. This results in a lowering of both rate and volume to a level which becomes which becomes fairly well established.

The second plane of the third stage shows no particular change in the character of respiration.

In the third plane the respiratory volume begins to decrease. This is due to a beginning paralysis of the intercostal muscles, first evidenced by delayed thoracic inspiratory effort, with the pause between inspiration growing progressively longer. With final paralysis, respiration depends on the diaphragmatic movements, and therefore become quick and jerky.

In the fourth plane, there is a further marked decrease in respiratory volume. Cessation of respiration marks the passage of anesthesia into the fourth stage.

Another dependable sign as an anesthetic guide is the eyeball activity. During the second stage and the first plane of the third, the motor muscles of the eyeball undergo a period of exitation activity. As the patient passes into the second plan e of the third stage, there is cessation of the eyeball activity. The availability of the eyeball for inspection makes this sign a valuable guide.

Pupillary reactions are variable. In the first stage, there is emotional dilatation which returns to normal by the third stage.

In the second plane of the third srage, there is frequently a marked dilatation which progressively increases until complete dilatation is reached in the fourth plane.

It should be remembered that premedications will alter these signs.

The eyelid reflex, another helpful sign, is tested by raising the upper eyelid with the finger. The lid will attempt to close at once if the reflex is still present. In the second stage, the reflex is present; whereas in the third stage it is absent.

Swallowing is reflex in origin, and occurs if the administration of anesthesia is retarded, but is rare with anesthetic agents of rapid action. It most often appears with anesthesia ascending from the third stage.

The circulatory signs are important guides. In the first stage, the pulse is rapid ane pounding. The blood pressure is increased with ether, but not so marked with chloroform, due to reflexes from exitement.

In the second stge, the face is deeply flushed and moist. The pulse is more regular, full and pounding. With chloroform, the pulse begins to weaken and the blood pressure drops as the third stage is reached.

In the third stage the blood pressure is about normal with ether, but lower with chloroform.

In the fourth stage, the pulse is slow, weak and thready. The blood pressure may be rising, but this is an asphixial rise. It then falls, and when this occurs, death may be the result.

The general condition of the patient during the third stage of anesthesia is as follows: The patient snores deeply and rhythmically with the rate about normal. With ether there is more tendency to snore due to hypersecretion. The muscles are relaxed, but the abdominal tone should not be lost. All of the feflexes are gone, except the corneal reflex, as manufested by blinking of the eyes when the cornea is touched. The face is deeply flushed and wet from perspiration with ether; wh reas with chloroform, the face is pale, and only slightly moist, and calm and deathlike, due to the lowered blood pressure. The patient may be kept in the third stage for several hours with ether; therefor it is of extreme importance to recognise the signs and symptoms of this stage.

Source:

Op. Cit., Guedel, pages 21-38

Reference:

Op. Cit., Flagg, Pages 82-119.

Accidents During Anesthesia

Accidents during anesthesia give rise to emergencies, which if not recognised and treated may end fatally. Circulatory changes are often causes of complications. Rapid asphixia produces an initial rise in blood pressure. Emotional exitement and fear, particularly when accompanied by struggling, will also result in elevation of the blood pressure, because of an outpouring of adrenalin into the blood stream. Increased blood pressure may dilate the heart when the heart has degenerated, and the heart may stop or contract feebly. Under proper treatment a recovery in a few weeks time may occur if the damage is not too great.

Weakened blood vessels, as in arterio-schlerosis may rupture under the stress of an increase in blood pressure, the extent of damage depending on the location of the vessel.

Prevention of such accidents can be attained only by prevention of a rise in blood pressure., since it is often impossible to recognise these patients before operation.

Long continued asphixia results in a lowering of the blood pressure. Hemorrhage and shock due to the operation will also lower the blood pressure.

Lack of oxygen supply to the heart muscle may result in ventricular fibrillation. This is rapidly fatal, unless artificial respiration can be used successfully, or rhythmic compression of the heart can reestablish normal rhythm. The prevention of the condition is to inhibit the output of adrenalin by means of preanesthetic medications with barbiturates or other depressants.

Another common cause of anesthetic accidents is respiratory failure, either central or periferal. Central respiratory failure may be caused by an overdose of the preanesthetic drug, by an overdose of the anesthetic agent or by incresed intracranial pressure, as in brain tumors.

Periferal respiratory failure may be due to the interference of the passage of air to the lungs as occurs in pharyngeal and laryngeal spasm due to the direct irritation of the anesthetic vapor. Tugging on the viscera may cause spasm of the vocal chords, and may produce momentary complete closure of the glottis. The relaxation of the tongue permits it to fall backwards. If this happens it will close the respiratory passage.

