

## **Annotations on anaesthetics / by Samuel Osborn.**

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With the Author's kind regards

1790

ANNOTATIONS

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ON

ANÆSTHETICS.

BY

SAMUEL OSBORN, F.R.C.S.,

CHLOROFORMIST TO ST. THOMAS'S HOSPITAL.

(Reprinted from 'St. Thomas's Hospital Reports,' Vols. X and XI.)

SECOND EDITION.

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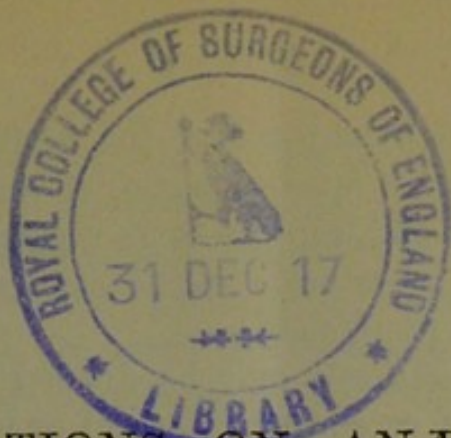
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## ANNOTATIONS ON ANÆSTHETICS.

BY SAMUEL OSBORN, F.R.C.S.,  
CHLOROFORMIST TO ST. THOMAS'S HOSPITAL.

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HAVING administered the anæsthetics at this hospital for some time, I have been asked to give my experience as to what I consider to be the best and safest mode of administration, and also to relate any interesting points which have been connected with that administration.

The three anæsthetics in general use are, nitrous oxide gas, ether, and chloroform, arranged in their order of strength, it being necessary to employ one or other according to the length or variety of operation, or age of patient.

Ethidene dichloride I have had no experience of. The variability of its composition is the great objection to its use, and it is on this account that I prefer to use ether.

Nitrous oxide gas is used principally for dental operations, where the extraction of teeth and such operations of short duration can be performed within a few minutes, for a prolonged use of this anæsthetic is dangerous, and therefore not applicable to any operation of magnitude, or rather of long duration, the two being almost identical.

As a rule, chloroform is administered to children under five years of age, and to adults above sixty; ether to all persons intermediate between those ages. The chief reason for which is this, that ether is given in all possible cases because of its undoubted greater safety. Ether, moreover, causes an increase of the heart's action, whereas chloroform decreases the same.

Chloroform is administered to old people because the inhala-



tion of ether produces hyperæmia of the bronchial passages to so great an extent that a fatal termination is not unfrequently the consequence. In children the same remark applies, but in reality they take any anæsthetic so remarkably well that either may be used without preference.

The process of anæsthesia may be divided in three stages, the first being that of cerebral excitement or loss of consciousness, the second accompanied by loss of sensibility, and the third by loss of motion. Beyond this it is not necessary to go, the final stage being one of total paralysis of all nerve centres. Generally speaking, the second stage is sufficiently profound for most operations. Instances where the third stage is essentially necessary will be described under the heading of administration in special cases.

Preparation prior to the giving of anæsthetics may be divided into ordinary and special preparation.

In ordinary preparation, no food should be partaken of for four hours previous to the giving of the anæsthetic, and the food then taken should be finely minced or in a liquid form, so that digestion may be thoroughly completed and the stomach empty. If this is not carried out more or less sickness is the consequence.

Patients prior to operation are in a high state of nervous excitement, and the function of digestion is consequently retarded, and so, by having the food minced, digestion is completed more rapidly.

Special preparation is called for in patients weakened by long suffering, such as those affected with cancer, long-standing cases of necrosis, and who may be characterised by the general term anæmic. These are the cases in which anæsthetics must be given with extreme caution, for from amongst these are usually to be found the fatal cases. A previous course of the most nutritious diet, accompanied by the administration of tonics, or, in other words, a feeding up prior to operation, must be resorted to.

In some patients where anæsthetics have been taken badly on a former occasion, small doses of ether and chloroform taken internally have been recommended with a view of getting the constitution accustomed to these drugs.

If chloroform is to be administered, brandy-and-water may



be given beforehand, but no alcohol of any description should be given before the inhalation of ether.

