($P < 0.05$) than those obtained by the other two methods.

In conclusion, the advantages of the Elder valve over previously available equipment and over the exhaled-air techniques include the following: (1) simplicity, (2) delivery of 100 per cent oxygen, (3) two hands can be used to maintain a mask fit, (4) high flow rate permitting adequate ventilation in spite of mask leaks, (5) avoidance of personal contact with the victim. The disadvantages are principally lack of ready availability and dependence on compressed oxygen as a power source.

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Bedside Measurement of Carbon Dioxide Response

GERALD EDELIST, M.D., AND HOWARD L. ZAUDER, M.D., PH.D.*

In the course of studying several patients with a peculiar syndrome of apnea, occurring upon loss of wakefulness (Ondine's curse),[1] it became necessary to determine the response to increasing concentrations of carbon dioxide with a minimum of equipment and a maximum of efficiency. The system shown in figure 1 was devised.

An intra-arterial Riley needle is inserted for withdrawal of blood for measurement of Pa_{CO_2}. Resting ventilation is measured by placing the anesthesia mask, with Wright ventilation meter attached, on the face of the patient and after nine minutes of quiet respiration ventilation is measured over a one minute period, while blood is being drawn for Pa_{CO_2}. The Pa_{CO_2} is measured with a Severinghaus electrode coupled to a Beckman 160 physiologic analyzer. One length of anesthesia rebreathing tubing (32 inches) is added to increase the dead space for carbon dioxide buildup and after nine minutes $\dot{V}_E$ and Pa_{CO_2} are measured in the same way. A second length of rebreathing tubing is then added and the procedure repeated. During the entire procedure three-hundred cc. of oxygen are added at the nipple of the mask adapter (fig. 1). Some typical CO_2 responses elicited by this technique are shown in figure 2.

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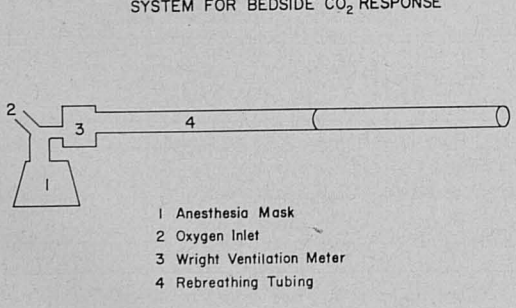

FIG. 1. Apparatus for bedside CO_2 response.

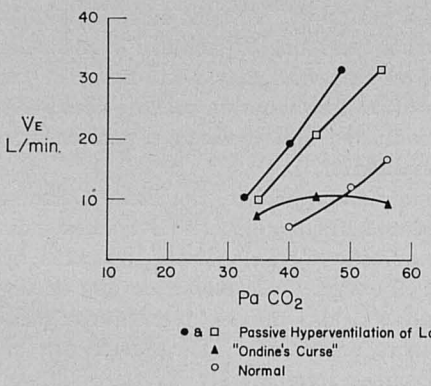

FIG. 2. Typical CO_2 response curves.

Although this system is not as accurate as other methods of measuring carbon dioxide response it does have the following advantages: (1) It is simple and portable. (2) Arterial Pa_{CO_2} is measured ruling out the effects of a-A CO_2 gradients on the response curve. (3) It measures the ventilation at different CO_2 levels, held constant for six minutes, allowing steady-state measurement and equilibration of

cerebrospinal fluid Pa_{CO_2} with blood Pa_{CO_2}.[2] The disadvantages are as follows: (1) The end-expired P_{CO_2} is assumed to be held constant for six minutes but the PA_{CO_2} is not measured during this period. However, in previous work we found that 2–4 minutes of rebreathing produced a peak of PA_{CO_2} and this then plateaued.[3] (2) The initial measurement of Pa_{CO_2} and $\dot{V}_E$ is produced with an equipment dead-space of 100 ml. which will increase the resting $\dot{V}_E$ slightly. However, the slope and position of the curve should not be changed. This is the primary consideration in evaluating the effect of various factors on the response to carbon dioxide stimulation. The Pa_{O_2} will vary with variation in ventilation since a constant volume of oxygen is added to the mask. However, Pa_{O_2} below 100 does not occur. The variation in the slope and position of the response curve is only affected minimally by Pa_{O_2} when the Pa_{O_2} is above 100.[4]

In our experience, this technique has proved to be easy, since we used equipment with which anesthesiologists are most familiar.

References

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Self-Powered Atomizer

E. R. Malia, M.D.*

Our department has developed a safe and economical device to facilitate topical application of anesthetics and other medications requiring atomization. After 5 years of clinical trial, we have found the unit to have definite advantage over the inconvenient, manually operated, bulb-type atomizer especially for cocainization prior to endotracheal intubation.

The source of power is pressurized dichlorodifluoromethane (Freon) which is nontoxic. This power atomizer † instantly delivers a fine mist-like spray of cocaine for laryngotracheal insufflation. We have safely used cocaine solution with concentrations varying from 4 to 10 per cent, and have found 4 per cent cocaine to be ideally adequate. A graduated solution vial is available which allows accurate measurement of the amount of solution used, thereby reducing the hazards of overdosage. The multipurpose power unit is readily adaptable to several different types of atomizers, one of which is shown in figure 1.

This all-purpose adjustable spray tip atomizer can be used with aqueous or more viscous solutions. The adjustable tip facilitates reaching otherwise inaccessible areas in the throat; behind the soft palate, or far down the trachea. Nebulized cocaine requires less than 5 minutes to effect good anesthesia. The duration of

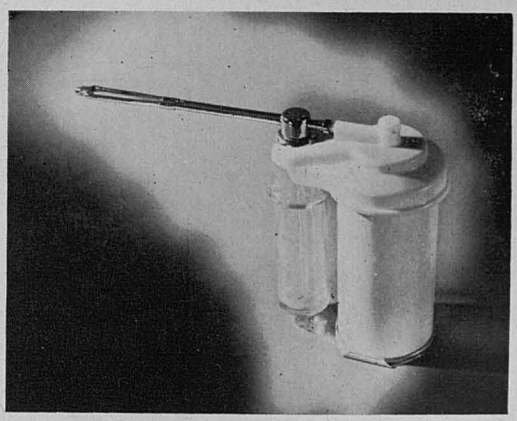

Figure 1.

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† The self-powered atomizer is available from Rals Laboratories, 3030 West 117 Street, Cleveland, Ohio 44111.