THE VAPOURS CHIEFLY USED FOR ANÆSTHETIC INHALATIONS, AND THEIR SAFE EMPLOYMENT.

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In adding my quota to this discussion on anæsthetics, I desire to give my own retrospective experiences, chiefly confining myself to that portion of them that bears upon their safe administration.

My experience has been almost solely confined to chloroform, the A. C. E. mixture, nitrous oxide gas, and ether; of which alone I shall speak, except to remark that I employed the bichloride of methylene some years ago for small cases, but that I failed to find that it possessed particular advantages, and consequently ceased to use it.

At Guy's Hospital, about twenty years since, chloroform was universally employed in all cases. I consequently grew up with a strong prejudice in its favour, which, however, the subsequent history of anæsthetics has now greatly modified. In fact, I have come quite to discard chloroform, except for infants, and in some rare cases to be presently mentioned. Chloroform was then given at Guy's, as at other metropolitan hospitals, by being dropped in doubtful quantities on lint or flannel, free, or fixed over wire, or inside a metal face-piece. I was a witness of four deaths from this primitive and haphazard method of administering the vapour.

Another much superior way of giving chloroform came at that time into vogue—that, namely, by Clover's bag, in which a measured quantity of air was mixed with $\frac{3}{4}$ or $\frac{4}{5}$ per cent. of chloroform-vapour before the operation. The patient could, of course, breathe no more than the proportion of chloroform put into the bag, which was practically found to be safe; whilst the quantity administered might be any less percentage, according to the distance to which the air-valve was left open or closed. Of all the methods of administering chloroform, that seems to be the most nearly perfect. I introduced the bag at Guy's Hospital when I was house-surgeon in 1865, and employed it for years subsequently, probably altogether in more than one thousand cases; and I can only remember one case, in which, during its course, I was led to doubt the issue of the anæsthesia. That was a case near Dorchester, in 1868. The patient was an anæmic woman; and Mr. John Hilton had nearly removed a cancerous breast, when the patient became extremely faint, and both Mr. Hilton and myself were, for two or three minutes, doubtful if she would survive. Happily, the pulse never quite ceased, and recovery quickly ensued. Still, the case shook my belief in the entire safety of the chloroform, even when given by the bag-arrangement; and I believe the bag has been, for eight or ten years past, seldom used by any one in England. Perhaps its clumsiness chiefly caused its non-survival; whilst other safer anæsthetics have also gradually ousted chloroform from its erewhile easy supremacy in Britain. Strange, indeed, is it, then, to find that M. Paul Bert, last winter, again advocated a similar method of administering chloroform as quite a novel procedure, and that the *Times* gave prominence to his views by publishing a paragraph thereon, though our accomplished fellow-countryman the late Mr. Clover, had a priority of at least twenty years in using this now discarded contrivance. M. Bert should be further reminded that the six per cent. of chloroform vapour which he recommends is probably a dangerous dose, inasmuch as it has been experimentally found to be such to dogs by the Scientific Committee of the Royal Medical and Chirurgical Society, which reported in 1864; and, as dogs are anæsthetised by about the same quantity of chloroform-vapour as human beings, it is reasonable to suppose that the larger proportion (6 per cent.), which is fatal to the lower animal, might be lethal also to man. Perhaps some such fact as this partly explains the want of safety that attends the inaccurate giving of chloroform on lint, and in other similar ways.

One great objection to the use of all complicated apparatus, such as Clover's chloroform bag, or Clover's gas and ether apparatus, in hospitals and other public institutions, is the probability that more than one administrator may be called upon to use them. One person alone should be responsible for their well-being; and experience shows that they are apt to go wrong in the hands of office-bearers, such as house-surgeons and dressers, who are constantly changing.

Next to Clover's bag, Junker's apparatus seems to be the best yet introduced for chloroform-inhalation. I have only used it for lengthy operations about the nose, mouth, or throat (other than cases of extraction of teeth), when the patient has been anæsthetised by ether or the A. C. E. mixture, and when those agents cannot be regularly continued, owing to the fact that the surgeon requires the frequent removal

of the inhaler from the face for his manipulations. Then Junker's apparatus, with the small tube to deliver the chloroform-vapour, by occasional whiffs, into the pharynx, through the nostril or mouth, whichever may be disengaged, can be conveniently used for maintaining the narcosis.