To treat the spasms, oxygen must be forced into the lungs until the spasm is passed. Blockage of the passage by the tongue is treated by the insertion of a pharyngeal airway which holds the tongue forward.

Periferal blockage may also be caused by aspiration of various materials. The most common ones are vomitus, mucous, pus, blood, and sponges and instruments used in oral surgery.

There are other less common accidents which may give rise to emergencies. Collapse of a large area of lung tissue due to a mucous plug may not be moticed until after it is complete. Cyanosis and dyspnea appear within a few minutes, and must be treated by the administration of oxygen. The prevention of the collapse depends upon the prevention of bronchial occlusion. Carbon-dioxide inhalations every fifteen minutes is a good preventative measure as well as treatment by stimulating the respiratory centers.

Removal of pressure on the trachea as in a thyroidectomy may result in tracheal collapse. This should be anticipated and endotracheal anesthesia adminstered to prevent it.

Frequently during operations, embolisms may occur from air, fat, or venous clots set free in the blood stream. Prevention of anoxemia is the only treatment.

Care should be taken to prevent injury to the eyes from direct irritation of ether in using the open drop method.

Idiopathic paroxysmal tachicardia may occur as evidenced by an enormous rise in the pulse rate. The condition usually passes without treatment. Epileptiform convulsions of unknown origin may also occur.

These are but a few of the more common abnormal reactions that must be watched for in the administration of an anesthetic. It is important that the anesthetist be familiar with all the complications and their emergency treatment.

Source:

Op. Cit., Guedel, pages 75-132

References:

Op.Cit., Gwathmey, pages 379--390.

Preoperative Medications

Preliminary medications in anesthesia is being used practically routinely because of the effect that it has in diminishing the anxiety of the patient, and in avoiding some of the dangers if anesthesia. Those in common use are: Opium derivatives; barbiturates; scopalomine, and atropine.

The most common preliminary medication is morphine and atropine, the ordinary dose being morphine grains 1/4 with atropine grains 1/150. The usual time of administration is forty-five minutes before the operation, but sometimes a physician will prefer a two hour interval.

The next common medication is morphine and scopalomine. The maximum dose of morphine is morphine grains 1/4, and scopalomine grains 1/100.

The advantages of using morphine are many. It reduces apprehension in the patient and makes the anesthetic prompter ans smoother. It reduces the amount of anesthetic needed and thereby reduces the kidney irritation and the gastric amd pulmonary after-effects. The patient does not awaken from the anesthetic so early and thereby escapes some of the discomfort following the anesthesia.

On the other hand, morphine depresses the respiratory center, and interferes with the usual pupillary action, which is an important sign for the anesthestist.

Atropine used with the morphine, however, stimulates the respiratory center and counteracts somewhat the depressant action of the morphine. Atropine also inhibits the secretions, so that there is less danger of the occurrence of ether pneumonia by the inhalation of saliva, or the excess secretion of the bronchi caused by the irritating effects of the anesthetic agent. The disadvantages are that atropine alters the size of the pupil and the character of the pulse.

Scopalomine is often used instead of atropine with morphine. Scopalomine has the same effect on the pupil and the secretory glands, but it greatly intensifies the narcotic effect of the morphine. Scopalomine has a tendency to produce vasodilation and cause a fall in blood pressure. It also intensifies the respiratory depression caused by the morphine.

Preliminary medication of morphine and atropine, or morphine and scopalomine are indicated in certain cases. They are indicated when the anesthetic agents used are nitrous oxide and oxygen, and nitrous oxide and ether. It is also indicated in athletics, alcoholics, and heavy smokers, especially women, where the induction is apt to be prolonged and difficult. It is valuable in neck and throat cases, such as goitre, and tonsil and adenoid cases. Whenever one wishes to reduce the amount of a anesthetic used, such as cases of diabetes or acidosis, preliminary medication is advised. It is also indicated in neurotics or hysterical patients, in patients where postoperative pain will be extreme, as in burns or rectal surgery, and in all types of local anesthesia.

These preliminary medications are contraindicated when the open method of ether administration is used with no rebreathing apparatus to stimulate the respira tion. It is also contraindicated in extremes of age, where an idosyncracy to the drug exists, where oxygen cannot be conveniently had, when the anesthetist is not experienced, or when nursing care after the operation is inefficient.

The barbituric acid derivatives are also used in allaying emotional exitement. Their action is usually short, and they are often given in conjunction with morphine.

