Practicalities

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ANAESTHESIA IN GENERAL PRACTICE

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During the past century anaesthesia has suffered many vicissitudes, but it is during the past twenty-five years that many major advances have occurred. This has led to the rapid expansion of anaesthesia as a speciality of absorbing interest, not only for the anaesthetist but also for the patient. And with this expansion has come many new and scientific methods of administration, and many new and scientific instruments for the administration. But unfortunately the "rag and bottle man" outlook is still maintained far too often.

Practically all anaesthetic deaths are preventable—a sweeping statement, but true. This is borne out by published figures, such as those of Sise and Woodbridge (1930), who gave 123,000 anaesthetics with ethyl chloride without mishap; Kniberg (1933), who gave 125,000 ethyl chloride anaesthetics without mishap; another series of 1,161,820 dental gases with two fatalities, published by McCardie (1923); together with many other statistics from competent anaesthetists—all these show that the vast majority of anaesthetic deaths should be preventable if only proper technique is employed.

Chloroform is the one anaesthetic, *per se*, which can be responsible for anaesthetic fatalities, even when a proper technique is used. Furthermore, chloroform is probably one of the more favoured anaesthetics in use in general practice. There are at least four methods by which chloroform causes anaesthetic troubles, often leading to death:—

- (i) *Primary cardiac failure*—this occurs early in the administration, and is probably caused by vagal stimulation due to too high a concentration of chloroform being inhaled.
- (ii) *Ventricular fibrillation*—due to intermittent administration, or to stimulation before the patient is fully anaesthetised.
- (iii) *Gradual paralysis of the respiratory centre*—due to over-dosage, leading to secondary cardiac and respiratory failure.

(iv) *Delayed chloroform poisoning*—due to the toxic effect on the liver parenchyma.

Fortunately these grave conditions do not occur often, and there seems to be some natural barrier to their onset in the parturient woman, in which cases chloroform is most used in practice.

The other anaesthetic drugs of value in practice are ether (di-ethyl ether), vinesthene (di-vinyl ether), ethyl chloride, nitrous oxide, the intravenous anaesthetics and the local anaesthetics, but before discussing them in detail it will be well to recall certain definitions, without knowledge of which clear thinking is impossible.

Analgesia.—This occurs in the first stage of anaesthesia, when painful stimuli are not appreciated as such, although the patient retains considerable control of his faculties. It is seen, commonly, during drunkenness. It is of value in practice for painful dressings, dental fillings and obstetrics in the early stages of labour.

Anaesthesia.—This condition of complete lack of recognition of painful stimuli may be produced in several ways—either (i) by "blocking" the area to which the stimuli will be applied (*local anaesthesia*); (ii) by "blocking" all the nerves supplying the part to be stimulated (*regional anaesthesia*); (iii) by cutting off the afferent impulses in the spinal cord (*spinal anaesthesia*); (iv) by rendering the patient unconscious of all external stimuli (*general anaesthesia*). Of these, the first and the last are of most service in general practice.

Premedication.—The giving of drugs prior to anaesthesia is useful for the following reasons:—

- (i) To diminish the secretion caused by irritating gases, such as ether (di-ethyl ether).
- (ii) To overcome the patient's nervousness, which in turn leads to
- (iii) Lowering of the patient's metabolic rate.

Both these factors cause—

- (iv) Less anaesthetic agent being used, which is both economical and of great importance to the patient, as it lessens the possible toxicity of the agents used.
- (v) To ease the induction and maintenance of anaesthesia.

Premedication can be of varying degree, from simple *sedation*, where the patient is fully conscious but happy in his mind, to *narcosis*, when the patient is deeply asleep with no knowledge of external affairs, but will respond to stimulation in greater or less degree. Or, if pushed further, the stage of *anaesthesia* can be produced.

But these effects should not be sought for with a single drug. It is true that anaesthesia can be produced by means of morphia (Macintosh), but it is a procedure which causes a great deal of trouble and anxiety to the anaesthetist. Therefore a simple grouping will be given.

Of the drugs used to prevent excessive secretion, *atropine sulphate*, 1/150–1/50 gr., is most often used. But since it also paralyses the vagus, alarming increase of pulse rate may occur, especially in hyperthyroidic patients. *Scopolamine* is the other drug used, in doses of 1/6–1/3 gr., which combines some sedative effect as well. But in patients of over sixty years of age it may cause alarming symptoms of cardiac or respiratory arrest.