The grave objection to the use of chloroform appears to arise from the fact that it acts as a depressant of the heart's action. And there is probably a certain element of truth in the dictum, that all the volatile compounds containing chlorine are somewhat unsafe for anæsthetic purposes. This characteristic necessitates certain special precautions during their administration. The patient should be kept nearly in the prone position, that the enfeebled heart may have the least possible amount of work to do during the operation, and that the brain may receive an adequate blood-supply. Indeed, as some memorable cases have exemplified, the mere elevation of the legs, and consequent relative lowering of the head, in the case of a patient apparently dead from chloroform-syncope, has been enough to cause the brain again to act, and the imperilled life to be restored. To counteract the tendency to depression, it is as well, possibly, to give a tablespoonful of brandy in some water, ten minutes before the operation. If any sign of failure of pulse or of faintness arise, the inhaler must be at once removed, the head lowered, the tongue pulled forward to allow complete freedom of respiration, mucus and vomit removed from the throat; the feet and legs raised by an assistant, if there be pallor of the face; the chest flocked with a wet towel, to excite respiration; and some volatile cardiac excitant immediately applied before the mouth and nostrils. Ammonia, in one of its forms; ether, a whiff of which may be given on a handkerchief; or, best of all, nitrite of amyl, should be instantly used; recently, I have always had a box of capsules of amyl-nitrite in my pocket when giving chloroform. Cases of chloroform-syncope, directly relieved by ether or by amyl-nitrite, are now on record. These remedies, however, are useless, if respirations have quite ceased. Such measures, combined with steady perseverance in artificial respiration, which should be commenced at the very first sign of real danger from failure of heart-pulse, or breathing, together with the application of electrical stimuli to the phrenic nerves and diaphragm, if an electric battery be at hand and in working order (which is rarely the case when it is wanted), will often be crowned with success, though the case may at first appear almost hopeless.

But, with all the caution possible, chloroform remains an unsafe agent for anæsthetic purposes, from its qualities as a cardiac depressor, and should only be used when other safer remedies cannot be employed, or their use is contraindicated. It appears that, of late years, the mortality from anæsthetics has been steadily decreasing in England. This change for the better is probably due to the fact that other anæsthetics, particularly nitrous oxide gas, ether, and the A. C. E. mixture, have been gradually supplanting chloroform in professional esteem.

Its place has been chiefly taken by the A. C. E. mixture, which is equally portable with chloroform, and can be used in almost all the cases in which an anæsthetic is required. For obstetric operations, and in dental cases in children, I generally use it. In fact, armed with a drop-bottle filled with A. C. E., and with a Skinner's inhaler, an anæsthetist is equal to most of the emergencies of his practice, and probably possesses an agent more nearly universally capable of application, with almost complete safety, than any other anæsthetic compound. The chief objection to it, perhaps, is that it is somewhat slow in producing entire anæsthesia. Wherever practicable, it should be used rather than chloroform. The exhilarating effects of the three parts of ether seem to more than antagonise the depressing effects of the two parts of chloroform, so that scarcely any deaths, if any, have been reported from its use. Should syncope occur during its administration, the same measures as are recommended for such an emergency from chloroform should be adopted.

But, in spite of this strong testimony in favour of A. C. E., I am yet of opinion that, of all the compounds hitherto employed for the production of anæsthesia, none other is equal in safety to nitrous oxide gas for short operations, or to the gas combined with ether, given through Clover's apparatus, for longer cases. One advantage of having the ether at hand in the apparatus, ready for use after nitrous oxide is that, if, in the course of an operation which beforehand seemed likely to require only gas, the surgeon should find it necessary to prolong his procedures, the anæsthetist can at once assist by admitting the ether vapour to the inhaler. When nitrous oxide is used alone, the mere removal of the inhaler suffices to re-admit air to the lungs, to make the countenance red once more, and to permit the brain quickly to resume its functions. In fact, the gas is such a safe anæsthetic that, although it is much used by dentists, scarcely any deaths have been recorded as due to the nitrous oxide alone, without some other misadventure to explain the fatal result. The gas being almost tasteless, the patient breathes it freely, and without hesitation.