Source:

Op. Cit., Flagg, pages 283-290

References:

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Preparation of the Patient

In preparing the patient for an operation, there are two aspects to be considered; the psychic and the physical.

All that is possible must be done to relieve the apprehension and fear of the anesthesia that is nearly always present with a patient looking forward to an operation. He should be reassured by the nurse of the capabilities of the surgeon, and of the skill and carefulness of the anesthetist. The anesthetist should acquaint the patient with some of the various feelings he will have have while taking the anesthesia, reassure him of the normality of these sensations, and explain the desirability of deep breathing during the induction. It is sometimes the tendency of the doctors and anesthetists to regard the individual as just "another case", giving no thought to the feelings of the individual patient.

Before an operation involving the use of a general anesthetic, it is important that the pateint have a complete physical examination. He should be examined carefully for cardiac, renal, and pulmonary diseases. These patients are considered poor risks for anesthesia, because serious complications may result if these organs are not functioing properly. A urinalysis should be done to determine whether or not the patient has an undiscovered diabetes or acidosis. Coagulation and bleeding time of the blood should be determined in order to foresee any tendency toward hemorrhage.

Preliminary to the anesthesia, the anesthetist must make sure that the patient has no false teeth or gum in his mouth which he may aspirate during the induction. Jewelry and hair pins must also be removed.

It is also important that the patient have no food or liquids in his stomach or intestinal tract. This is important for several reasons. If the patient should vomit during the administration, he may aspirate some of the vomitus, which would probably cause either asphixia or post-operative pneumonia . The present of food in the gastro-intestinal tract predisposes the occurrence of shock also. If the intestinal tract is empty, there will be less gas pains following the operation, and less danger of defication and contamination of the surgical drapes the operation. A small enema should be given the morning of the day of the operation.

Source:

Op. Cit., Flagg, pages 291-293

Reference:

Op. Cit., Gwathmey, pages 326--337.

Selection of an Anesthetic Agent

The anesthetic agent to be used is determined by the particular physical condition of the patient and by the type of operation. Safety for the patient should be the first consideration. Next should be the depth and duration needed for the operation, the comfort of the patient, and the convenience of the operator.

Ether, ethylene, and nitrous oxide are considered equally safe in ordinary cases.

Ether has several advantages. It is easily administered and it gives more complete relaxation, less asphixia, and less rise in blood pressure, so that the respiration and circulation are more nearly normal. Ether can be given over a comparitively long period of time, and is valuable in operations which necessitate the length of the anesthesia to be from two to three hours. Ether acts quickly and good relaxation can be obtained in ten minutes.

The main disadvantage of ether is its irritant action, and it is contraindicated in renal disease and in acute respiratory disease. It may be used in chronic respiratory diseases unless there is actual dyspnea. Children are especially sensitive to ether irritation, resulting in difficult respiration or choking. Ether favors bleeding especially when it is in contact with the operative field as in oral surgery. All anesthetics are dangerous in advanced heart disease, but ether and nitrous oxide are preferable to chloroform.

Nitrous oxide is the safest anesthesia for short operations where a local anesthesia is not indicated. It is more pleasant to take than ether, and it causes little or no irritation, and little exitement.or nauseating after-effects. It has little or no influence on immunity. It seems to reduce the danger of shock, and it is especially prefered for exitable and neurotic patients. However, if the anesthesia lasts longer than one hour, it becomes somewhat more dangerous than ether. Nitrous oxide is of great value in obstetrical deliveries.

Its disadvantages are that with its use muscular relaxation is not so complete, it causes some asphixia, and an abnormal rise in blood pressure. In administering nitrous oxide a special apparatus must be used, and the anesthetist must have special experience for its administration, therefore it is more expensive. It is not advisable to use this anesthetic where there is a danger of asphixia ; such as in children where their thorax is not strong enough, or in obese or anemic patients. A tank of oxygen should be present and available at all times.

Ethylene, one of the newer anesthetic agents, has been proving very valuable in cases where other agents are contraindicated. Its effects are like a very rapid ether anesthesia, but because of its rapidity the action appears more similar to nitrous oxide, but acts more powerfully and promptly. The anesthesia and relaxa-

tion

tion are deep and adequate for major operations. The recovery is very rapid, the patient usually being awake within two minutes after the anesthesia is discontinued. The induction is not disagreeable to the patient, because the gas acts rapidly and the rather unpleasant odor is not noticed after the first few inhalations. During established anesthesia, the pulse and respiration are practically normal. A comparitively low concentration of the gas is needed, therefore more oxygen can be used in conjunction, and less asphixia is caused. Sweat and salivation are slight or absent. It has no irritating effects on the kidneys or respiratory tract. Nausea and vomiting afterwards is only half as frequent as in the use of ether. Gas pains are also reduced markedly. In obstetrical use, it does not inhibit uterine contractions and it does not seem to affect the child.