Sedation is most often produced by morphia (or its alkaloids) in doses of 1/8–1/4 gr., combined with either of the drugs mentioned above given 1 to 1½ hours before operation.

Narcosis is most often obtained by the use of the short-acting barbiturate derivatives, such as sodium amytal, 6–9 grs. two hours before operation, nembutal, 3–4½ grs. 1½ hours before operation, or sodium soneryl, 3–4 capsules (each capsule 2½ grs.) 1½ hours before operation. These drugs are put up in capsules, and it is an aid to absorption if the ends of the capsule are pricked with a needle just before administration.

But there is another method of producing narcosis, namely, by giving short-acting barbiturates by intravenous injection. The drugs commonly used are Evipan Sodium, 10 % solution, Pentothal Sodium, 5 % solution, Sodium Amytal, 10 % solution, or Nembutal, 10 % solution, but there are many other preparations. (Note—10 c.c. of a 10 % solution is equivalent to 1 gramme of the drug.) All the above-mentioned drugs must be freshly prepared. The usual method of administration is to give the drug intravenously (be certain that it is intravenous), slowly, asking the patient to count. When counting ceases, pause some ten seconds, and then give just under the same amount already given. For example, if 0.4 gm. (4 c.c.) Evipan caused counting to cease, then give another 0.35 to 0.4 gm. (3.5 to 4 c.c.), making 0.75 to 0.8 gm. (7.5 to 8 c.c.) in all. The narcosis so produced is extremely pleasant for the patient, causes an easy induction of the subsequent general anaesthetic, but is of very short duration, and therefore anaesthesia must be proceeded with during the first five to ten minutes.

Total anaesthesia can be easily produced in the same way with these short-acting barbiturates, but factors determining the depth of anaesthesia depend upon the choice of agent, the rapidity of induction, and the dosage given. At this juncture it is well to remember, however, the difference between Evipan and Pentothal—the former is an intravenous narcotic, whilst the latter is an intravenous anaesthetic. Therefore it is useless to try to produce full anaesthesia with Evipan, otherwise severe respiratory depression will result. Therefore Pentothal is the agent of choice for producing surgical anaesthesia.

The more rapid the injection the quicker unconsciousness supervenes, the deeper the anaesthesia, but the more rapid is the rate of recovery. Thus, if to an average man 0.5 gm. (10 c.c.) of Pentothal be injected as quickly as possible, he will be unconscious in fifteen to twenty seconds, respiration will cease within another thirty seconds so that artificial respiration may be required, muscular relaxation is complete, and, providing oxygenation is maintained by artificial respiration, consciousness will be regained in about ten to fifteen minutes or less. Conversely, with a slow injection (three to four minutes) he will remain conscious, though sleepy, for four to five minutes, but he will never be completely relaxed and he will remain in a very light stage of anaesthesia for half an hour or more. These results are, of course, due to the concentration of the drug within the brain.

It is valueless to have a standard dose for all patients. Dosage must be governed by age and weight of the patient. Thus, a young muscular soldier of twenty years of age may require 0.75 gm. Pentothal (15 c.c.), or even more, to produce anaesthesia, whilst an old woman of six stone might only require 0.35 to 0.45 gm., that is, 7 to 9 c.c. or less. Another point to remember is that these intravenous anaesthetics should not be used in cases of asthma or other allergic conditions.

Bearing all these conditions in mind, intravenous narcosis or anaesthesia is a relatively safe and easy procedure and of great value in practice. It is an extremely useful method for alleviating the distress of painful dressings, suturing of large wounds, the removal of teeth, the setting of fractures, and other minor operations. Providing a means of artificial respiration

(such as the Oxford inflator) is at hand, the very rapid method of injection is extremely useful for reducing dislocations in muscular persons or external version of the foetus in the pregnant woman. But it should not be used until one is quite cognisant with the other methods of administration. But whichever method is used, the patient should be kept in bed afterwards for at least twelve hours if possible, and he should not be allowed to drive a car for at least twenty-four hours.

