ARTICLE III.—*On the Employment of Chloroform in Dental Surgery.*

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THE administration of chloroform in dental surgery is attended with some special difficulties, which lead to its employment being avoided in many cases where it might otherwise be of considerable service. In operations within the mouth, the inaccessible nature of the locality, the severe pain attending such operations, and the untoward complications apt to accompany the anæsthetic state, contribute in making the exhibition of this agent frequently unsatisfactory. Certain extra precautions are therefore here necessary, and certain rules must be followed to secure a prospect of success. And it should be recollected that failure in this instance is much more detrimental in every way than if anæsthesia were never attempted at all.

In exhibiting chloroform for such operations as tooth extraction, everything should be so arranged that the patient may be kept under its influence for as short a time as is compatible with the requirements of the case. The sooner the anæsthesia is produced after inhalation is commenced, and the sooner the patient can be relieved from its effects when they are no longer desirable, so much the better. With this view all preparatory measures should be made before commencing with the anæsthetic. The instruments likely to be required should be selected, and laid out in order, and covered by a napkin. The chair or couch to be used should be arranged so as to suit the operator's convenience. Any mere examination of the mouth or teeth should also be made at this time, and the services of one or two competent assistants secured. The presence of friends or relatives,—unless medical,—of the patient should as far as possible be discouraged. They seldom assist in any way, frequently keep the patient wakeful, and sometimes embarrass the operator.

Always bearing in mind that the part to be operated on should be placed so that the surgeon shall have the greatest possible facility for examination and manipulation, the most convenient and much the safest attitude for the patient is the recumbent or horizontal position. For this purpose a low couch or sofa raised at one end, and without a back, will be found most serviceable; the patient being laid in a semi-recumbent posture, with the head supported on the raised end of the couch, and the face turned towards the light. The dress about the throat and neck should be loose; the neck should in all cases be without any covering whatever in front, and any coverings on the chest should be so arranged that all the movements of respiration may be at once and easily observed.

In operations within the mouth it was, and to a less extent it

still continues customary to introduce a cork or some such substance between the teeth previous to and during the exhibition of the anæsthetic: such a practice is far worse than useless. The very first inhalations of chloroform produce in many patients a slight degree of irritation in the fauces, often promote an accumulation of fluid in the mouth, and generally excite a desire to swallow. This latter act cannot be accomplished so long as anything keeps the jaws apart; the patient eventually struggles to rid himself of the difficulty, his struggles are mistaken for mere cerebral excitement, and a contest takes place between the half-insensible patient and his attendants, probably with the result that the attempt to produce anæsthesia is in the end abandoned. Instead, then, of introducing any substance of this nature between the teeth, nothing of the kind should at this stage be attempted. The patient should be left the perfectly unconstrained power of deglutition, and the chloroform should be inhaled in an easy and placid manner through the nostrils. Any forced or rapid inspirations do little good, and sometimes give rise to difficulties, as they are almost always followed by a cessation for a time of the respiratory act altogether. This symptom above everything else is to be guarded against; and on anything like interruption to the regularity of the breathing being observed, the chloroform should be at once withdrawn.

In order that speedy insensibility may ensue, perfect silence should be maintained. The patient ought, if possible, to be without any apprehension that the anæsthetic is hazardous, or that no effect can be produced by it in his case, or that the operation will be commenced before a sufficient quantity has been inhaled. Wherever a patient is nervous or anxious about such matters, it will be found that much more time and a much larger quantity of chloroform will be required than would otherwise be the case. Another point of some importance is the frame of mind in which a patient comes under the influence of this anæsthetic. If an effort be made to go quietly to sleep, there is little chance of much struggling or involuntary restlessness. On the other hand, especially in the case of all minor operations, if a patient entertain the belief that under the influence of chloroform the conduct is necessarily outrageous, it seldom fails that such an idea is practically realized. Indeed, in not a few instances it would almost appear as if the patient had premeditated the display sometimes made during the exhibition of such agents; and in all cases it is advisable that he should be instructed to remain as quiet as possible so long as sensibility is retained. In this way, with a little effort on the patient's part, the whole operation may be rendered much more satisfactory both to himself and the surgeon.

