operation proves unexpectedly long, ether, which should always be carried as well, may be added to the ethyl chloride. In most cases before the narcosis it is desirable to insert a mouth-prop in case jaw spasm arise. It is not, I think, advisable to change from ethyl chloride anaesthesia to that of chloroform, for the same reason that it is unwise to change from ether to chloroform, unless during distinctly light anaesthesia. The rapid transition from a drug which markedly stimulates respiration and probably lowers blood pressure, to another which markedly depresses both respiration and circulation may be dangerous. It is besides difficult to properly time the period of transition.

The earlier administrators averred that there were no contraindications to ethyl chloride anaesthesia. Girard, for example, said that "circulatory troubles and respiratory affections did not contraindicate its use; neither age nor sex, nor alcoholism, nor other intoxications forbade its administration. The only doubtful factor was the state of the urinary organs." In spite of difficulties of administration, he asserted that "ethyl chloride was superior to ether, chloroform, nitrous oxide, and ethyl bromide." However, since it quickens and deepens respiration and increases vascularity it should not be used when there is already much obstruction in or about the air passages, and especially when the obstruction is in the larynx.

The slight pathological changes found in the urinary organs of animals by Haslebach and one or two others after prolonged administration need not be considered as contraindications considering the short duration of anaesthesia in the human subject. Two at least of the fatal cases have been found *post mortem* to have fatty hearts—for example, the first death recorded occurred in a patient who had a fatty heart and sclerosis of the coronary arteries; hence it would appear inadvisable, if the condition of fatty heart can be diagnosed, to select either nitrous oxide or ether as an anaesthetic.

To repeat, then, consideration of the average death-rate I have indicated and of the chemical constitution of ethyl chloride will make it appear to be less safe than ether and far less safe than nitrous oxide. Nitrous oxide stands in a class by itself as regards safety, hence we should use nitrous oxide whenever it be reasonably possible and ethyl chloride when nitrous oxide is impossible and when ether and chloroform are unnecessarily powerful and lasting in their effects.

For practical purposes we may put the matter in some proportion, thus, and say that ethyl chloride is to nitrous oxide as chloroform is to ether. In other words, ethyl chloride may be compared to chloroform in the ease and convenience of its administration and its high power of narcosis, while nitrous oxide may be likened to ether in the difficulty and complication entailed in its inhalation, and in its weak narcotic effects.

REFERENCES.

¹ *Transactions of the Society of Anaesthetists*, vol. vii. ² *British Dental Journal*, November 15th, 1905. ³ *BRITISH MEDICAL JOURNAL*, March 3rd, 1906, p. 538. ⁴ *Lancet*, April 4th, 1903, and October 7th, 1905.

NOTES ON ETHYL CHLORIDE.

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ALTHOUGH ethyl chloride has been largely used and written about in this country since 1902, there are many points concerning the anaesthetic and its administration which have yet to be satisfactorily settled; I therefore venture to give a few notes from my own observations.

DETAILS OF ADMINISTRATION.

Ethyl chloride anaesthesia may be divided into three stages:

1. *The Stage of Light Anaesthesia.*

As a preliminary step it is important that the patient should take a breath and fairly distend the bag; the vapour is thereby well diluted, and there is no pungency; cough and "choky" feelings are due to neglect of this principle. Incidentally the patient gains confidence.

During the second expiration, spray in 2 c.cm. of the anaesthetic, and wait five breaths; if the anaesthesia is progressing satisfactorily, do not give more; but if not, add another c.cm. from time to time. The facepiece must

be kept well applied, and no air admitted until the end of the first stage. If the anaesthetic is given very slowly respiration may become very hurried from exhaustion of the air in the bag; a breath then becomes necessary.

Swallowing movements often occur before consciousness is lost, as ethyl chloride causes a slight increase in salivary secretion.

At the point where consciousness is lost there is often a pause in respiration which may last up to twenty seconds. A kicking movement or sudden snatch at the bag is now to be expected.

Loss of consciousness in a typical case takes place in from ten to fifteen seconds, then respiration gradually slows and deepens, the eyes roll, and the pupils commence to dilate; this sign is absent in about 10 per cent. of cases.

The end of the first stage now arrives, the breathing being slow and deep, the pupils dilated to about 4 mm. and not reacting to light, and the eyeballs fixed; the muscles generally are relaxed, a great exception being the masseter.

By now the patient has been inhaling the anaesthetic about thirty seconds, and, if it be withdrawn, three or four teeth may be extracted with ease, as the patient will remain under some twenty to forty seconds. Some phonation and movement will probably occur towards the end of the anaesthetic state, but the patient will have no knowledge of the pain on waking.