In some cases it is found necessary to give an enema of egg-and-brandy during the operation, for when the patient is under the influence of an anæsthetic, the passage of fluid by the mouth is attended with danger.

When it is necessary to have a patient insensible during an operation, *always have the anæsthetic given by some one who is in the constant habit of administering it, and who will attend to that solely.*

The patient, having been prepared, should be placed upon his back on the operating table, with the head slightly raised and all constriction by tight garments removed from the neck, chest, and abdomen. False teeth should be removed, and patients always asked prior to the commencement of administering the anæsthetic whether they have done so, as cases have occurred where, by some mishap, the teeth have become detached, and falling into the larynx have occasioned fears of asphyxia.

The head of the patient should be kept on a level with the body or on a gradually inclined plane, not doubled forwards by too great a number of pillows under the head, for by so doing curves are made in the windpipe, but let the exit from the lungs to the mouth be in one straight line.

The warmth of the body should be kept up by being covered with a blanket, as in these days, when operations are mostly performed under the carbolic spray, the condensation of the steam occasions both damp and cold. Also the breathing of the patient should not be interfered with by the carbolic spray more than can be helped, the ether being already a sufficient impediment to the breathing.

When commencing any anæsthetic, the first inhalations should be freely diluted with air, and the patient gradually brought under the influence; for large quantities suddenly placed over the patient's mouth occasion gasping and struggling for breath.

When food is in the stomach patients are longer in getting under the influence of the anæsthetic, but as soon as vomiting has taken place they speedily become insensible. Sickness, in the true sense of the term, or the bringing up of the contents



of the stomach, seldom occurs when patients have been properly prepared. In some cases, even when food is withheld as long as recommended, sickness occurs, on account of digestion not having taken place, this being due to nervous influence consequent upon the impending operation. Vomiting is more frequent after chloroform giving than after ether, its excessive sweetness being the cause. Ether in its evaporation produces much irritation of the buccal and bronchial glands, and consequently the secretion of the respiratory tract is largely increased, and flowing into the stomach is sooner or later ejected, or, collecting at the back of the fauces, has to be removed. If the patient's head be inclined to one side, so that the saliva can partially run away by the angle of the mouth, this is lessened, for according to the amount of saliva swallowed will be the amount of frothy vomit to be afterwards ejected. Pallor of face frequently precedes vomiting, and may occasion some anxiety, the colour returning as the act of vomiting is consummated. The alternating contraction of the abdominal muscles is the principal sign of impending vomiting, and if the anæsthesia be slightly increased, this can be subdued.

To know when the patient is sufficiently under the influence of any anæsthetic for the operation to commence, the conjunctival surface should be touched with the tip of the finger, and if no reflex action takes place, shown by the contraction of the orbicularis palpebrarum muscle, a sufficient degree of insensibility has been produced. In certain cases, which will be subsequently mentioned, it is not necessary to have even so profound anæsthesia as the above. The corneal surface of conjunctiva is more sensitive than that covering the sclerotic; therefore, if the latter shows insensibility when touched the anæsthesia will be found sufficient for ordinary purposes; insensibility of the former being, of course, required for operations upon the eye itself. It must be borne in mind, however, that the conjunctival surface repeatedly touched by the finger eventually loses its sensibility. This fact must be borne in mind by the chloroformist, and first one eye and then the other be touched, or a false impression that the patient is thoroughly anæsthetised may be conveyed. Paralysis affecting one side of the body may also occasion loss of sensibility of one conjunctival surface.

Dilatation of the pupils is a sign of the anæsthetic having



been pushed to a sufficient extent, and the inhaler should be immediately removed from the face.

Flaccidity of the limbs is no sign of cutaneous insensibility.

When the patient is fully under the influence of any anæsthetic he should not be moved about more than is possible.

The skin is undoubtedly the most sensitive part of the body, and much more so than the deeper structures or internal parts. The primary incision and the final passing of the sutures being more painful than the sawing of bone or handling of intestine, it behoves the chloroformist to have complete anæsthesia at the two extremes of an operation. This deficiency of sensibility in handling intestine is frequently noticeable in the operation of ovariectomy. An exception to this indifference of internal parts is seen in the washing out of the bladder after lithotomy or in the operation of lithotrity, both of which are extremely painful.