Lastly, there is a simple method of producing narcosis if any of the above-mentioned drugs are not to hand, namely, the intravenous injection of 4-5 c.c. of ordinary Paraldehyde within five to 10 seconds. It causes some cough to start with, because of the immediate excretion of some of the drug in the lungs, but the patient soon settles down, and anaesthesia may be continued in the usual way.

Whatever method is used, however, it is essential that *the patient's airway be maintained from the beginning*. It is the first and most important rule attendant upon anaesthesia in any form, that once unconsciousness of any degree is induced the airway must be kept clear.

The commonest cause of obstruction to respiration is the *falling back of the tongue*. It can be prevented for the most part by holding the jaw well forward by placing the fourth and fifth fingers of the left hand behind the angle of the jaw, and the index finger of the same hand under the point of the jaw and pushing the jaw well forward. Often, however, it is necessary to use tongue forceps as well. They should be placed, not through the tongue vertically, but horizontally through the dorsum, well behind the tip. As a substitute, a large safety-pin may be bent in the middle of the free prong, or a curved needle may be held in a needle-holder or Spencer Wells forceps. All other types of tongue forceps should be eschewed. Once forward, an efficient airway should be inserted straight away.

The next cause of obstruction is usually *excessive mucus* in the mouth and pharynx. This should be removed by a swab on the end of the finger, and *not* on a swab holder, for fear of injury to the mucous membrane of the pharynx.

Spasm of the glottis may occur, due to the inhalation of an irritating vapour, severe anoxaemia, or too rapid induction of intravenous anaesthesia. It is recognised by the sudden inspiratory stridor, followed by cessation of respiratory exchange, with indrawing of the thoracic wall, which remains in the position of expiration. Anaesthesia must be stopped and a stream of oxygen applied to the face. Usually the spasm passes off in a few minutes, but occasionally it persists. In this case artificial respiration must not be applied, although the patient becomes deeply cyanosed. This is because the vocal cords are like a pair of swing doors which open towards the pharynx and come together completely in the middle line and swing no further downwards. Therefore, artificial respiration merely deflates the lungs still further. Just before death occurs the cords relax, and a very slight inspiration occurs—now is the time for artificial respiration and the administration of oxygen. Once recovered, anaesthesia may be proceeded with in the usual way.

The *methods of artificial respiration* of value are as follows:—

(i) *Laborde's tongue method*.—The tongue should be seized with either tongue forceps or a dry swab, and pulled out of the mouth as far as possible and then let go. This should be repeated ten to twelve times a minute. It is an extremely useful method not only for adults but also for children and infants. Should this method fail, then one of the following should be used:—

(ii) *Schafer's method*.—In this the patient is turned on to his face, the head put on one side, and the operator kneels at one or the other side of the patient, and drops his hands with the full weight of his body on to the loins. (It will be noted that this method of artificial respiration is an indirect one. It causes respiratory exchange by pushing up the diaphragm, when the abdominal contents are pressed upon, and this produces expiration. On releasing pressure, the diaphragm moves downwards of its own accord, and therefore inspiration occurs, but it is a passive act.)

(iii) *Sylvester's method*.—The patient is laid flat on his back, and the tongue is held forward by tongue forceps. The operator, kneeling at the head of the patient, seizes both wrists and forces them vertically upwards and above the patient's head. The arms are then swept down to the side and the wrists are crossed over the lower part of the thorax, and compression therefore occurs. Both these manœuvres should be repeated some ten to twelve times per minute.

Before describing the various techniques of administration, it would be well to recapitulate the various *signs of anaesthesia*. Guedel's chart is appended for convenience of memory (Fig. 1). Without complete knowledge of these signs, excursion into anaesthesia is a dangerous pastime.

FIG. 1
Guedel's Chart

FIG. 2
Effect of Metabolism on Anaesthesia.

a = unit $\times$ on basal metabolic rate.

b = unit $\times$ on man of 30.

c = unit $\times$ on man of 30 with hyperthyroidism.

(Reproduced from *Essentials of General Anaesthesia*, by R. R. Macintosh and Freda B. Pratt, by permission of Blackwell Scientific Publications Ltd., Oxford.)

Classically there are four stages.

1. *1st Stage. Analgesia.*—This stage has already been described, but there is one sign—Human's eyelash sign—which is present during this stage only. Touching the eyelashes evokes movement of the eyelid, which reflex is lost at the end of this stage.

