VINYL ETHER FOR MINOR SURGERY & DENTISTRY.

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It has long been realised that nitrous oxide is not as satisfactory an anæsthetic agent for children as for adults, they rapidly become cyanosed, and anæsthesia only lasts for about 30 seconds. Nasal administration for dental extractions is possible but difficult, consequently there has been a continual search for an anæsthetic agent which would be rapid in action and produce an anæsthesia that would last for at least a minute. The introduction of ethyl chloride nearly 40 years ago was a great advance, though cases of sudden death are more frequent than with nitrous oxide and the recovery period is sometimes prolonged. Vinyl ether, a recent addition to our range of anæsthetic drugs, seems to produce good results with less nausea, and a more pleasant recovery, so that a discussion on its methods of use will not be out of place.

Vinyl ether is di-vinyl oxide, while ether is di-ethyl oxide, the difference can be seen in their structural formulæ:—

Vinyl ether is sold in this country under the trade name of "Vinesthene," it is a colourless liquid with a garlic like odour. As an anæsthetic agent it is more potent than chloroform and less toxic than ethyl ether.

The introduction of vinyl ether as an anæsthetic agent for dental work and minor surgery is quite recent; the largest series of cases being reported from the Eastman Dental Clinic. Since March, 1936, when it was first used in the Clinic until November 30th, 1938, it has been administered 4,079 times without incident.

In 1935 there were 6,256 nitrous oxide cases in children and 74 ethyl chloride cases, but in 1937, the first full working year, 4,887 cases had nitrous oxide, 1,796 vinyl ether, and only 15 had ethyl chloride. In addition vinyl ether has almost completely replaced ethyl chloride in the casualty department of the Royal Free Hospital, and as the administration is similar for both dental extractions and minor surgery we will now describe the methods in common use.

Two methods are now popular, the open drop method, which is almost universal in America, and the closed method which was introduced by the author, and is used most generally in this country.

The open drop method. This method is recommended by Saghirian of Philadelphia, and in his hands has given excellent results, both in children and adults. Here is his own description of the technique:—

1. The mouth prop, attached with string, is placed in position.
2. Eight layers of hospital gauze are placed over the mouth and nose of the patient.

(Based upon post-graduate lectures given at the Eastman Dental Clinic, and Queen Mary's Hospital, Stratford).

3. A chloroform dropper is used, and held close to the gauze. Vinyl ether is dropped in a circular pathway over the gauze at the rate of 60 to 80 drops per minute. The left thumb of the anæsthetist at first allows the dilution of vinyl ether with air.
4. Four pieces of gauze are now removed and the remaining four pieces doubled by folding, covering the nostrils alone. The fluid is allowed to drop continuously to maintain an even plane of anæsthesia.
5. The throat is packed and the operator proceeds with the necessary dental surgery.

This method is extravagant in use, for in our hands we found that from 10 to 15 c.cs of vinyl ether were needed for each case, and the induction was neither as rapid nor as certain as the closed method.

The closed method. Since the boiling point of vinyl ether is higher than that of ethyl chloride, the inhalers commonly used for the latter are not efficient, and for this reason a special model (see Fig. 1), was devised so that the vinyl ether can be applied to a sponge which is placed between the mask and the rebreathing bag.

The sponge container consists of two metal wide bore tubes that rotate one within the other, and by means of port holes, three positions can be obtained at will:—

1. "*Fill.*" The inhaler is shut, but vinyl ether can be applied to the sponge through the filling funnel.
2. "*Closed.*" The funnel is closed as well as the inhaler.
3. "*Open.*" The funnel remains closed but the inhaler is open to permit complete rebreathing.

When this type of inhaler is used the method is so economical that the manufacturers of vinyl ether were induced to pack the liquid in ampoules containing 3 c.cs., one ampoule being sufficient for an anæsthesia lasting about one minute either in an adult or a child.

Relaxation of the jaw is so good and is so consistent a feature with this anæsthetic that it is not essential to commence with a prop in situ for dental work.

The method of induction is as follows:—

The inhaler is turned so that the pointer is at "fill," and the contents of an ampoule are allowed to run into the sponge chamber, and the pointer then turned to "closed." The bag is now partially inflated by blowing air through the tap at the bottom of the bag by means of an enema syringe, or better still the tap is connected to a supply of oxygen and some allowed to enter the bag.

The mask is now held close to the patient's face and the pointer slowly turned to "open," gradually the mask is brought nearer to the face, so that after about four or five breaths the mask is quite tightly applied, and complete rebreathing is taking place.

Struggling, if any, will last for about ten seconds, and anæsthesia will be rapidly induced, the average time required to complete the induction being 55

FIG. 1.—The Vinyl Ether Inhaler and McKesson Mask.

FIG. 2.—The Wide Bore Nasal Mask for use with the Vinyl Ether Inhaler, or with the McKesson for nasal gas and oxygen.

FIG. 3.—Visible Drip Apparatus for use with the McKesson Gas and Oxygen Machine.

seconds. The only reliable guide to the depth of anæsthesia is the onset of "automatic breathing." Throughout the induction the airway must be maintained, and this can best be done by firmly supporting the chin. Most of the difficulties encountered are due to the neglect of this precaution.

After automatic breathing has been properly established the inhaler is removed at the end of an expiration the pointer turned to "closed," and the mouth-pack inserted if the operation is a dental one. Anæsthesia will last for about one minute, but for minor surgical procedures the mask can be reapplied, allowing a full inspiration of air whenever the slightest sign of cyanosis appears. In dental work it is possible to prolong anæsthesia indefinitely by changing the face-piece for the special nasal mask, (see Fig. 2), with the expiratory valve closed, and applying the inhaler to the patient's nose with the pointer turned back to "open." More vinyl ether can be added as required.

When the anæsthetic is withdrawn, recovery is usually complete in about one minute, and the patient is then fit to leave the dental chair or surgery. After vinyl ether, patients are seldom sick, nor do they complain of nausea or headache, and in this agent we have an anæsthetic that has considerable value for children especially. It will be found invaluable for children under the age of six or seven when more than two teeth have to be extracted, for the administration of nasal gas is difficult and requires bulky apparatus. The closed method by means of the special inhaler is the method of choice except in infants of a few weeks old, for in these cases the open method with the exhibition of a continuous supply of oxygen gives the best results. We have found this anæsthetic of great value for the operative treatment of congenital pyloric stenosis on account of the rapid recovery and absence of post-operative vomiting.

The unpleasant odour of vinyl ether can be disguised by placing a few drops of oil of lavender on the mask before induction.

The addition of vinyl ether is of value to gas and oxygen mixtures when smooth anæsthesia is difficult to obtain, and for this purpose a drip device (see Fig. 3), has been evolved which fits on to the McKesson, and has been found invaluable for prolonged nasal administrations, enabling a high percentage of oxygen to be given throughout.

The apparatus consists of a visible drip control and a pressure compensator, the liquid being allowed to fall upon a wire mesh which assists vaporisation. The whole fitting screws on to the commercial bottle of 25 c.cs of vinyl ether so that there is no loss in filling.

SUMMARY.

1. Vinyl ether is a safe general anæsthetic for short dental operations, and for minor surgical procedures usually performed in the surgery.
2. The apparatus described is portable, as well as economical in use.
3. A large series of cases is reported without incident.

In conclusion I should like to thank Messrs. A. Charles King of London for the ingenious way in which my ideas have been converted into practical apparatus.