Protoxide of nitrogen, or nitrous oxide, or laughing gas (Messrs. C. Barth & Co.), is given by Clover's combined inhaler, which I shall later on speak of when describing the inhalation of ether. One minute is about the time occupied in producing insensibility with nitrous-oxide gas, or after three stertorous inspirations have taken place the patient will be found in a condition fit for operation.

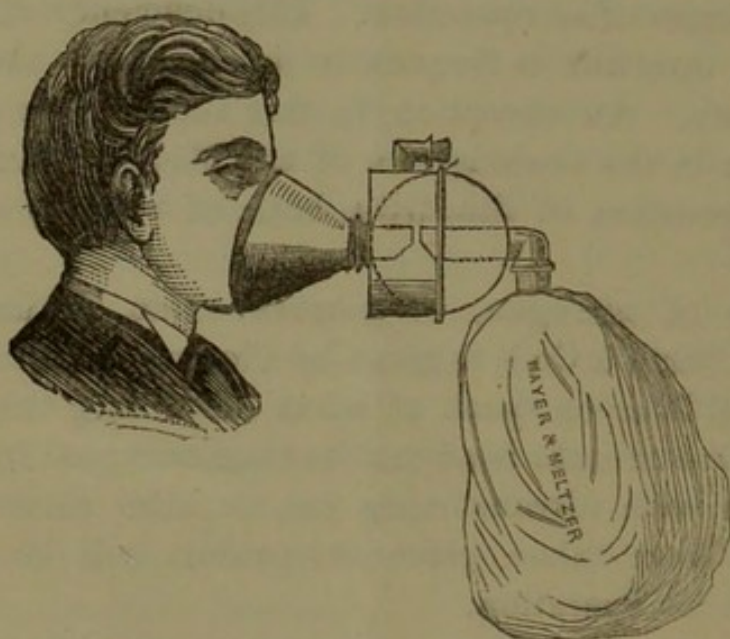
Nitrous-oxide gas produces great congestion of the vessels of the face and head generally, shown by the lividity of the countenance, and also occasionally causes bleeding from the nose or even hæmoptysis. Therefore, in a case of severe disease of the arterial system, such being operated upon for ligature of a vessel for the cure of aneurism, I should not administer gas prior to the giving of ether.

Chloroform (prepared with methylated spirit, and manufactured by Messrs. Wright, Layman, and Umney) should be largely mixed with air, and for this reason it is best administered on a piece of lint folded into a cone to fit over the nose and mouth, whereby a free admixture of air is allowed. When, in January, 1876, I communicated to the 'Brit. Med. Journ.' the mode of administering chloroform at St. Thomas's Hospital, I then stated that Millikin's modification of Snow's inhaler was the one in general use. This inhaler I used for a long time and was well satisfied with it, but I consider the administration of



chloroform on lint to be far safer, as a sponge holds too large a body of chloroform, and the quantity placed in the instrument must be accurately measured.

Ether is best given with Mr. Clover's portable regulating inhaler as manufactured by Messrs. Mayer and Meltzer, of 71, Great Portland Street. Having used this apparatus for some time I can confidently recommend it as being in my opinion by far the best, both as regards safety and comfort of the patient. It also consumes less ether. It is undoubtedly the least disagreeable to the patient, for any one having experienced



a trial with this inhaler and another, has always given the preference to the one in question. The reason lies in the fact that the inhalation of their own expired air is gradually and imperceptibly changed to one heavily charged with ether, whereas other forms of apparatus necessitate a large volume of ether to commence with, which, after having been poured upon the sponge, in its evaporation lessens in degree instead of increasing in force. The sensation of the inhalation of ether to many patients is that "of its running down their throats."

When ether (sp. gr. .720, manufactured by Messrs. Burgoyne, Burbridges & Co., of Coleman Street) is to be given by Clover's portable regulating inhaler, two ounces of ether—this amount being equal to the contents of the small tin porringer placed in each box—will be found sufficient to commence with. For if the patient struggle, a larger amount will overflow and allow of the liquid ether escaping into the inhaling



tube. After the lapse of ten to fifteen minutes the amount may be replenished by another half porringer full, and later on, if the operation be a long one, by another half porringer; but four ounces will generally be found sufficient for the longest operation. Should this amount not be used, the cylinder should be thoroughly emptied and refilled prior to the commencement of each operation. Care must be taken that the sides of the india-rubber bag are not adherent to one another at the insertion of the cylinder, for without the air passes freely to and fro from the bag the patient is longer in coming under the influence.