The means of exhibiting the anæsthetic itself has been a subject of considerable discussion; and in dental surgery this is a point of some importance. Various forms of inhalers have from time to time been brought forward, each being by its own advocate described

as superior to all the others, and all of them as preferable to exhibiting such agents on a napkin or handkerchief. It must be kept in mind, however, that the less we have to attend to besides the patient the less risk is there of danger; whereas, if attention has to be bestowed on the working of an apparatus, complicated as these inhalers occasionally are, it necessarily interferes with that close watching of the patient which is in all cases absolutely essential. Much importance has been attached to the waste of chloroform resulting from the use of a napkin. A very little consideration, however, will show this to be a waste of the most trifling description, comparatively of no moment whatever, never in any case amounting to more than the value of a sixpence, and seldom to any appreciable amount at all. Again, it has been argued that the patient gets too much chloroform by using a napkin. To this it may briefly be replied, that this is the fault of those administering it. If the chloroform be properly managed, in all probability the same quantity will require to be inhaled to produce the same effect in a given time whatever apparatus be used, unless, indeed, its exhibition be frittered away in a repetition of very small quantities, when a great deal more will be inhaled with a much less satisfactory result, and that only after subjecting the patient to an uncalled for and inexpedient protraction of every stage of anæsthesia. Another circumstance rendering any extra complication in the "inhaler" objectionable, is the frequency with which the inhalation requires to be suspended and renewed. This especially applies to operations on the mouth and in its neighbourhood, as, for instance, in the extraction of a number of teeth at a time. Here the patient often becomes conscious during the operation, and requires an additional dose of the anæsthetic to be administered, while perhaps the position of the head and the condition of the mouth would render any special apparatus difficult to adjust, not to speak of the flow of blood rendering it dangerous. The simplest and the safest method of administration, then, is by using a napkin or handkerchief folded several times, so as to prevent the too sudden evaporation of the anæsthetic, and pouring upon it the chloroform in quantities not less than a dessertspoonful at a time, and renewing it as soon as the former supply has passed off. The napkin should be held at first about two inches from the patient's face, enjoining him to close the eyes so as to avoid the smarting otherwise apt to be occasioned. As the anæsthetic effects begin to appear, the napkin may be brought into closer proximity with the face, until at last it may even be applied in actual contact with the mouth and nose, and kept there, unless there be any contrary indication, until anæsthesia is complete. Instead of folding the napkin, it has been proposed to use a single layer placed over the mouth and nose, and to drop the chloroform upon this, keeping it constantly moistened with a small quantity of the anæsthetic. This method answers well in many cases where the patient is lying down, and not rest-

less or excitable, but it is attended with some difficulties when the semi-recumbent posture is adopted; and in the case of tooth-extraction, another drawback to this mode of administration exists in the apparent tendency to move the head about, as if in apprehension that the operation was about to be commenced. For simplicity, for safety, and for convenience in the facility of its withdrawal and reapplication, over and over again, there seems no method so well adapted for operations about the mouth as the napkin folded and used as already described.

The quantity of chloroform inhaled before perfect anæsthesia is induced varies very much in different patients. There is also a great difference in the degree of rapidity with which one patient in comparison with another will inhale a given amount of chloroform. Owing to these two circumstances, the time required to produce complete insensibility ranges among various patients from a period of a few seconds' duration, upwards, to cases where the inhalation requires to be kept up for five or ten minutes or more before a sufficient effect is obtained; and so far as my own experience goes, it is among the latter class of cases that vomiting and after-sickness most frequently occur. This is of some consequence where tooth-extraction is to be the operation performed, as expedition obviously becomes essential for success when such occurrences are to be expected.

I have stated that previous to and during the exhibition of chloroform, no substance should be placed between the teeth with the view of keeping the jaws apart. After the anæsthesia is complete, however, it will in general be found necessary to separate the jaws widely, and to retain them so in order that the operator may command a ready access to, and a full view of, the parts. And it may be asked, how is this to be done? When the anæsthesia is sufficiently deep for performing painlessly any such operation as the extraction of a tooth, little difficulty will commonly be experienced in merely opening the mouth; since, from the muscular relaxation induced, the lower jaw will tend to drop on simply allowing the head of the patient to fall back to a slight extent. Exceptional cases do occasionally occur where the teeth, and even the lips, are closely and forcibly kept shut. But in no instance is the difficulty so great as not to be easily overcome by merely inserting between the front teeth the end of any thin flat body, such as the handle of a tooth-brush, and rotating it so that the teeth, or where these are absent the gums, shall be separated by and rest upon its edges. This being once accomplished any suitable gag may be introduced between the molar teeth of the side opposite that to be operated on, and by moving it further back or forwards, the same size of gag may be made to retain the mouth open to various different degrees. In 1854, I published, in the *Monthly Journal of Medical Science* for April of that year, an account of a speculum for purposes of this nature, and which in certain cases I still con-

tinue to employ, as it remains more steadily in position than those generally used, and dispenses with the necessity for being held by an assistant,—a proceeding sometimes interfering with the required amount of light and space. The instrument is tolerably well known, and for further particulars I must refer to the above publication. On the whole, however, as with the use of inhalers, etc., the simpler all such auxiliaries are the better, and with a little judicious management, nothing in ninety-nine cases out of a hundred will be found necessary for opening the mouth and retaining it so beyond the measures already described. It need scarcely be said here, that where both upper and lower teeth are to be extracted, the operator should commence with the lower ones, as the flow of blood does not in this way tend so much to interfere with his subsequent proceedings.

