A VAPORIZER FOR FLUOTHANE

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Fluothane — bromochlorotrifluoroethane — is a powerful volatile anaesthetic agent developed and produced by Imperial Chemical Industries. It is so potent—less than 2 per cent of Fluothane vapour sufficing for anaesthesia in the great majority of subjects—that it is essential that one should have fine accurate control of the mixture administered and be able to raise or reduce its strength by small fractional percentages.

At the beginning of our clinical trials of Fluothane, the drug was given via the Trilene (trichloroethylene) bottle on a Boyle’s machine, nitrous oxide and oxygen being used as the vehicle. This method gave varied and not altogether satisfactory results.

According to Mapleson (1957) there are no less than ten factors which can affect the percentage of trichloroethylene delivered to a patient by a Boyle’s bottle. In an attempt to understand our rather uneven clinical results, the effects of some of these factors on the strength of Fluothane obtained from a similar bottle were investigated in the laboratory.

Method. Compressed air was led via an accurate rotameter to a Boyle’s bottle containing Fluothane. The bottle was surrounded by a water bath kept at 19°C. The resulting vapour was passed through a mixing chamber—to avoid inaccuracies from channelling—and was then sucked by a small Edwards pump through a Raleigh gas interference refractometer. Some scores of readings were taken under a wide variety of conditions. It was found that the position of the plunger, the rate of air flow, the amount of Fluothane in the bottle, and, if the water bath was not used, the passage of time (Falkner Hill, 1957), all had a very marked effect on the strength of Fluothane vapour produced. If the control lever was fully opened, whatever the rate of flow and whatever the amount in the bottle, depression of the plunger to just above the surface of the liquid produced some 9 per cent of Fluothane vapour—a dangerously high concentration.

A position of the control lever was found such that with the plunger at the top of its travel and with 3 oz (1 oz = 28.4 ml) of Fluothane in the bottle a 4 litre flow produced a 1.85 per cent vapour, that is, a useful clinical strength. The lever was then fixed in this position, the plunger kept at the top, and observations were made of the effect of varying the rates of flow and the amount of liquid in the bottle. Some of these readings are shown on the graph (fig. 1). It will be seen that increasing or reducing the flow correspondingly increased or reduced the strength of Fluothane—a 2 litre flow producing only 0.75

Graph showing the effect of varying the flow rates and the amount of the liquid in a Boyle’s bottle on the strength of Fluothane vapour produced, contrasted with that delivered by a Fluotec inhaler containing anything from 50 to 150 ml and with the dial turned to 2 per cent.
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per cent, while an 8 litre flow raised this figure to 3.82 per cent. The amount in the bottle caused similar but less wide variations—a flow which produced 1.4 per cent with 2 oz in the bottle produced 2.5 per cent when the content was increased to 4 oz.

It was felt that these extremely wide variations resulting from alterations in gas flows and the amount of liquid in the Boyle’s bottle explained many of our clinical results and were of such an order as to make this apparatus as at present designed unsatisfactory if not unsafe for the administration of Fluothane.

The accuracy of a prototype Fluotec vaporizer was then similarly tested with a refractometer. With any flow rate from 4 to 10 litres the Fluotec was found to be accurate throughout its range to within 0.05 per cent. This accuracy was affected neither by the amount of liquid in the vaporizer—providing that any at all could be seen through the observation window—nor by the passage of time. The built-in thermostat worked so accurately that the same values to within 0.01 per cent were recorded when the inhaler had been in constant use for over an hour. With flow rates below 4 litres a little inaccuracy was detected at the extremes of the range, but in the middle ranges, e.g. 2 per cent, the accuracy as shown on the graph was impeccable even with only a 2 litre flow.

For the last six months we have been carrying out clinical trials with Fluotec vaporizers, at first with a prototype and later with the improved production models. These inhalers have been used by nearly twenty different anaesthetists attached to this department on many hundreds of patients anaesthetized for a wide range of surgical procedures. Sturdily and beautifully made, they have proved extremely satisfactory in use, and have elicited nothing but praise. They can be warmly recommended.

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REFERENCES


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... and ward sister. The question of the right age to operate on these babies may be a matter of opinion, but the criteria of optimum condition of the baby as described in this book, which are largely those adopted by Kilner and Hunter, are among the most important lessons that have been learned in the handling of these infants. The fulfilment of these conditions may demand a considerable stay in hospital before operation is undertaken, and such a reasonable attitude rarely appeals to the administrators of a busy general hospital. The nursing care of these infants makes heavy demands upon the nursing staff, which is probably only possible in the special units. The endotracheal technique and management of the anaesthetic, as described in the book, follow the lines developed by Magill, Gillespie and Hunter.

It is difficult to quarrel with the anaesthetic aspects that are mentioned, and Holdsworth’s use of local infiltration to do a primary repair of the lip in the first few days of life seems a reasonable procedure. Though general anaesthesia is perfectly feasible for these early repairs, probably local anaesthesia is less wearing for the surgeon. After ten days of age the child becomes restless under a local, and it is probably then wiser to wait and do it under general anaesthesia a month or two later.

The book should certainly be read by all who are faced with anaesthetizing babies for hare lip and cleft palate.

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