Ether of  $\cdot 720$  sp. gr. is better than  $\cdot 735$  as it combines better with chloroform and has less tendency to produce hyperæmia of the bronchial passages. Four parts of ether to one of chloroform is a very useful combination for eye or rectal operations, which require more profound anæsthesia. An improvised inhaler may be well contrived out of an inverted soda-water glass, in the bottom of which is placed a sponge covered by a napkin; the latter, coming over the rim of the glass, is folded backwards on the outside.

Persons of great strength, also heavy drinkers, take a larger amount of the anæsthetic to produce unconsciousness than others, therefore no definite statement of the amount required can be made. To chloroformists of short experience the stage of excitability is generally an anxious one; the patient is not thoroughly cognisant of what he is doing, and may refuse to have any more of the anæsthetic, or to have the operation performed at all. If this occurs, the patient must be forcibly restrained, and the anæsthetic pushed. This is, of course, more difficult in private administrations, but must nevertheless be done, the patient not being responsible for statements made after the anæsthetic has been once commenced.

It is well to throw a towel over the upper part of the face and head of the patient, to effectually prevent any entrance of air; it also necessitates the patient keeping his eyes closed, and is useful at the same time for removing from the mouth the saliva which is secreted in so large an amount by the inhalation of ether. Thus administered, the discomfort and danger of taking anæsthetics is, I believe, reduced to the lowest minimum; for, with one hand always on the pulse and



with an eye always on the respiration, any alteration in one or the other is at once taken notice of. But *neither ether nor any other anæsthetic is absolutely safe*. The inhaler should be occasionally raised as any blueness of the face, with lividity of the lips or pallor of the face, are premonitory signs which the chloroformist must take into account, and regulate the administration accordingly.

Clover's gas and ether inhaler (Mayer and Metzler) has become now the favourite apparatus for the administration of anæsthetics in several of the London hospitals. Its mechanism being so constructed that it lies in the power of the administrator to give first nitrous-oxide gas alone, then a combination of gas and ether, and finally ether alone.

The advantage of quieting a patient preparatory to the giving of ether, by the administration of a few inspirations of nitrous-oxide gas, is so very slight, that the usefulness of this inhaler is seriously counter-balanced by the increased cost of the instrument and its greater cumbersomeness, compared with Clover's portable regulating inhaler. Another advantage stated in its favour is that no ether is wasted, it being unnecessary to empty the cylinder after each operation, but only to close the stop-cock. But comparing the small amount of ether now required by either of Clover's inhalers in comparison to the large amount *wasted* by the use of other apparatus, this need hardly be mentioned, and taking into consideration the cost of nitrous-oxide gas, the expense of the administration far exceeds the saving in ether. Another point in favour of the portable inhaler is the larger graduated scale for the regulation of the volume of ether to be administered.

An objection I have heard raised against Clover's apparatus is, that there is necessarily a certain amount of carbonic acid poisoning. Such is undoubtedly the case, but the success of his inhalers is quite sufficient to override this objection.

Other instruments for administering ether may be used, amongst the best being the ordinary cone of leather with a sponge inside, or Mr. Ormsby's inhaler, but that form of apparatus is the best which one is in the habit of using most frequently.

Whilst speaking of caution, great objection should be made to the administration of anæsthetics in the wards, as frequently



there is more difficulty in bringing the patients round. Whether this is due solely to their being unprepared, or due to imperfect ventilation, I cannot say; it has besides a depressing effect upon the other patients.

Chloroformists should not administer anæsthetics for too long a time at one sitting, for the administrator after giving anæsthetics for two or three hours consecutively, becomes somewhat anæsthetised himself and lacks that amount of vigilance which he had at the commencement, and ought to have throughout the whole of the administration. This is more especially the case when open inhalers are used. There is in addition great mental strain to the administrator from the anxiety and constant watchfulness entailed.