The inhaler must fit the face accurately, and permit no admixture with air through any chink; otherwise the patient may grow noisy, and be then only with difficulty anaesthetised. The rapid recovery which occurs when the gas is removed is, of course, an advantage when the operation is very short, as for dental cases; but, for longer operations, it is a distinct disadvantage.

It is in these latter instances, that the benefit of being able to continue the operation under ether is manifest.

As regards the administration of ether, some such apparatus as that of Clover appears to be far superior to the ordinary method employed in America, in which the ether is poured on a sponge stuffed into a felt cone, and fitted to the face. It is possible, with Clover's apparatus, to administer the ether at first in such extreme dilution, and so gradually to increase the dosage, that (without using any nitrous oxide at all) the patient dozes off into complete anaesthesia without manifesting any sign of dislike to the process.

In the usual way of giving the gas first, it is a mistake to turn on the ether tap too soon; if the patient be only semi-conscious, he is apt to notice the change, and to struggle for freedom.

Ether excites the heart and exhilarates the patient, in which fact probably lies much of its safety for anæsthetic purposes; and this property, as opposed to the depressing qualities of chloroform, we should at all times remember. But ether, at the same time, causes an abundant secretion of mucus from the pharynx and air-passages, rendering it an unsuitable agent when the patient has been the subject of old bronchitis. When gas and ether are used, the patient beginning with the tasteless gas scarcely recognises the fact that the process has begun, and goes on afterwards from nitrous-oxide anaesthesia, in which, of course, the larynx, as well as other parts, have lost acute sensitiveness, to ether-narcosis, without the irritation of the larynx and the coughing that are frequently so troublesome when ether is used, except in the most diluted condition, at the beginning. This is, I believe, one of the chief advantages of the gas and ether combination.

It has, happily, never been my lot to witness a death from gas or ether, nor to see more dangerous symptoms than blueness of the skin and temporary suspension of the respiratory process, for the relief of which the removal of the inhaler, together with the clearing out of mucus and vomit from the mouth and throat, have always sufficed. I have found the pulse, under all circumstances, remain strong and steady, although the respirations might be feeble.

Should dyspnoea remain really urgent, the pulling out of the tongue, the immediate application of cold to the front of the chest and face, the partial elevation of the head and upper part of the body, the turning of the patient partly upon his face, so that mucus may continue to escape; and, lastly, a few forcible artificial respirations, so as to expel the compound from the lungs and to free the overburdened right side of the heart, should be tried. But if, with all these efforts, especially if perseverance have been made with artificial respiration, no signs of resuscitation be given, I should expect the case to be possibly more hopeless than one of apparent death from chloroform; for, the heart will have been overexcited, its right side is probably engorged, and the brain has been rendered functionless by the arrest within it of venous blood. Probably no drug, except, perhaps, nitrite of amyl, holds out, at this stage, if the heart have quite ceased to beat, any prospect of averting the fatal issue. But, fortunately, this consummation with ether is most rare. Generally, too, when real danger with ether occurs, the respirations cease before the heart-pulsations, in which case amyl would probably be useless.

With regard to the selection of an anæsthetic, I think that those who are about to use one should endeavour first to find whether some other drug than chloroform cannot be employed. As respects age, chloroform may be used, apparently, with almost complete safety, to young children, say, up to the age of 6 or 7 years; thence, up to the age of 16 or 18, I prefer the A. C. E. mixture. Above that age, nitrous oxide gas for short cases; and gas and ether for longer operations should be used in almost all cases. When, however, the patient is liable to bronchitis, the A. C. E. combination, or possibly chloroform, seems more suitable than ether alone. In tropical climates, too, where ether almost boils at the ordinary temperature, chloroform may be preferable. Again, in lengthy operations about the nose, mouth, or throat, as I said before, Junker's apparatus, with the small tube, is most useful. I believe it right to entertain almost a pious horror of chloroform for inhalation in the case of adults, and only to use it when other anæsthetic remedies seem inadvisable.