The principle drawback to the use of ethylene is the extreme explosiveness of a mixture of ethylene and air. The operating room must be elaborately grounded and insulated from electricity, as even a four percent concentration of ethylene in air will explode. There must be careful exclusion of electric sparks including static electricity, open flames, or cautery. Ethylene is an expensive gas and causes less relaxation than ether or chloroform. Ethylene affects some people by dangerously increasing intracranial pressure, but this is rare.

Chloroform was first used as as a substitute for ether, but from experience gained from its use, it is considered much more dangerous. This anesthetic is used much more widely in European countries than in the United States.

Chloroform would have decided advantages over ether if it were not so much more dangerous. It is much less expensive because the dose needed is smaller. The administration of chloroform is very simple by the open drop method. It is easier and pleasanter for the patient ot take, and the anesthesia is more quickly produced and more quickly recovered from. It causes no bronchial or lung irritation.. Nausia and vomiting are less common after-effects. Chloroform is not inflammable or explosive.

There are three special dangers in chloroform anesthesia; early heart failure, cardiac depression with a small margin of aafety, and delayed chloroform poisoning. Contraindication to its use are diabetes, sepsis, hemorrhage, eclampsia, feeble persons, fatty degeneration, and lymphatic diathesis.

Cyclopropane is another recent addition to the ansethetizing agents which has been used clinically with good results. Its most valuable use is in the administration of an anesthetic preliminary to ether. It is more pleasant to take, and avoids anoxemia, as only eighteen percent of the gas has produced profound anesthesia. Its action and recovery are rapid. It is unirritating to the throat. It is important to watch the administration closely, because an overdose causes severe heart complications. It may be used as a general anesthetic for all kinds of anesthesia, and it is useful in obstetrics.

Ethyl chloride is an anesthetic which is used for local anesthesia as well as for general. When it is used as a local anesthesia, the liquid is sprayed on the part. It evaporates very quickly, and reduces the temperature of the skin to such an extent that it becomes insensible to pain.

Athough ethyl chloride is used for deep anesthesia frequently, this practice shoud be discouraged because there is a narrow margin of safety between the amount needed for satisfactory maintainance and the lethal dose. Therefore the administration of this anesthetic is usually limited to induction and incomplete anesthesia.

Ethyl chloride is often used as a substitute for nitrous oxide, because of its portability and cheapness. The administration of ethyl chloride is often followed by headache nausea and vomiting. The dangers of this anesthetic are that it is easy to give an overdose, and that asphixia may occur from spasm in the respiratory tract.

Proylene, acetylene, and vinethene have also been used successfully as anesthetic agents, but as a whole they are more dangerous and there action less dependable. They are used mostly in short anesthesias, in induction, and in obstetrics.

Special types of anesthesia are often needed in speci al types of operations

As has been stated previously, for short operations nitrous oxide is the safest where there is no danger of respiratory embarrassment.

Mastoid operations are the easiest from the anesthetist's standpoint, because a deep anesthesia is needed only in the initial stages. The hammering and chiseling seems to have some anesthetic effect on the patient. The best procedure in mastoid cases is to begin the operation by the drop method of chloroform gradually switching to ether, After the deep anesthesia is established, the anesthetist can be out of the way. The nitrous oxide and ether anesthesia is contraindicated because the apparatus is more or less in the surgeons way.

In operations of the upper respiratory tract closed methods should be avoided, preferably using chloroform for the induction and ether and air for the maintainance.

In operations of the tongue, cleft palate, and sub-mucous operations when a local anesthesia is not used, sone form of vapor anesthesia should be used with a tube ending in the mouth and nose.

In adenoid and tonsil cases, induction with nitrous oxide followed by ether should be used. Later the ether vapor is used and passed through a tube placed either in the mouth or nostril. A deep anesthesia is required in these cases to abolish all reflexes, including cough, swallowing and tongue reflexes. A water suction should be part of the anesthetists equipment in oral surgery to prevent the aspiration of blood.

Many surgeons prefer a local anesthetic in goitre operations, but if a general anesthetic is determined on, ether and chloroform with oxygen by a tube are the best anesthetics to use.

In amputations, dislocations, setting fractures and other similar operations, a fairly deep anesthesia should be used. Gas and oxygen is preferable for this type of work. Operations on the fingers and toes also require a deep anesthesia to avoid reflex movements because of the unusually large nerve supply in these regions. Preliminary medication is essential.