2. *2nd Stage. "Delirium."*—This may be merely potential or manifest by incoherent talk or actual struggling—the patient is, however, unconscious and will be completely amnesic of all that has happened. Naturally, the actual effects will depend upon the type of patient, e.g. an alcoholic or restrained fear (the tight-lipped Englishman or his offspring!); these may produce violent movements or undue noise during induction, or premature stimulation may have the same effect; as may a poor induction, either too short, producing marked asphyxia, or too long, by keeping the patient in this stage longer than is necessary. Respiration is erratic, eyeball movement may be marked, the pupil will be dilated, and the corneal reflex is present. Vomiting may occur at the end of this stage, especially if there is marked asphyxia or a full stomach.

3. *3rd Stage. Surgical Anaesthesia.*—In this stage automatic respiration sets in, muscular relaxation is sufficient to make the patient unable to respond to any stimulation, the eye becomes central in position, the pupil contracts and the corneal reflex is lost, and swallowing movements cease. As the anaesthesia becomes deeper, breathing will become more abdominal in type, due to intercostal paralysis, until finally—

4. *4th Stage*—The respiration ceases, the pupils dilate, cyanosis becomes marked, muscular relaxation is complete, and if not relieved the heart muscle also becomes relaxed and therefore stops beating, and death will take place. This will not occur if artificial respiration is given and full oxygenation maintained by these means. (Except where chloroform has been used, because in this case the heart will stop before respiration ceases.)

Of all these signs, *respiration is the sign par excellence*, and every breath should be both seen and heard. Too much reliance should not be placed on the size of the pupils, as these will be modified by any premedicative drugs.

Premedication will vary the signs and depth of anaesthesia in other ways also. Reference has already been made to the effect of lowering the patient's metabolism. Thus, if to a patient with an absolutely basal metabolic rate, the "unit x " of premedication is given, it will, by itself, produce a degree of anaesthesia, say, to the point a (Fig. 2). But the same unit to a child (whose metabolic rate is much higher) or to a man of thirty years of age with hyperthyroidism, say to the point c . Conversely, the same depression will occur if a weak anaesthetic, such as nitrous oxide, is given, and thus the difficulty of producing anaesthesia of sufficient depth with nitrous oxide in certain individuals becomes clear. In such cases premedication must first be given, and then the anaesthesia produced will be sufficiently deep for the operation to be performed.

Lastly, it is necessary to have a clear conception of the difference between anoxaemia and cyanosis, and to realise their importance in relation to anaesthesia.

Anoxaemia is a deficient oxygen supply to the tissues. Physiologically, there are four types:—

- (i) *Anoxic*, in which there is insufficient oxygen in the air inspired, and therefore insufficient oxygenation of the blood.
- (ii) *Anaemic*, in which there is insufficient haemoglobin to carry oxygen to the tissues.
- (iii) *Stagnant*, in which blood may be fully oxygenated, but the mechanical pump of the circulation is deficient.
- (iv) *Histiotoxic*, in which, in spite of an adequately oxygenated blood supply, the tissues are unable to utilise the oxygen.

Cyanosis, on the other hand, is independent of the oxygenation of the blood, but *dependent upon the amount of unsaturated haemoglobin present in the blood*. For practical purposes it may be stated that normal persons have 15 gm. Hb per 100 c.c. blood. If 5 gm. Hb % are not saturated with oxygen, cyanosis will result. Thus, in a plethoric man with, say, 18 gm. Hb %, he may be cyanosed, but he will not be anoxaemic, as there are still 13 gm. Hb % left for saturation with oxygen, and therefore full oxygenation of the tissues is still possible. Conversely, in an anaemic woman with, say, 7 gm. Hb %, even the slightest trace of cyanosis means so much anoxaemia that death would occur since there is insufficient oxygenised haemoglobin to oxygenate the tissues.

Thus if two patients, one anaemic and the other plethoric, are anaesthetised with nitrous oxide, the former will show little cyanosis and yet be deeply anaesthetised, because of the anaemic anoxaemia, whereas the latter will be very cyanosed but hardly anaesthetised at all.

Before proceeding to anaesthetise any patient, an examination of the chest should be performed, not only to detect gross physical disease, but also to protect the anaesthetist from the medico-legal point of view.