Allusion has been before made to the care with which any impediment to the respiration must be avoided in the administration of chloroform. This seems to be of much more consequence than watching the pulse, or indeed than all the other usual precautionary measures put together, as by far the most frequent and most imminent source of danger lies in the risk of suffocation. This, I am aware, is no new or singular opinion, but it is one by no means practically enforced in every case. It is, however, a point to which too much attention cannot be directed, and in such operations as those under notice, most danger is likely to occur in this manner at the very time when it is most likely to be overlooked, and that is during the operation itself. One cause of this is obvious, and has been already explained, namely, the inability to swallow while the mouth is open. If it appear then, on looking into the mouth, that any obstacle to the entrance of air exists at the back of the cavity or in the pharynx, so that the opening of the larynx might be closed, this it need not be said is to be immediately and effectually removed. During the state of complete unconsciousness, and especially where the patient is lying horizontally on the back, the tongue is apt to fall, or to be retracted somewhat towards the gullet, and in this way a danger of suffocation has been apprehended. The practice of some of our highest surgical authorities is on these occasions to draw forward the tongue with artery forceps or a tenaculum, and sometimes by means of a ligature passed through its substance. In certain cases these proceedings may be demanded, particularly in such as those where much time is likely to be occupied, and where it is desirable to keep the tongue drawn forward for a considerable period continuously. But we must recollect, that by keeping the larynx uncovered—if such be the effect of this measure—the entrance of fluid as well as air is promoted, and that an accumulation at the orifice of the larynx of a quantity of saliva or bloody fluid will choke a patient as readily as if it were closed up by the epiglottis or tongue lying there. Now, to rid himself of an obstacle

to the respiration, such as saliva or blood, the patient always endeavours to swallow. But where the tongue is kept forcibly extended this is impossible, while the lodgement of fluids on, and their passage into the larynx is rendered more likely to occur by its exposure. Such a mode of procedure, then, will be of little avail, unless at the same time the entrance to the larynx be sedulously kept free of fluid matters. There seems no absolute necessity, however, in the majority of dental cases for thus hooking forward the tongue at all. So long as the respiration is seen to go on, no interference of the kind is required; and when there does occur any tendency to disturbed or obstructed or arrested breathing, the chloroform should be withdrawn, and merely the forefinger thrust well back into the pharynx, where, by a few simple movements, the fluid can be cleared away, deglutition, in all probability, at once excited, and the tongue pulled forward if necessary. I may here be permitted to remark, that in the experience of between one and two thousand cases of complete anæsthesia for dental operations, I have never had occasion to resort to any other measures than those last mentioned.

It is seldom before, and generally after, the accession of insensibility that sickness with vomiting commences. And it is only when it commences before or at this stage that it forms anything like a serious impediment to the surgical procedure, as after this is effected its occurrence is of but little consequence. When vomiting begins about the time of the operation being commenced, the anæsthesia is generally so well established, that on the first paroxysm of sickness passing off a very little more chloroform will restore the anæsthetic state so speedily, that before the re-accession of vomiting the operation in most instances may be successfully completed. When it begins earlier than this, however, the difficulties are increased, and in some cases render it injudicious or impossible to continue the administration of the chloroform. It is superfluous to say that, of all operations, those in the mouth and its vicinity are such as are most interfered with by vomiting. In this way it becomes a complication of a very troublesome nature to the surgeon. But it by no means rests here, for it also entails serious risk to the patient, inasmuch as in many cases there results from this cause great danger of suffocation. The vomiting, when anæsthesia is deep, often seems to be imperfect, the contents of the stomach gurgling up into the mouth, in small quantities at first, while there is an apparent inability to eject the vomited matters any farther. In this way these are sometimes accumulated at the upper part of the gullet and pharynx, and unless due caution be exercised the larynx may thus be shut up and respiration prevented. The ordinary rule is not to exhibit chloroform until the expiry of several hours after the last meal, so that the stomach may be empty,—a condition in which it is supposed that sickness is less likely to occur. Patients, however, sometimes deceive the operator in this respect; and in other cases digestion seems to proceed at a very slow rate

previous to the expected operation. In this manner, then, with a patient unconscious and utterly helpless, an operation half-completed within the mouth, and a stomach charged with half-digested food, vomiting may be conceived to be an occurrence by no means void of danger.

