THE CHANGING FACE OF ANAESTHESIA*

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From time immemorial man has sought to attain relief from the pain of surgical operations, but the ideal was only finally attained little more than a century ago, when anaesthesia for surgical procedures was achieved.

In no other branch of medicine during the last quarter of a century has the advance been so rapid and have concepts so often been changed as in anaesthetics. The result of this fluid state is that those caught in it, are strongly tempted to grasp at dogma as a means of establishing routine and stability. There is, for example, the doctor who states that he never uses ether at all; and then there is the one who declares that ether is still the only anaesthetic agent of any value; both of course are completely misguided. It is only by avoiding dogmatism and developing

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an understanding of the complex processes attendant upon the state of anaesthesia that one can hope to achieve success in the practice of this branch of medicine.

As we all know, Long and Morton, in America in 1842, were the first to put ether to practical use as an anaesthetic agent. In 1844, Horace Wells, a dentist also in America, used nitrous oxide for dental extractions. After these two agents had been used for a few years, Simpson, in Scotland in 1847, used chloroform as an anaesthetic.

All these agents were administered by the open method, and it was not until 1862 that Skinner introduced the domett-covered wire-framed mask, which was frequently copied and was later named after one of the imitators—Schimmelbusch, of Berlin. The Skinner or Schimmelbusch mask is still today an indispensable piece of apparatus to the doctor who practises in the country, away from easily accessible hospital facilities.

The popularity of chloroform after it was introduced by Simpson caused ether to be abandoned for a time, and then followed the first major change in the administration technique of anaesthetics. Some fatalities occurred with chloroform and Snow, who incidentally was the first whole-time anaesthetist, constructed an apparatus to deliver a percentage flow of chloroform with oxygen or air. Clover, in 1862, improved on this chloroform apparatus, but he was convinced that ether was safer than chloroform and, after experimenting and improving still further, he produced the Clover's apparatus, which is still remembered by a few of us of the older school.

An apparatus was later constructed in America by Colton for the administration of nitrous oxide, mainly for dental cases, and in 1887 Hewitt, in England, designed the first practical machine for administering gas.

So, by the end of the 19th century, inhalational anaesthesia was firmly established. Needless to say, the surgeons were now getting bolder, and the scope of surgical undertakings grew.

After various attempts at rectal administration of ether had been abandoned, Gwathmay, in 1913, introduced the method of administering a mixture of oil and ether by the rectum, for use in operations on the head, neck and thorax. During the 1920s and 1930s, other rectal anaesthetic agents were introduced, first paraldehyde, which was discarded because of its unpleasant odour and occasional production of violent restlessness, and then avertin (Eicholz, 1926). This last rectal anaesthetic was still in use and very popular up to the beginning of the last World War, and thus we now had the rectal route of administering an anaesthetic—a route which is still commonly used today, although the vehicle may have changed somewhat. Anaesthesia, it may be said, had turned to the rectum.

In 1891, Quincke described the passage of a hollow needle into the subarachoid space. Thus lumbar puncture became a practical procedure, and it was not long before cocaine was given by this route as an analgesic agent for operations. Owing, however, to the toxicity of cocaine this procedure was soon abandoned, but when Meischner discovered and described percaine (now known as nupercaine) it was used by the spinal route—firstly by Howard Jones—as an analgesic agent. Thus the spinal route for surgical analgesia was established and anaesthesia had taken another turn: spinal analgesia had given it a stab in the back! Surgery in the meantime continued to get bolder and was demanding new techniques from the anaesthetist.

In 1878 Macewen introduced an *intratracheal catheter* by the mouth and started what was to become one of the most important technical changes in the history of anaesthetics. Years later, in 1912, Kelly, of Liverpool, modified an apparatus designed by Elsberg in New York, and used intratracheal insufflation of ether for anaesthesia in his surgical practice. Shipway, of Guy's Hospital, again improved this apparatus to allow the ether to be warmed up and so give a higher concentration of the vapour in the anaesthetic mixture. The Shipway's apparatus was still a familiar sight in most theatres before the last World War, when Boyle, of St. Bartholomew's Hospital, designed his apparatus. Today there can hardly be a hospital in South Africa which does not use one of these machines.