One of the problems which so often perplex the practitioner is the finding of a cardiac murmur, and the question of the advisability of proceeding with the anaesthetic under these circumstances. A diagnosis should first be made and the aetiology of the condition assessed. Providing no active disease is present, it can be stated as a general rule that an old cardiac lesion *without signs of failure* can safely be anaesthetised, but an anaesthetic which allows of sufficient oxygenation, such as ether, vinesthene or ethyl chloride, should be chosen, and not nitrous oxide, as these patients are more susceptible to the effects of anoxaemia.

There now remains the question of the choice of anaesthetic and the mode of administration for any particular case.

For anaesthetics of short duration, such as tooth extractions, setting of fractures, paracentesis, etc., the anaesthetics to be considered are nitrous oxide, vinesthene, ethyl chloride, chloroform, local anaesthetics and the intravenous anaesthetics. The technique for the last type has already been discussed.

The administration of nitrous oxide and oxygen will first be described. It should not be mere asphyxia, not so given that the patient feels the subjective sensation of suffocation. There are many types of apparatus, but only two need be described. The first consists of two cylinders of nitrous oxide with foot keys, a re-breathing bag, a facepiece and a three-way valve: the first position allows air to be both inspired and expired, the second allows the patient to breathe out of the bag and to expire into the atmosphere, and the third allows the patient to breathe in and out of the bag (re-breathing). It will be noted that in this type of apparatus—the simplest of them all—no oxygen is available except from the air, which contains 20 % oxygen only. The bag should first be half-filled with gas—over-filling is to be avoided because of the positive pressure produced, which leads to the subjective feeling of suffocation. Then a suitable mouth-gag should be placed in position, and the facepiece should then be lightly applied, and the patient told to breathe in quietly, giving quiet encouragement by words or slight pats on the shoulder, etc. During this time the gas flow should be sufficient to keep the bag half-filled. As soon as the patient has passed through the first and second stages and is in the third stage of anaesthesia, two inspirations of air should be allowed by placing the valve to the required position. Now turn the valve to the position for re-breathing and cut off the gas. Depending upon the stage of anaesthesia and the time required for the operative interference, one inspiration of air is allowed as often as possible, without allowing the patient to come out of the surgical anaesthetic level. If the operation is for the removal of teeth and no nasal attachment is present, then the anaesthesia will be of very short duration and speed is essential for the extraction. The anaesthetist must work in concert with the dentist, opening the mouth with the gag and keeping the jaw well forward and preventing flexion of the neck, since this would cause the tongue to be pushed backwards at its base and obstruct the pharynx. The anaesthetist should also keep careful watch on the teeth extracted and for small fragments which fly off. It will be noted that cyanosis plays no part in deciding the depth of anaesthesia. It is sometimes of value to remember that nitrous oxide is heavier than air, and therefore if the patient is in a recumbent position a flow of gas from the facepiece placed above the face will then produce sufficient amnesia for him not to remember the actual application of the facepiece.

The next method of administering nitrous oxide is in combination with oxygen through a nasal attachment together with a mouthpiece. Macintosh was the first to note that, once surgical anaesthesia had been produced, the automatic breathing occurs entirely through the nose. Furthermore, he was able to prove that induction could be performed also through the nose entirely, providing the nose was quite patent. The mouth-gag is first inserted and the nasal attachment placed in position to enable the patient to breathe easily, and the connecting tubes are fixed around the head, above the ears. The bag is half-filled with nitrous oxide and the patient is instructed to *expire through the nose*. After one or two such expirations it will be found that the patient is also inspiring this way. Sufficient nitrous oxide should be run into the bag to compensate for the gas so removed. In many cases the patient—especially if gently encouraged—will soon become adequately anaesthetised. Once the required level of

anaesthesia is produced, the nasal attachment should be removed to allow one inspiration of air and then replaced. A sponge is now placed at the back of the mouth (do not obstruct pharyngeal airway, however), and sufficient oxygen is added to keep the patient at the required level of anaesthesia until the operation is complete. With practice, long anaesthesia may be kept up by this method. It will be found that the longer anaesthesia lasts the more oxygen can be used.