Vomiting in many instances does not occur until the anæsthetic condition is passing off, and it is not improbable that in certain cases the mode of rousing the patient has something to do with the accession of this after-sickness. No violent measures should be resorted to for such a purpose; no shaking of the patient; no loud speaking or vociferating into his ears; no attempt of any kind to awake him the moment the operation is over; and, certainly, no allusion of any kind should be made to sickness or vomiting. The patient ought to be allowed to lie perfectly quiet—to have free access of air, and not be permitted to speak or be spoken to so long as any mental confusion exists.

In concluding these remarks it may be observed, that so far as concerns the typical progressive stages of anæsthesia manifested in any individual instance, the practical experience of one or two cases would be more instructive than any amount of description. Certain progressive degrees of insensibility have been attempted to be determinately laid down, and the distinguishing features peculiar to, and characteristic of, each of these stages to be mapped out. This has been done as a guide for the administration of such agents with the view of averting danger. But the indications of the various degrees of narcotism vary with the nervous constitution of the patient, as well as with the amount of chloroform exhibited. And so far as danger is concerned, this does not manifest itself exclusively at any particular stage or degree of the anæsthetic state, but has occurred at its very commencement as well as at its completion, and even occasionally after its apparent subsidence. In this way it would seem that no ratio can be well established between any series of phenomena and either the progress of the anæsthesia or the proportionate risk accompanying each stage. An observant eye and a sound judgment, a practical acquaintance with the use of anæsthetics, and a readiness for all emergencies likely to complicate their action, are the true safeguards and the essential qualifications for the employment of such agents in dental surgery.

As a resumé of what has been now stated, the following points may be briefly recapitulated:—

1*st*, The difficulty attending the administration of chloroform in dental surgery arises from the nature of the locality and the severity of the pain in such operations; together with the inconvenience and danger here incurred by any untoward complication accompanying the anæsthesia.

2*d*, Everything should, therefore, be so arranged that the patient may be kept as short a time as possible under the anæsthetic.

The operation ought not to be commenced before the full effect of the chloroform is produced; and the details of the operation itself must be adapted to the passive resistance of the anæsthetic state, and to the limited time at our disposal.

*3d*, The patient should be in the recumbent posture. Nothing should be placed between the teeth while exhibiting the chloroform. The respiration above all should be closely watched, and on any symptom of its being impeded or arrested, the chloroform should be at once withdrawn, and the pharynx cleared of saliva or any other fluids.

*4th*, On completing the operation the patient should be allowed to awaken quietly, and without hurry or molestation of any kind.

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ARTICLE IV.—*Excision of Superior Maxillary Bone.* By GEORGE BUCHANAN, A.M., M.D., Surgeon and Lecturer on Clinical Surgery to the Glasgow Royal Infirmary; Lecturer on Anatomy, etc.

J. M'T., aged 50, two months ago had his attention first directed to his present disease, by a severe pain in the gum over the left molar teeth of the upper jaw, one of which was diseased. He supposed it to be a gumboil, and had the decayed tooth removed. This afforded some relief to the pain, but caused no diminution of the swelling, which continued to increase rapidly till it interfered with deglutition and articulation. It now gives him great uneasiness, and frequently prevents sleep at night.

At present the appearance of the disease is somewhat as follows:—The left side of patient's face is completely distorted by a large tumour, which protrudes the cheek at least an inch beyond that of the opposite side, and encroaches considerably on all the facial cavities. It bulges somewhat into the nasal fossæ, and raises the eyeball above its natural level. It can be felt in the zygomatic fossa behind the malar bone. The anterior wall of the antrum is completely absorbed by the pressure of the growth which protrudes in nodules underneath the cheek. The posterior half of the alveolar process on the left side is invaded by it, and it can be partly felt behind the velum. It causes the patient great pain and discomfort, and he is anxious for relief.

On the 16th of May 1863, I performed excision of the upper jaw in the following way:—The patient was put deeply under the influence of chloroform, and though he occasionally became so far conscious during the operation as to assist in spitting out blood, and turning his head as desired, he assured me afterwards that he felt no pain at all. An incision was made from the angle of the mouth to the prominence of the malar bone in the line of the zygomatic muscle. This divided the cheek into the mouth. Next I cut through the