The anesthetic for circumcision ~~for circumcision~~ of a child should be started with a few drops of essence of orange followed by chloroform until the second stage is reached. Then a switch to ether can be made.

In all rectal surgery, a full physiological dose of morphine with some other drug should be given. The anesthesia can be induced and maintained with nitrous oxide and ether. Chloroform is contraindicated.

In obstetrical cases a light anesthesia is needed.

Chloroform, nitrous oxide, ether, or some of the other anesthetics which are used principly for induction can be used. Anesthesia should not be given during the menstrual period because of the possibility of hysterical exitement afterwards, but if an operation is imperative it is best to use a warm oxygenated chloroform vapor.

In genito-urinary operations and laparotomies a deep anesthesia is needed. The most generally accepted method is nitrous oxide induction followed by ether. Gastroenterostomy needs a deep anesthesia and the vapor method of ether administration has been very successful. These operations should be preceded by a blood transfusion and followed by subcutaneous or intravenous fluids.

In peritonitis or intestinal obstruction, ether should be used. If regurgitation of fecal matter is present, the stomach should be washed out well and the stomach tube left in place during the operation. If vomiting occurs the anesthetist must insert a mouth gag and keep the throat absolutely clear. In these cases there is great danger of death by suffocation.

Other factors that serve as a guide in the selection of a suitable anesthetic, which I will only mention to make the picture complete, are the age and sex of the patient, whether he is obese or thin, the presence of heart, lung or kidney disease, patients who are athletes, alcoholics, drug habitues, epileptics, insane, ornervous, and the presence of cancer. All these conditions

call for air

call for either a special type of anesthetic, or demand a variable dosage.

These are only some of the more general rules to follow in the selection of an anesthetic. When for any reason, even if the choice has been made carefully, the anesthetic is taken badly, a change should be made immediately.

Source:

Op. Cit., Sollman, pages 702-705.

Reference:

Op. Cit., Flagg, page 340-364.

Administration Techniques of Ether

In the discussion of administration techniques, I am going to limit it to the discussion of ether with a few references to nitrous oxide when it is used in conjunction with ether, because it appears to have the basic principles of the administration of the other anesthetics.

Before the administration of an anesthetic, certain preliminary preparations must be made. The anesthetist should have certain equipment on hand. This includes a watch with a second hand, a blood pressure apparatus with a Bowles type stethoscope for placing under the arm band of the apparatus. He should also have a pencil and an anesthetic record so that the pulse ,blood pressure, amount of drug used, etc. can be recorded every five minutes plus remarks about the patient's condition. A record of the patient's blood type should be near if there is anticipated need of a transfusion. On a tray there should be a tongue forceps, airway, mouth gag, two small syringes filled with caffeine sodium benzoate and adrenalin, and a bottle of spirits of ammonia. Iodine, alcohol, and cotton should be close at hand for painting the site of injection. A kidney basin to catch vomitus is often needed. In the surgery, ready at a moments notice, should be normal saline and ten percent glucose if the surgeon wants it. Gauze pads and vaseline to put over the eyes to prevent irritation are needed.

There are several general rules to remember during the induction. The patient first should be examined to see that all foreign materials are out of the mouth, and that he is not too tightly restrained by straps. The anesthetist should explain to the patient to take a few large even breaths, holding the mask about six inches from the face and gradually bringing it down while this breathing goes on. The mask is fitted tightly, but not pressed too hard against the face, and a rather pure ether is given for a few whiffs to hurry the patient through the exitement stage. The anesthetist must be careful that the patient does not get too concentrated or too dilute a mixture of the fumes. If the patient begins to shake his head or gasp or choke, the mask should be removed until normal breathing resumes. At the end of the second stage an airway should be inserted to prevent the relaxed tongue from rolling bavk and obstructing the breathing. During induction the anesthetist may keep the tongue forward by pushing the angle of the jaw forward.

During the third stage the mucous should be wiped out of the throat occasionly with a piece of gause on long forceps. The attention of the anesthetist should be constantly on the patient, abd he should not attempt to watch the progress of the operation or talk to the nurses while guiding the patient between life and death.

There are two methods by which ether is administered; by inhalation, or by insufflation.

Inhalation anesthesia consists of having the patient inhale ether vapor by oral inhalation, intrapharyngeal inhalation by introducing a tube into the pharynx, or by intratracheal inhalation by introducing a tube into the trachea.

In the insufflation method ether vapor is blown into the patient's respiratory. The methods are likewise oral intrapharyngeal, and intratracheal insufflations.