2. *The Stage of Deep Anaesthesia.*

On continuing the administration the muscles become well relaxed, if not already in that state; the face flushes and may become covered with beads of sweat, the corneal reflex becomes less active and finally disappears, and there is often a decided external squint.

The bag should now be withdrawn, the patient having been under about forty seconds, and one may then count on from 90 to 120 seconds of available anaesthesia.

3. *The Stage of Recovery.*

Recovery is rapid, especially if the anaesthetic has been discontinued at the end of the first stage.

The majority of patients come out quickly and easily, awakening with a start, and being troubled only by slight mental confusion afterwards; there is always a dreaming stage before awakening. Alcoholic patients while in this subconscious dreamy condition are intolerant of restraint, and may become violent. Many patients in this state will answer questions automatically; "neurotic" women are usually very troublesome.

General muscular spasm is occasionally met with in the first stage, and is more common when air is freely admitted; micturition and sometimes defaecation occur if the patient is in this state, and has not been properly prepared.

The pupils, as already mentioned, generally dilate, but may remain normal or only dilate very slightly.

Cyanosis is rare; it is caused either by retraction of the tongue or by the general muscular spasm already mentioned.

Dosage.

The usual amount required to produce the second stage of anaesthesia is 2 to 5 c.cm.; it is best to use plenty for nervous patients to get over the difficulty of shallow breathing.

The dose varies considerably with the individual. I commonly find that $\frac{1}{2}$ to 1 c.cm. is quite sufficient for young children, and that 4 or 5 c.cm. is necessary for alcoholics.

The depth and length of anaesthesia obtained with ethyl chloride is proportionate to the amount introduced into the system, and is not affected by the period of induction. This accounts for the wide range of anaesthesia which can be obtained with this drug, and the control one has over it.

After-effects.

The after-effects commonly complained of are nausea, headache, and excitement. Nausea and headache are rather common and the patient takes a long time, from 60 to 120 seconds, to go under; if the anaesthetic is given timidly, a little at a time. It seems extremely probable that the continued breathing of expired air is often the cause of these symptoms, as they occur if too dilute

a vapour is used, or the anaesthetic is given slowly, or too large a bag is used. If a little care is taken, and the exact dose requisite for the patient given, nausea and headache are uncommon; they are much more common if an overdose is administered.

Vomiting occurs after mouth operations from the swallowing of blood; this must not be confused with vomiting caused by the anaesthetic; as the anaesthetic period of ethyl chloride is twice as long as that of nitrous oxide, the patient has a greater opportunity of swallowing blood. For this reason the head should be inclined forwards as soon as possible and the patient encouraged to spit out.

Headache and excitement are common in subjects of a naturally excitable temperament.

Safety.

Ethyl chloride is not nearly as safe an anaesthetic as nitrous oxide in the hands of the untrained. This I attribute to the absence of well-defined "leave-off" symptoms like cyanosis and jactitation. When the administrator is accustomed to it, it is probably safer than any other anaesthetic (nitrous oxide included); as so small an amount is necessary to render the patient insensible to pain, recovery from a light anaesthesia is rapid, and there is no cyanosis or venous congestion. The anaesthetic is a cardiac stimulant, and, if a full dose is given, dilates the peripheral arterioles.

Children.

Ethyl chloride is taken exceedingly well by children of a few weeks or months; I prefer it to chloroform or ether for circumcision. A piece of lint is placed in the hand, which is bent into a cuplike form and held over the mouth and nose; a little ethyl chloride is then sprayed on the lint and the anaesthesia continued with the tube of ethyl chloride held in the wrong position, so that the vapour alone comes from it and is conducted into the hollow of the hand. Recovery is rapid, signs of anaesthesia are marked, and laryngeal stridor does not occur when the prepuce is divided.

Precautions.

The bladder should always be emptied beforehand, and it is not wise to give this anaesthetic if a purgative has been taken and its action is still proceeding.

When a gag is used the jaw should be kept well forward; this is essential for a successful administration, and if not attended to cyanosis and marked stertor will be the result in a good many cases; besides this, the patient will take two or three times as long to go under. As there is generally a strong contraction of the masseter, the gag should not be placed between obliquely-situated incisors, as these may be forced out. The tongue forceps should always be to hand when giving the anaesthetic for dental purposes, as that organ commonly slips or is retracted backwards. A mouth-opener or wedge is also needed, owing to the masseteric spasm. When a large number of teeth have to be extracted the patient may be allowed to wake up once or twice to rinse out the mouth and get rid of blood; after the first administration the patient goes under more rapidly and requires a very much smaller dose.