We now have come to the mechanical administration of the inhalational anaesthetic; but, to come back to Macewen and his intratracheal catheter, it was left to Rowbotham in America and Magill in England to perfect the intratracheal technique as we know it today. Magill, especially with his blind intubation and controlled or assisted respiration, made a wonderful contribution to anaesthesia in particular, and the saving of lives in general.

In 1923 Waters, of Wisconsin, demonstrated that carbon dioxide could be absorbed by soda lime in a closed-circuit anaesthetic technique. With this technique, he introduced cyclopropane to anaesthesia; in 1925, Henderson and Haldane introduced carbon dioxide as a gas to be used in anaesthesia; and thus the face of anaesthesia received the new technique of CO_2 absorption and the blast of two new gases.

In 1932, Weese and Scharpff introduced evipan, an intravenous anaesthetic agent, and thereby opened the long-sought-after and entirely new route for the administration of an anaesthetic. Those of us who are young enough to remember this event, will also remember the stir it caused at the time. The surgeon could now promise his patient just a little prick and then sleep! Most of us, however, had a very great respect for evipan, because the fact that once in the vein it could not be withdrawn again, coupled with reports of very marked respiratory depression, made us cautious of the drug. Two years later, Lundy introduced pentothal sodium, stating that it had none of the disadvantages of evipan, and thereby started a new fashion in anaesthesia that was to sweep the world. Unfortunately, the popularity of this agent, and its unbridled use by the uninitiated, led to many unnecessary fatalities. The regrettable tendency of some enthusiasts to embark on the wholesale use of a new drug and a new method, without due regard to aspects of safety, often cause the tragic results of poor judgment to be attributed to the drug or to the method, in general terms. Some of the prejudices about pentothal which sprang from its early misuse, are even today harboured by some members of the profession who should be better informed. Anyhow, pentothal gave the changing face of anaesthesia a shot in the arm!

Then, in 1942, Griffith and Johnson made the discovery that curare, an extract of a South American shrub, could be used as a muscle relaxant in anaesthesia. This brought about another major change in anaesthetics; whereas one had before to rely on a deep level of anaesthesia for relaxation during surgery, one could now keep the patient on a lighter plane and use a muscle relaxant to give the desired relaxation. Curare was followed by the synthetic relaxants and also by the shorter-acting relaxants. The many and varied uses of these drugs have only been fully understood during the last decade, and they have been a boon to the anaesthetist. Here again, as with pentothal, the misuse of these drugs by the unwary and inexperienced led to unnecessary tragedies. The relaxants—and pentothal—spelt the doom of chloroform, which had been known for years to have many disadvantages but was still used, purely for its ease of induction and relaxant qualities. These two activities were now taken over by pentothal and the relaxants, and chloroform disappeared from the general scene, although it is still used in midwifery.

In 1942 Allen made the first reports on hypothermia in anaesthetics. Although this technique has had many setbacks, mainly owing to the ventricular fibrillation it sometimes produces, it is still used successfully in combination with other techniques in major operations.

Then came along induced and controlled hypotension. The surgeons had for years been complaining that during some types of surgery the bleeding at the site of operation hindered their work. Scurr was the first in this field, and in 1949 he used pentamethonium halide (lytensium) to reduce the blood pressure during operations. Enderby and Wyman continued the work with these sympatholytic agents and hexamethonium bromide (vegalysin) became more popular because of its more constant action. Then Randall, and some others, described arfonad—a thiophanium derivative. As the result of the work of Sarnoff, Scurr and Wyman during the early fifties, this agent came to be used practically exclusively; it had fewer complications or side-effects than the ganglion-blocking agents, and was more constant in its action. Controlled hypotension is a very useful technique in anaesthesia widely practised today, but one must utter a word of warning—to embark upon this procedure, which after all is highly unphysiological, without proper selection of the case and proper after-care organization, is to court disaster. Apart from all other complications, and there are many, primary heart failure is an ever-present danger with this technique. As A. R. Hunter put it, this technique should be confined to those cases where it makes the impossible possible, and it should not be used to make the possible easy.