Certain general precautions should be adopted by the anæsthetist, whatever compound he may be using, of which the following are the chief.

1. The patient should have no meal (except in cases of extreme feebleness) for four hours beforehand, to avoid the tendency to vomiting. A little brandy or ammonia may be given with some water

fifteen minutes before the operation, if the patient be an adult, and chloroform be selected.

2. The anæsthetist should endeavour to reassure the patient by a kind, gentle manner, which may calm an agitated heart, and induce easy respiration.

3. No tight-fitting garment or band should be left around the chest or abdomen.

4. All artificial teeth must be removed from the mouth.

5. The anæsthetist should examine the heart-sounds and pulse before the operation. This precaution may seem superfluous in most instances, but in a few cases may put the administrator on extra guard.

6. The patient should be placed in the recumbent posture, with the head but slightly raised. This is particularly important when chloroform or any other cardiac depressor is used.

7. The anæsthetic should be applied in the manner most suitable to the vapour used, about which I have already sufficiently spoken under the heading of each drug that I have mentioned.

8. The surgeon should not commence his procedure before the patient is fully narcotised; not alone in severe operations, for many simple procedures, such as the reduction of dislocated joints and strangulated hernia, and the diagnosing of tumours of the abdomen and pelvis, require complete muscular relaxation for their successful attainment.

9. It is a golden rule never to give more of the anæsthetic than is necessary for the production of sufficient anaesthesia for the operation that has to be performed. Since every extra degree in anaesthesia is an advance along that road whose extreme goal is death, the patient should be taken no nearer the dreaded end than is quite requisite, as all the steps passed have to be retraced. Besides, as the gap separating the patient from death becomes lessened, it may easily arise that, in extreme narcosis, one extra and apparently trivial event, which in health would be quite inoperative to cause a fatal issue, may determine the patient's career.

10. Wherefore, lastly, as the work which the anæsthetist performs depends for its successful result on such a number of nicely balanced conditions, his whole attention, during the few minutes of his employment, should be concentrated upon the case. He must watch the respirations, the pulse, the countenance, and the general condition of the patient. He should not be observing attentively the steps of the surgeon's procedure, otherwise he may fail to notice the first sign of danger in the patient, and the life, for which he is chiefly responsible, may be jeopardised before it is recognised that it is in peril. Moreover, the anæsthetist may rely upon receiving more than full recompense for all his care in a decreased number of mischances, and a welcome table of good results.

ON THE TREATMENT OF INTRA-UTERINE DISEASE: WITH SPECIAL REFERENCE TO THE BEST MODE OF MAKING APPLICATIONS TO THE INTRA-UTERINE SURFACE.

Introduction to a Discussion in the Section of Obstetric Medicine at the Fifty-Second Annual Meeting of the British Medical Association.

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It is only within a comparatively recent period that any attempt has been made to treat affections of the mucous membrane lining the cavity of the uterus on the same principles as have been found efficacious in cases where that membrane is similarly affected when situated elsewhere in the body. Indeed, when such a course was first suggested, it was not alone opposed as being dangerous, but was, moreover, declared to be impossible, and ridiculed as absurd. Thus a writer in the *Edinburgh Medical Journal* for February 1872, when reviewing the first edition of my *Lectures on the Diseases Peculiar to Women*, in which I advocated the treatment of a granular condition of the intra-uterine mucous membrane by the application to it of fuming nitric acid, said, "Patients thoroughly treated in this manner will certainly have no more menorrhagia; they may be glad if they have even a uterine cavity left."

Yet, long before this paragraph was penned, surgeons had been in the habit of applying nitric acid freely to the mucous membrane of the rectum, when in a granular state, with the most satisfactory results, and it was well known that it produced only a very superficial slough; therefore, to talk of there being "no cavity left," after it had been applied to the uterus, showed great ignorance on the part of the reviewer.

Notwithstanding the opposition offered to the direct application of