There are two methods for adminisreing ether by the method of oral inhalation. These are the liquid method and the vapor method. The liquid method consists of presenting the ether to the patient upon a medium which causes its evaporation by the patients breathing. The vapor method is the administration of ether that has already been vaporized to the patient.

The liquid method is best described by the drop method. There are three types of drop method administration. These are the open method, the semi-open method, and the closed method.

In the open drop method the liquid ether is poured upon a face mask made from a wire frame with a smooth surface for contact with the patient's face, over which is a covering of stockinet bandage or gause. The drop bottle should be so constructed that it will give large drops and so that the rapidity of the drops can be controlled. An ether can with a cork grooved on the sides produces a large clean drop.

The aim in the administration is too achieve the lower second plane of the third stage of anesthesia. The administration of a smooth induction depends on two things. First, the patient should be made to breathe somewhat more freqiently and deeply than usual. Second, the control of the drop should be such that there will be no spasm in respiration. One of the best methods is to have the patient count slowly, and gradually increase the drops, letting up if the patient catches his breath.

A fair guide to the dropping rate is:

1st. minute----12 drops
2nd. minute----24 drops
3rd. minute----48 drops
4th. minute----96 drops

With the above rate the patient should pass into the second stage in aboit four minutes. Approximately ninety-six to one hundred drops per minute should be maintained for the first fifteen minutes. When the desired stage is reached the drop should be reduced to around fifty, and reduced further to around twenty to thirty drops after the first half hour. These figures are not accurate and may only be used as a guide.

Maintainance is best dontrolled by a constant even drop. careful observation of the signs of the depth of anesthesia must be made in order to control the amount of ether given.

If the anesthesia is under good control, the stage of recovery may begin earlier. The patient is usually brought to the stage of vomiting before he leaves the operating room. Shallow respirations may retard the return of reflexes and consciousness.

The open drop method has several advantages. The apparatus needed is the simplest; perfect oxygenation is obtained; it is even and easily controlled; it is fool proof; and it is the best method when ether alone is used.

This method also has disadvantages. Certain people, such as alcoholics or active young people, cannot be controlled by this method; it is very wasteful of ether; the patient may suffer from acapnia and shock due to excessive loss of carbon dioxide; the patient loses heat more easily; the induction is usually prolonged and not as pleasant as induction with nitrous oxide; and it is not suitable to use it when morphine has been used as a preliminary medication.

The semi-open drop method is like the open drop except that it is modified so that the outside air is restricted, and there is induced a certain amout of rebreathing. Over the ether mask are placed towels leaving about one third of the mask exposed on which the ether is dropped. With this methid concentrated ether is needed, so it is often poured or sprayed on the mask. A rubber dam may be used instead of towels.

The advantages of this method over the open drop method are: vigorous subjects are more easily anesthetized, there is less waste of ether and less ether in the air of the operating room, less inclination toward acapnia and loss of body heat, the induction is more rapid, and because of rebreathing, respiration is stimulated, and there is less danger when morphine and atropine have been used as medications.

The closed drop method is the best all around method except for young children. With this method nitrous oxide is usually given for the induction. It must be given with a suitable apparatus that provides for the complete exclusion of atmospheric air. This apparatus usually consists of a glass mask with a rubber rim next to the face, with a tube leading to a rebreathing bag. Between the mask and the rebreathing bag are the inlets ~~and~~ for the nitrous oxide and ether, and an expiratory valve for use when nitrous oxide and oxygen are used. There is an air valve which may readily admit air without removing the head piece. In the inlet for the ether is used a fine wire gauze for an evaporatinn ~~purpose~~ surface.

In the administration the patient is first permited to breathe air, and after a few minutes the air vent is closed and the patient breathes nitrous oxide which has been previously admitted to the rebreathing bag, and he breathes this to and fro. In about forty ~~minutes~~ seconds when the breathing becomes deaper and more rapid, the ether is added very slowly and increased as rapidly as possible without causing respiratory spasm.

Consciousness is loss readily and easily, and the excitement of the second stage is much reduced. If the color becomes bad, the patient usually responds quickly to the administration of air or oxygen through the inlet. The color of the ears should be watched.

In the maintainance stage if the breathing is not normal, the throat tube may be introduced. With this method, as the anesthesist becomes familiar with all the signs of anesthesia, she can execute the most delicate control of the depths of anesthesia.

The stage of recovery can be started much sooner with this method and the anesthetic may be stopped as soon as the peritoneum is closed.

The only disadvantages of this method are that the apparatus is cumbersome and expensive, it cannot be used in childeen and small babies, and it is not absolutely fool-proof.