Occasionally, although quite willing to help, the patient starts to mouth-breathe during the second stage. In this case the mouthpiece must be applied until the third stage is obtained, and then anaesthesia is proceeded with by the nasal method.

Whichever method is used, however, certain cases cannot be anaesthetised by this means. This applies principally to the plethoric alcoholic individual. In this case induction should be performed with ethyl chloride, and once in the third stage a quick change is made to gas and oxygen nasally if prolonged anaesthesia is required.

Nitrous oxide, with or without oxygen, is extremely useful for all types of cases except very young children and infants. The so-called "gas-resistant" patient will always be overcome either by the use of adequate premedication or the use of ethyl chloride for induction. For even simple extractions, the giving of two Veganin tablets, one hour before operation, will repay itself in time and trouble by allowing a smoother induction and maintenance than would otherwise have occurred.

Ethyl chloride is an extremely useful anaesthetic in practice, although there is often a feeling of apprehension about its use. This is because it is an extremely potent anaesthetic agent, and the patient passes through the stages of anaesthesia very quickly. There are *four golden rules* (Macintosh) for its administration:—

- (i) A free airway must be maintained.
- (ii) Every breath must be seen and heard.
- (iii) If respiration ceases, stop anaesthesia until the cause be found.
- (iv) If in doubt as to stage of anaesthesia, treat as deep.

If these rules are observed, very few incidents will occur from its administration. It is an extremely useful anaesthetic for children and alcoholic individuals, but it should not be used for long anaesthesia without especial experience. If such an anaesthetic is required, open ether should be used after induction with ethyl chloride. Because of the severe depression of respiration attendant upon the use of ethyl chloride, *chloroform must never be used as a "follow on."* Pallor is a sign of impending disaster.

A small open mask, such as the Schimmelbush, should be covered with several layers of surgical gauze, and the mouth-gag inserted before anaesthesia is begun. Because of its potency, the patient will always become more deeply anaesthetised for a few seconds after the removal of the mask, and this should always be remembered.

Vinesthene has similar uses to ethyl chloride for induction, but because it does not produce such marked respiratory depression it may be used for prolonged anaesthesia. There are two methods of administering it—either in a special inhaler (Goldman's, or, better still, the Oxford modification) or on an open mask. The disadvantage of *Vinesthene* lies in its high volatility, and therefore much is wasted by using the open mask method. A mixture of 25 % *Vinesthene* and 75 % ether (*Vinaesthetic*) is much more useful for this type of administration and for longer anaesthesia. For short anaesthesia in children this is the one of choice. The anaesthetic, in liquid form, is run into the sponge or funnel and the facepiece is applied gently, with instructions to blow up the bag. Induction is pleasant and rapid, and anaesthesia quickly develops, and there are few after-effects, although salivation may be marked.

Local anaesthesia is of value for minor operations such as suturing wounds and the removal of cysts. A simple pack of novocain applied for five minutes will often reduce the pain of suturing; otherwise subcutaneous infiltration of a sufficiently wide area, and also deeply into the skin along the line of incision, will usually be sufficient. For regional anaesthesia a knowledge of the anatomy is required, and local anaesthetic must be deposited in close apposition to the nerves, or even into the nerve sheath. In all injections, however, *the plunger of the syringe should first be withdrawn*, in order to exclude injection directly into a bloodvessel.

Chloroform is often used for both short and long anaesthesia. It has only one advantage—the fact that it is non-inflammable. Otherwise, for the reasons given earlier, it should not be used, except perhaps in obstetrics.

The subject of *analgesia and anaesthesia in obstetrics* warrants a special mention. One of the original methods was introduced in 1902, and was known as "twilight sleep." In this method morphia and scopolamine were used, but often it did not cause analgesia, labour was often prolonged, uterine inertia was common, both motor and psychical excitement often showed themselves, and the babies were narcotised and respiration, in consequence, difficult to initiate. Therefore this method is of little but historical interest nowadays.