How long does it take to get a patient under the influence of an anæsthetic?

Nitrous-oxide gas will produce insensibility in one minute, but the effect being so transitory it can only be given for operations which can be completed in five minutes. Ether given by any open inhaler will not produce insensibility under eight or ten minutes; when given by Clover's portable inhaler, insensibility can be produced in from three to four minutes, and when preceded by a few inhalations of nitrous-oxide gas in from two to three minutes. But if nitrous oxide is not used the space of time occupied in producing insensibility is the same in both of Clover's apparatus. The time occupied, however, and by any apparatus, is always shorter in the warm weather, and a longer time is required for persons of strong constitution or accustomed to much alcohol. The amount of the anæsthetic required varying in a corresponding degree to the vital capacity of the patient.

Chloroform, when used in children and old people, produces insensibility in about two minutes or rather less.

How long may a patient be kept continuously under the influence of an anæsthetic?

Nitrous-oxide gas, as was previously mentioned, can only be given for a space of one minute, therefore ether or chloroform is used when duration is of consequence, and of the two I undoubtedly give the preference to ether on account of its being a vascular stimulant. Two hours and fifteen minutes is the longest time that I have given ether continuously, but even



then after discontinuing the application of the mouth-piece the patient was, of course, considerably longer in a state of unconsciousness, although not entirely insensible, as shown by touching the conjunctiva. In cases where anæsthesia is kept up for a long period, shock, partially due to the anæsthetic and partially due to the operation, is developed to a greater or less extent, shown by coldness of the surface of the body and extreme prostration. This is best combated by the application of a warm-water bottle to the cardiac region, and subsequently, when the operation is completed, by an egg-and-brandy enema.

Lastly, one word of advice, and that is, *never keep a patient under the influence of any anæsthetic longer than is absolutely necessary.* The operator not unfrequently continues his demonstration after the patient is fully under the influence of the anæsthetic and ready for operation, or, led away by the interest of his case, or the remarks of bystanders, enters into a dissertation in the middle of the operation, or before it is thoroughly completed.

With reference to the treatment of patients after the administration of anæsthetics, no food should be given for the first twelve or fourteen hours after the operation, but soda-water and milk, or other cold or iced drinks may be taken. Patients should not be roused, but allowed to gradually sleep off the effects of the anæsthetic, a current of fresh air being allowed to freely circulate through the room.

A previous successful administration of any anæsthetic should not be taken as a criterion to its safety on a future occasion. For although a previous administration may be a proof of the patient taking any anæsthetic badly, the converse does not hold good, and a patient having previously taken anæsthetics well may, as the result of a protracted illness, take the same very badly on another occasion. Valvular disease of the heart, shown by cardiac murmurs, need be no hindrance to the administration of ether, a fatty heart which is not diagnosable by any auscultatory signs being the form of heart disease which is the most dangerous.

Feebleness of pulse, also, should not deter one from the administration of ether, for although a very small amount of ether will be required to produce insensibility, the pulse will, under its influence, generally improve, and should it not do so,



the patient may with care be carried through the operation. This was noticeably the case in a patient almost moribund operated upon by Mr. Francis Mason for ovariectomy.

In giving anæsthetics for cases operated upon with the aid of Esmarch's bandage it will never be found necessary to produce very intense anæsthesia, not even that amounting to insensibility of conjunctival surface, for the constriction by the tourniquet so deadens the limb that sensibility is blunted. Also in patients suffering from shock the amount of anæsthetic required is less in amount than in ordinary cases, on account of the nervous sensibility being already partially paralysed.

The administration of anæsthetics for eye operations is more dangerous than that for other operations, the reason being that very deep anæsthesia has to be produced before the conjunctiva will remain insensible throughout the whole of the operation. In the removal of cataract, where coughing or struggling at the critical moment of extraction of the lens may spoil the whole operation, it is better to give ether first, and subsequently follow it up with chloroform.

The question whether anæsthetics should be given at all in eye operations is a debatable one, the vomiting from chloroform and the vascular turgescence from ether being the objections to their use. I consider that anæsthetics are always necessary for ophthalmic operations upon children, but never for adults, except in cases of enucleation and for operations upon the eyelids.