In addition to the advantages already mentioned are the facts that it can be used in a large range of cases, that it is most ecconomical in the use of ether, body heat is preserved, rebreathing prevents acapnia, preliminary morphine and atropine can be used with greater safety, and the operating is almost free from the odor of ether.

In the vapor method of oral inhalation the ether is given in a vapor form and the respiration has nothing to do with the production of vapor.

A simple apparatus consists of a cautery bellows or an oxygen tank, a bottle for vaporizing the ether and a mask like the one used in the open drop method. The air or oxygen is attached to the bottle containing the ether and is allowed to bubble through it, the ether being conveyed to the mask through a tube. This method is a good one to use in small babies where their respiratory volume is not enough to vaporize the ether in the drop method. Ether may also be vaporized by setting the ether bottle in hot water, but this is not as efficent.

The administration is simple, but careful observations of ~~signs~~ symptoms must be made for signs of deep anesthesia.

In intrapharyngeal inhalation a tube is lead directly to the pharyngeal cavity. It can be used in adults or children over ten years of age. The ether may be conducted by a nasal tube or by a pharyngeal tube. If too much respiration takes place through the mouth, wet towels may be placed over the face.

The advantages of this method are that it is ideal for military surgery and for all head and neck work in adults. Any volatile anesthetic may be given by this method. It is simple, portable, and inexpensive. Where rebreathing is desired the apparatus which was used for the induction can be used with the addition of a throat tube and rubber tubing.

In intratracheal inhalation the vapor is introduced directly into the trachea of the patient. This is used in cases of excision of the tongue or larynx where there may be respiratory obstruction caused by the operation.

The inhalation and expiration both pass through the tube, therefore the tube should be as nearly the same size as the trachea as possible. Preliminary medication of morphine and atrophine must be used to prevent the tube from being obstructed with mucous. This method is rather dangerous and should be administrated only by an experienced anesthestist.

Anesthesia by insufflation methods are also of three types: oral, intrapharyngeal, and intratracheal.

Insufflation means the blowing of the anesthetic vapor into the patients respiratory tract. In oral insufflation the equipment is the same as for the oral inhalation of vapor except that an oral tube is substituted for the mask. Oral insufflation is usually used when choloform is being used, and a nasal or intraoral operation is being performed.

In intrapharyngeal insufflation, or blowing the anesthetic in to the patient's posterior pharynx, there are two distinct methods. In one method, which is the best, air is mixed with the ether; and in the second method only a small amount of concentrated ether is given, depending on the atmospheric air, to dilute this and supply the necessary volume. The apparatus for the first method consists of three divisions: the air supply, the mixing chambers, and the section for delivery to the patient. The air supply can be procured by foot power, steam, or electricity. The foot power is satisfactory where a bellows is used. The section to the patient is a nasal tube made of nickle plated brass.

The induction is usually given by the semi-open or closed drop method. Then when the maintainance stage is reached, the vapor apparatus is started.

Intrphargygeal insufflation is used for operations on the head and neck, and when the asespis of the field of operation is endangered by the nearness of the anesthestist.

In intratracheal insufflation the vapor is introduced into the trachea usually a short distance from its bifurcation. The tube is smaller than the trachea and allows the expired air to escape around it. Ether vapor diluted with atmospheric air is used.

The apparatus is much like the apparatus for intratracheal vapor inhalation. In administration the induction must be given by the semi-open or closed drop method, and the intubation done under deep anesthesia.

This method has several advantages. It is specifically indicated in operations of the thoracic cavity to prevent collapse of the lung. It is a good method in intra-oral operations, operations on the trachea and larynx, and for operations on the head and neck in general. It is useful in emergency intestinal obstruction operations, when vomitus may collect in the upper air passages, because the return flow os air will expel this as weal as blood clots, secretions, infection materials, etc.

The disadvantages are that a special knowledge of technique is necessary and that the apparatus is complicated and extensive

These, briefly, are the important methods of ether administration. Ether is also administered rectally and intravenously.

Source:

Op. cit., Flagg; pages 120--168.

Conclusion

In concluding this somewhat limited discussion of general anesthesia, I am going to discuss a problem which in the past few years has been brought into prominence by the medical profession. It is the problem of whether or not a nurse is qualified to administer an anesthetic, and whether it is ethical for the medical profession to allow her to do so.