Ethyl chloride is a very reliable anaesthetic; only in very rare cases is it found impossible to get a patient under with it. The drug is not suitable for prolonged administration on account of the strain on the anaesthetist and the expense.

Preliminary to Chloroform or Ether.

As a preliminary to chloroform it is a pleasure to use; the patient does not come out between the two anaesthetics, and it saves a lot of crying and struggling with children or nervous patients. One should be cautious when combining the two drugs, as it is difficult to tell the effect of the chloroform until the effect of the ethyl chloride has worn off.

It is invariably used in this hospital as a preliminary to ether in place of nitrous oxide. There are two methods of starting with ethyl chloride; they are equally satisfactory. One method is to get the patient well under with ethyl chloride, and then turn the ether on to "3" rapidly; the other is to give a small dose of ethyl chloride, and then rotate the ether chamber gradually.

The ether need not be pushed when a sphincter has to be dilated; the patient should be kept under lightly, and ten or fifteen seconds before the operation 2 c.cm. of ethyl chloride sprayed into the bag; the patient at once drops into a very deep anaesthetic state.

When respiration is embarrassed by free secretion of mucus the patient may be allowed to come out sufficiently to swallow it, and 2 c.cm. injected into the bag sends him under again before vomiting has time to set in.

Apparatus.

An ordinary Clover's bag is the best size to use; a large bag is wasteful of time and anaesthetic.

A wet bag gives very bad results. Those who use inhalers containing a sponge should dry it after each administration, as the moisture from the breath collects.

There are two pieces of apparatus I find useful—one is a two-way gas stopcock, of the drum pattern, fitted with a tube; the stopcock fits on an ordinary Clover's inhaler between the tank and bag. The tube enables one to spray ethyl chloride into the bag at the commencement or at any period during the administration—for instance, when the patient has been allowed to come out too far and is retching. It also acts as a very convenient air-valve and renders it unnecessary to lift the ether apparatus at all from the face to give air. Instead of doing so the drum is revolved a half-turn, and this opens the air-valve and shuts off the bag; this apparatus can be fitted directly on to a facepiece, and makes a splendid inhaler for continuous administration.

The other apparatus is an ethyl chloride inhaler with a glass tube in the angle piece, containing 10 c.cm. of the drug; there is a tap to control the introduction into the bag, and the amount used can be read off on a scale as it is being run out of the tube. The loss from leakage is infinitesimal, so that absolutely accurate dosage is possible, and one can give $\frac{1}{4}$ or 10 c.cm. with equal facility.

MEMORANDA: MEDICAL, SURGICAL, OBSTETRICAL.

PAINLESS LABOUR.

"Now, please remember there is no such thing as a painless labour." These words occur in the course of the interesting and instructive address by Dr. Horrocks, which was published in the BRITISH MEDICAL JOURNAL of March 10th. In my opinion this is far too sweeping a statement and one which I cannot agree with. I maintain and fully believe that there are cases of labour which are, practically speaking, painless. The following case which I attended some years ago supports my contention:

I was called to a case one morning about 10 a.m., and found a primipara, 18 years of age, in labour. She had complained of slight pains in the stomach and upper part of the abdomen. Examination of the abdomen proved that she was pregnant and near full term. On vaginal examination, the os was found to be very slightly dilated. The examining fingers were with difficulty introduced into the vagina. Uterine contractions appeared to be going on, but were very slight. It was concluded that the first stage would last many hours, and therefore, I left the house. About two hours later I received a message asking me to come at once, as the child had been born about half an hour after I left. I went at once to the case, and found that the placenta was unexpelled and that the child was still attached to the umbilical cord. The infant was a well-developed male, weighing about 8 lb. On questioning the mother, it was ascertained that there had been no pains since I had been there, and that the child had been born unconsciously. There was not the slightest tear in the perineum. The placenta was easily expelled by pressure from above. The mother made a rapid and an uninterrupted recovery, and the child did well.

This case seems to show that labour may be painless. From start to finish there were no pains in the accepted sense, and I think it very questionable if the slight pains which were complained of had any relation to the uterine contractions. It is all the more remarkable when one considers that it occurred in a young primipara, which is just the case in which one expects to have severe pains. The case supports Dr. Horrocks's contention that Nature herself is well able to provide for and to perform this physiological act. It shows the power she has of relaxing the parts, because the passages which with difficulty