In the reduction of dislocations the administration of chloroform is always required. Ether may be primarily given, and subsequently chloroform, but the former alone does not produce a sufficiently prolonged paralysis of the muscular system for the accomplishment of the reduction.

The administration of anæsthetics for cases to be operated upon for the cure of cleft palate are always troublesome, and it is usually found that chloroform for these cases is best. Ether causes not only an increased secretion of saliva, but also increased vascularity, and the mouth being wide open, patients return to consciousness sooner than when chloroform is given. Another difficulty in these cases is the insertion of the mouth-gag, the breathing on its insertion becomes immediately impeded by the tongue being thrown backward at the



same time as the lower jaw is depressed. A good mouth-gag is much wanted, its requirements being to keep the mouth open, to draw the tongue forwards, and to push the lower jaw forwards. The one that most fully meets these requirements is described in the 'London Medical Record' (April 15th, 1881).

The use of chloroform is necessary for all operations upon the interior of the mouth (removal of tongue, &c.), for the same reasons as mentioned when speaking of cleft palate. When the mouth has to be kept open for some time, I frequently use Clover's chloroform bellows manufactured by Messrs. Coxeter & Son, whereby a mixture of chloroform and air is blown down the back of the throat.

Shock may kill a patient whilst under the influence of an anæsthetic, death resulting, not from the effects of the anæsthetic, but solely from shock. For cases of sudden death have occurred on the operating table prior to the administration of any anæsthetic, and to which the fatal termination would have been attributed had any anæsthetic been given. A lowering of the pulse has been said to follow excision of the testicle; I have never experienced such a result, although I believe it to be quite possible in some constitutions, the more highly cultivated being the more sensitive. In more serious operations, such as the removal of a limb, &c., I have undoubtedly noticed an alteration in the pulse, and from the lowering of the pulse on the one hand, to a fatal syncope on the other, is only a question of degree. Shock was well exemplified in a case of amputation at the hip-joint operated upon under ether by Mr. Croft. In this case the pulse stopped immediately the pressure was taken off the abdominal aorta, and not when the limb was amputated. The remaining leg was immediately bandaged and the head being lowered the heart again recommenced its action.

Some peculiarities occasionally occur during the administration which are interesting and should be known to the administrator. The inhalation of ether frequently produces exanthematous patches on the face and upper parts of the body, and I have known a case to be removed from the operating table under the impression that the patient was suffering from one of the eruptive fevers and unfit for operation. The origin of this phenomenon is to be found in paralysis of the vaso-motor nerves by the anæsthetic. I should mention also that



if any skin eruption is present it is made by the same cause more prominent.

A false impression when feeling the pulse may be very easily conveyed, as in a case I remember where the patient, lying upon the arm, compressed the main artery and stopped the pulse greatly to the consternation of the anæsthetist. The case was one of removal of a tumour from the right scapula, the radial artery being abnormally situated and absent on the right side; the patient was suddenly brought over on to the left side for the convenience of the operator, and the left radial was stopped by compression from the weight of the body.

Elevation of the jaw, by pushing the angle of one or both sides forwards, acts upon the tongue and gives freer respiration. The converse also is easily seen, as I have frequently demonstrated to the students, that by pushing the lower jaw backwards, the breathing can be immediately impeded or altogether arrested. As it is difficult to raise the jaw, both hands being occupied, one holding the pulse and the other the inhaler, I have devised an underchin support which I call jaw compasses, being of that configuration, for the purpose of going behind the angles of the jaw and drawing them forwards and upwards. The administration by this procedure being considerably assisted. A circular india-rubber band, similar to that used for keeping letters together, passed over the nose-piece of the inhaler and under the symphysis of the chin, will also answer the same purpose.

Death may occur from cerebral hæmorrhage, the diseased blood-vessels of the brain giving way under the increased blood pressure.