During the last decade, thoracic surgery took a dramatic turn with the invention of the heart-lung machine, and entirely new fields were opened to the surgeon. Hand in hand with this development went that in anaesthesia, with relaxants, controlled respiration, and a light plane of anaesthesia. One feels that this technique, plus a certain amount of hypothermia, will probably be the accepted practice for these operations before long. Be that as it may, the success this highly technical procedure has met with, as indicated by the comparatively large number of patients who have been turned into useful human beings from human wrecks, is beyond all expectations and the procedure has certainly come to stay. The one fact brought out is that in these complicated surgical undertakings teamwork is a *sine qua non*, and that it is around this essential that success or failure to a great extent hinges.

In this brief review I have purposely left out a number of anaesthetic agents which made very little difference to the progress of anaesthesia—ethyl chloride, vinesthene, trichlorethylene, viadril, and halothane—to mention but a few. The last mentioned is important, however, in that it is a very potent, non-irritant, non-inflammable drug. It is best administered in very carefully regulated percentages and for that purpose several apparatuses have been designed to ensure an accurate percentage flow of vapour—shades of Snow's chloroform apparatus of nearly a century ago! Halothane has found a permanent place in the anaesthetist's armamentarium until a less potent drug with all its essential qualities comes along. In viadril we have a completely new source for an anaesthetic agent, namely the steroids. This agent was thoroughly tested at various hospitals—at Pretoria General Hospital by Kok and Knipe—and, although it has not found a permanent place in the anaesthetist's drug cupboard, the source of this agent warrants further exploration.

Furthermore, I have not mentioned the various drugs now available for premedication and post-operative medication. There are a number of newer ones that will stay with us for quite a while but I think atropine will stay the longest, being, to my mind, the most important one of any real benefit.

The nonchalance with which the tiro disregards what is to him the minor matter of premedication sometimes astounds one. I have seen colleagues sail into an unexamined and unpremedicated case with the greatest abandon—and then blame the apparatus or drug for the resulting fiasco.

Resuscitation of the patient in cardiac arrest by means of cardiac massage made a dramatic entry into anaesthetic practice, and the daily papers still make a great display of cases of this kind; and now the electric defibrillator and pacemaker for the ventricle with a bundle of Hiss that will not behave has entered the realm of the anaesthetist.

Since the last war, blood transfusion, and the intravenous drip with or without various serum substitutes or plasma expanders, have also become commonplace in anaesthesia and nowadays one never sees an operation of any magnitude without the anaesthetist's manipulating one of these bits of apparatus. Venipuncture has become the commonest procedure for the anaesthetist and woe betide the practitioner who is clumsy in this department of his practice.

Hypnosis, to create insensibility for surgical procedures, has been tried successfully for many years now. For years too, the psychiatrists have been creating a state of unconsciousness in their patients by passing an electric current through the brain—a procedure called electronarcosis, which I have been told is used fairly extensively in Russia for operations. The obvious limitations of these two techniques, however, have kept them out of the field of general anaesthetic practice so far.

SUMMARY AND CONCLUSION

As I now come to the end of this brief and quite inadequate review, it is just as well to stop and look back on the changing face of this fascinating subject. We started off with our inhalational methods and drugs through gas, ether, ether and chloroform. Then came the rectal route, the spinal route, hypothermia and finally the intravenous route, with the still untried electric shock through the brain in the offing. Hand in hand went the new techniques of intratracheal, semi-closed and closed circuit, with carbon-dioxide absorption, controlled respiration and hypotension. All this brought along new drugs and gases, some to be discarded after very short use, others to find a permanent place in the field of anaesthesia. New and elaborate pieces of apparatus were designed and put into use for all this development and, one may honestly say, for the good of the patient. But if you or I were to be asked to give an anaesthetic in a real emergency today, with the least material at our disposal, what would be the absolute minimum we should require? My answer would be—a Schimmelbusch mask and a bottle of ether. Now, as a parting shot may I ask, does the medical student of today receive enough training in this basic art of the subject?