The greatest advance was made by Minnitt in 1933, who showed that the *use of gas and air* would often produce analgesia of sufficient depth to cause great relief to the patient from her labour pains. It must be emphasised that he used gas and air in the approximate proportions of 45 % nitrous oxide and 55 % air. In other words, there was 45 % nitrous oxide and about 11 % of oxygen used. This is not sufficient to cause unconsciousness in a normal, well-built woman, but, recalling the discussion on premedication earlier in this article, it will be appreciated that in a small, frail, ill woman a degree of anaesthesia sufficient to cause loss of consciousness can be obtained. For this reason Minnitt made his machine automatic, inasmuch as the gas would not flow unless the airhole in the facepiece was occluded by the patient's finger and a deep inspiration was made. Once unconsciousness supervened, the finger did not occlude this vent, and therefore the gas supply was cut off. This type of machine is almost foolproof, but, on the other hand, it is useless to expect such a small percentage of nitrous oxide to produce analgesia in a strong, muscular, primiparous woman. In her case a little premedication early in the labour such as 1-2 tablets of Evipan or 4 grs. of Pentothal or 1½-3 grs. of Nembutal should be used as an adjunct, except in cases where an early delivery is expected.

But in all cases it is essential that the *modus operandi* should have been *carefully explained to the patient before labour starts*, that her full co-operation is maintained, and that she should start to breathe in gas and air mixture on the first inkling of the labour pains.

There are now several modifications of the Minnitt machine, such as the Minnitt-Walton, Queen Charlotte, Chassar Moir and Elam machines. The virtues and vices of these machines will not be discussed here, as they are essentially technical in detail, but in all, the original principle of the giving of gas and air is the same.

Analgesia may be induced also by the *intermittent use of chloroform* from such a bottle as Mennell's or the "Safety" Junkers. In this type of apparatus the patient renders herself analgesic by operating a small hand-bellows. It is relatively free from risk, but the inherent dangers of chloroform must always be borne in mind, and it should never be used unless a doctor is present all the time.

Of the other drugs of value for analgesia in midwifery, the following mixture will often prove very helpful. Pot. Brom grs. 30, Chloral hydrate grs. 20, Syrup Auranti 1 dr., Aq. Chlorofad 1 oz. One ounce of this mixture given early in the first stage and repeated if necessary in three hours, is of definite value. The chloral seems to have an anti-spasmodic action on the os uteri. A variation of this technique is the giving of *Nembutal-chloral* combination such as Nembutal grs. 3, followed in ten minutes by Chloral grs. 30. This is given in primiparae when the os is ½th-¾th dilated with regular pains, and to multipara when ¼th-½th dilated. The dose may be repeated in two to three hours, and yet again in smaller doses, but Nembutal grs. 7½ and chloral grs. 120 should not be exceeded in twelve hours.

In an emergency, local infiltration on both sides of the midline halfway between the anus and the anterior edge of the perineum will give some relief.

For *complete anaesthesia* such as is required for forceps delivery, internal versions, the suturing of the perineum and the like, *open chloroform* or *open ether* are the most practical methods, unless an anaesthetic apparatus such as a Boyle or McKesson machine is at hand. Chloroform "à la reine" seems to be particularly suitable for the parturient woman, and very little anaesthetic may be all that is required. Another factor in favour of its use is that it is non-inflammable, and therefore it may be used in a room where there is a fire burning.

Open ether can be used for this type of case, or for any anaesthesia of long duration. It should be the rule that every anaesthetist should be perfectly cognisant with this method of anaesthesia—it is indeed the very testing-stone of anaesthetic practice. Induction should never be hurried for ordinary purposes, a minimum of twenty minutes is always required before complete induction, and it is often half an hour before full surgical anaesthesia is produced. The face mask should be covered with many layers of surgical gauze, and the usual rules regarding the maintenance of airway, etc., most carefully followed. Once full surgical anaesthesia is

obtained, it is easy to keep the patient in this stage, and the risk of over-dosage is very slight; even if it should occur, respiration always ceases before the heart.

After these longer anaesthetics, when the patient is rendered unconscious for some time after the operation is over, it is essential to see that the patient is *not left alone until at least the swallowing reflex has fully returned*. The airway must be maintained in exactly the same way as before operation, and the patient kept warm, but care must be taken to see that the hot-water bottles, etc., so used do not burn the unconscious patient. Post-anaesthetic vomiting can often be lessened considerably by the use of carbon dioxide at the end of operation, in order to increase the depth of breathing and so "blow-off" the anaesthetic vapour still held within the alveoli of the lungs.