Death may also occur from failure of the heart's action (syncope) or from failure of respiration (asphyxia), the former being the more frequent cause. Impending symptoms of the former are by far the more serious of the two, for the heart's action once having stopped it may never be resumed, whereas respiration may be artificially carried on. I have seen one death occur during the inhalation of ether. The case was one under the care of Mr. MacCormac, in a man of forty-five years of age, being operated upon for malignant growth of the rectum. The patient had been previously prepared, and after having been placed in the position for



lithotomy, and the sphincter ani forcibly split, the heart's action suddenly stopped and was never resumed. The face was at first pallid, but subsequently became turgid. Ether had been given for twenty minutes, seventeen drachms being the amount used. He became quickly under the influence, the first stage of excitability being hardly at all shown. No vomiting occurred. Every means were tried to resuscitate the patient, but without avail. The post mortem showed œdema of the right lung, and both lungs greatly adherent to the pleural surface. The smell of ether was very noticeable in making sections of the lung. Heart healthy and valves perfect.

The post-mortem appearances of fatal cases show that hepatisation of the lungs with adhesions to the pleural surface, or a fatty heart, or one having adhesions to the pericardium, are more especially antagonistic to successful anæsthesia.

The element of danger is more often present in rectal operations. Why I cannot say; but undoubtedly I have had, and others also, more anxiety over the administration of anæsthetics in these cases. Whether it arises from the fact that *all bloodless operations are dangerous in plethoric individuals*, or whether diseases of the bowel are unusually depressing, and that the highly sensitiveness of the rectum requires a greater degree of anæsthesia, I am not in a position to say, but the fact remains the same.

Ether usually causes first a failure in the respiration, whereas chloroform causes first a failure in the pulse.

Ether may be given as an accelerator of the heart's action; this was well shown in a little child being operated upon by Mr. Sydney Jones. The child's pulse failed three or four times under the influence of chloroform, and necessitated its discontinuance. Ether being substituted, the heart regained its strength, and the operation was safely conducted. I have since, in other cases, administered ether as a stimulant to the heart when symptoms of its decreasing power have occasioned alarm.

In cases of threatening asphyxia never trust solely to thrusting the lower jaw forwards, but forcibly draw the tongue out of the mouth by forceps. Artificial respiration, after Sylvester's method, must be immediately commenced and carried on until



all hopes of recovery are at an end. Whether air enters the lung can be determined by the more healthy appearance of the face, as well as by hearing the air passing freely to and fro. Œdema, or spasm of the glottis, or obstruction in the trachea, must be met by immediate tracheotomy, and patients have been frequently saved thereby. From observations lately made by Dr. Howard ('Lancet,' May 22nd), it is probable that traction upon the tongue has no effect in raising the epiglottis; therefore, if traction upon the tongue does not relieve the threatening asphyxia, by allowing a freer current of air to enter the lungs, tracheotomy must be immediately performed. The venous congestion is also relieved by opening one of the external jugular veins, and at the same time, as a good current of fresh air is allowed to reach the patient, the skin may be stimulated by flicking the chest with the wet corner of a towel.

Such is the treatment of threatening asphyxia, the diagnosis of which from one of syncope is of the greatest importance, as the remedies applicable to the latter materially increase the symptoms of the former.

In cases of stoppage of the heart's action, in addition to percussion of the heart with the wetted end of a towel, artificial respiration must be immediately commenced, because the stoppage of both factors would make up the whole fatality. Inversion of the body should be always tried if stoppage of the heart's action occur. The head being lowered and the legs elevated the blood is sent to the upper part of the body; a similar effect is produced but less quickly by the application of bandages up the legs. The latter may be adopted with great advantage in operation about to be performed upon anæmic patients. Inversion of the body should be maintained until the heart's action is resumed, for success has been found to follow this procedure.

An intermittent action of the galvanic current may be applied over the region of the heart or subclavian triangle, and the vapour of ammonia or, better still, ether, applied to the nostrils. As a *dernier ressort* electro-needle puncture of the heart may be tried, but its success is questionable.

In conclusion, I would impress upon all surgeons these main points in connection with the administration of anæsthetics:



1. Always have the anæsthetic given by some one who is in the constant habit of administering it, and who will attend to that solely.
2. Never administer anæsthetics unless absolutely necessary.
3. Neither ether nor any other anæsthetic is absolutely safe.
4. Never keep a patient under the influence of any anæsthetic longer than is absolutely necessary.

10, MADDOX STREET, W.