It was not long after the beginning of the widespread use of anesthesia, that the administration was taken over completely by medical men, instead of being carried on by the inventors and discoverers. Before the time of the nurse anesthetist, anesthesias were given either by a specialist or by internes in the hospital. This proved to be a poor system. The specialist, being in private, practice, was often bust at one hospital when he was needed at another, and the number of specialists available were not sufficient. The internes in hospitals often gave anesthetics, but their term on the service was so short that no degree of excellence or of satisfactory technique could be established.

Many hospitals found it necessary to train nurses to give inhalation anesthetics. The hospitals also found that nurse anesthetists were far more economical, because they would work on the salary basis. The system worked rather well, and the number of nurse anesthetists grew to a large number. For many years nurses successfully with no particular notice taken of it.

When the medical profession began to object, they pointed out several reasons why a nurse was not qualified to give an anesthetic. The objections were made largely by medical and dental anesthetists who felt that nurses were enroaching on their field if work. They believe that forsuch delicate and exacting work, a nurse lacked intelligence and ability to assimilate information on the subject, and that they also lacked the ability to teach the art to.others. Another objection is: because of a nurse's lack of medical education, it is impossible for her to make a preliminary examination of a patient, which is so important to the safety of the patient; and also that it is impossible for her to correctly interpret and correlate the finding of others, and from that to direct the patient's preparation for the operation. These are the medical professions greatest objectiions.

The nurse anesthetists endeavoring to guard the field which nursed had aquired, stood their ground firmly by answering to the objections made against them.

The nurses declared that they were no enroaching on the field of medical men, but were asked to enter the field by the medical profession to improve the condition which had existed since 1846.

As to their lack of ability and education, the nurse anesthetists have pointed out that she has proved herself exceptional by deveoping technique of administration in such a manner as to warrant the approval of surgeons and hospitals. The post-graduate schools of today as a whole offer more than just technical training, giving theoretical training as well. A nurse, they claim, can direct all of her ability in one channel, having no other, professional interest outside the realm of anesthesia.

In answering to the charge of inability to correlate the the physical examination findings of the doctors because they are unable to make the examination themselves, the nurse anesthetists point out that a medical anesthetist must make an examination hurriedly himself, and in case of emergencies must accept the findings of internes, thus placing himself in the same category as nurses.

The nurse anesthetists, however, realise the need of higher and more uniform standards of education in the field, and the establishment of a set of minimum requirements for a recognised school of anesthesia. At present the courses in the various post-graduate ~~fields~~ schools of anesthesia varies from six months to over a year. The nurse anesthetists are working hard for registration ~~for~~ of nurse anesthetists and state board examinations. In many states it is unlawful for a nurse to give an anesthetic even under the supervision of a doctor. State registration, they believe, will safeguard hospitals and surgeons by relieving them of the responsibility for the nurses, and make the service more uniform and of better quality throughout the country.

The nurse anesthetists agree that anything outside the field of inhalation, such as local or regional anesthesia, is outside their field as it requires a greater knowledge of anatomy and topography of the skin and underlying muscles and nerves.

Dr. B.A. Wilkes of North Hollywood, California, is one of the medical men who believe that a nurse is capable of administering an anesthetic. Dr. Wilkes while working at the Missouri Baptist Hospital in St. Louis worked hard to break down the barrier of the prejudice that the staff held against nurse anethetists, and after he had, it was his responsibility to select and train nurses for the administration of anesthetics in that hospital.

Dr. Wilkes wrote:

" I want to say that the nurse is more reliable in my opinion than the physician, because I have never seen a doctor yet but what had so much curiosity about what was going on on the other side that he was looking over there, ~~and he didn't~~ and he didn't know what color the patient's face was, nor what the condition of the pupil or the pulse was. The nurse has no business on the other side, she is in somebody else's pasture. She belongs on this side, and she wants to make good. She is devoting all of her enrgy and all of her talent to that one thing------

" I am strong for the nurse anesthetist, and I am terribly hard on them, because I know that they hold the responsibilities on me; and if they are going to accept that job, they must accept their share of the responsibility. Nobody is going to die in my place from an anesthetic if I can help it. I think that it is just as dangerous as any other part of surgery, and an anesthetist must be capable and must be efficient, must be in good health, must have a ggod mind and a keen conception of what the different phases of the patient are and what may develope during the anesthesia."

In the future there will be more and more discussion of this problem pro and con. If the medical men wish to reserve the field of anesthesia to the medical profession, there will need to be a more efficient system worked out. As conditions stand now, in many localities, it is impossible for hospitals to operate their surgeries without nurse anestheists.

Sources:

Quotation: Wilkes: "Value of the Nurse Anesthetist in the General Hospitals", Transactions of the American Hospital Association, 36th, annual convention, Sept. 1934, pages 355-356.

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