Post-anaesthetic pneumonia is usually not pneumonia, but either a pulmonary infarct or pulmonary collapse. The former is differentiated by the symptom of haemoptosis. In the latter, haemoptosis never occurs, and if the collapse is of sufficient degree marked cyanosis may appear, and the mediastinum will move over towards the collapsed side. This mediastinal shift will naturally move the cardiac apex beat, and these points should serve to remind one of the diagnosis. There is no treatment for the former except, perhaps, the use of heparin, but for the latter the giving of expectorants or the use of inhalations of 95 % oxygen and 5 % carbon dioxide to cause over-breathing may help to remove the plug of mucus which has lodged within the bronchial tree, and so caused collapse of the distal lobes. In severe cases it may be necessary to use the bronchoscope, but this is a very specialised method of procedure.

There is one post-anaesthetic condition which causes some difficulty in treatment, and it is the symptom of restlessness. It may be stated as a rule that post-operative medication is not required until and unless restlessness occurs. Once it has occurred, the giving of a small dose of morphia such as 1/6th gr. to a normal individual will often cause the restlessness to disappear, since it is entirely due to stimulation of the pain centre in the medulla.

There are certain pitfalls in emergency work which should be remembered. The first is that when a patient is very ill the inexperienced anaesthetist may find himself in trouble because, on the administration of the normal amount of anaesthetic agent, he may find the patient extremely deeply anaesthetised, and it may be given as a rule that the more ill the patient the less anaesthetic is required and the more oxygen is required. Children become extremely toxic very quickly, and because of their rapid growth, which is taking place all the time, none of their essential tissues have the normal adult reserve power, and therefore even greater care must be taken in the administration of anaesthetics to them.

Lastly, there is one emergency which the anaesthetist must always bear in mind. It is *oedema of the glottis*, and it is met with most commonly in peritonsillar abscesses (quinsy). If it is necessary to anaesthetise a patient with quinsy, it is essential to see *whether or not the patient is using the accessory muscles of respiration*. If they are, it will be noted that they are never able to sleep. They may doze off, but they suddenly awake and soon their distress becomes pitiful. This fact of the non-sleeping bears considerable importance for the anaesthetist because, should he be unwise enough to administer an anaesthetic in such a case, the patient will surely die, since consciousness is lost for the simple reason that there is now complete paralysis of all the respiratory muscles. In such a case it is therefore essential to perform a tracheotomy previous to the administration of the anaesthetic, under local anaesthesia.

Thus it will be seen that the administration of an anaesthetic can no longer be regarded as a simple affair. It is necessary, first of all, to know the type of patient to whom you are going to administer the anaesthetic, and to help the patient accordingly by premedication; secondly, it is necessary to know all the signs of anaesthesia; thirdly, it is necessary to maintain an airway always; and fourthly, it is necessary to be cognisant with the main pitfalls which await the unwary. One of the most essential ways of becoming proficient as an anaesthetist is to make a point of administering to normal healthy individuals for minor operative procedures, using only atropine as premedication, an open ether anaesthetic whenever possible. Furthermore, it must always be remembered that, next to the patient, the most important person at an operation is the anaesthetist.

Books of value for further study:—

1. Macintosh and Pratt, *The Essentials of General Anaesthesia*.
2. Nosworthy's *Anaesthesia*.
3. Minnitt's *Ross and Fairley's Anaesthesia*.
4. Hewer, *Recent Advances in Anaesthesia and Analgesia*.

show the effort syndrome complex. It is now the rule in the E.M.S. that all cases with this diagnosis should be examined by a psychiatrist, and so far no report, as far as we know, has been published giving the results of these special examinations.

So far as our experience goes in this country, it should be stressed that it is quite useless making a man fit temporarily and returning him to service, only to find later that he is unable to fulfil his obligations and has to be discharged. Nevertheless, the problem is too big not to be tackled, and it does seem that one of the services rendered by the Ministry of Health and the Emergency Medical Service is the determination to deal with it and, so far as it is possible, to return such men as are capable to their duty.

ERRATUM

In "Practicalities: Number 1," page 117, line 10, in the July issue of the POST-GRADUATE MEDICAL JOURNAL an unfortunate typist's error was inadvertently passed for press. The passage should read:

"*Scopolamine* is the other drug used, in doses of 1/150th to 1/75th of a grain."

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