

FIGURE 1.

parent mask with little dead space has been devised in which a soft, molded plastic framework is sealed to the face with adhesive film (similar to 3 M Steridrape). A quick-disconnect fitting enables rapid and easy access to the mouth and nose through an aperture large enough to insert an airway, suction device or even a laryngoscope blade.

The mask and adhesive film are disposable. The quick-disconnect fitting is reusable. It connects to standard corrugated breathing

tubes and can easily be modified for use in intermittent positive pressure breathing. Conductive strips are incorporated in the plastic for use with flammable agents.

A working model has been tested. On a manikin, positive pressure in excess of 40 cm. of water have been developed without causing the film to peel off. Dead space was less than 75 ml. The model was tested in four patients and was found to function satisfactorily during spontaneous and assisted respiration.

A New Endotracheal-Cuff Air Valve

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Maintenance of pressure in the cuff of an endotracheal tube has been accomplished in the past by pinching the tubing to the cuff with a hemostat or other form of clamp. In recent years a one-way aluminum valve has been developed which permits and maintains inflation of the cuff until the air pressure is released by rotating the valve's hub. This

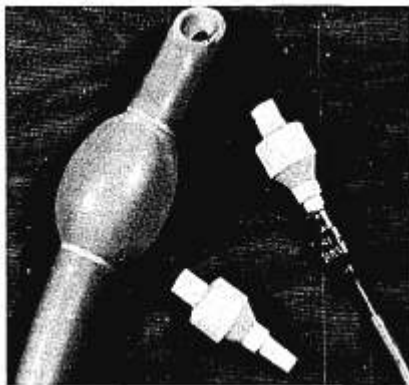
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mechanism is expensive, corrodes easily, and its parts become misplaced.

One-way valves are also presently used to permit serial injections of intravenous medications while preventing multiple punctures of intravenous tubing and retrograde flow of intravenous fluids and blood. The white plastic, one piece valve manufactured by Abbott (Venoalve, 4595) for this purpose can also

be utilized as a one way air valve for endotracheal tube cuffs.

The Venovalve has a female end which fits a standard syringe for air injection and a male end which permits an air tight seal to a female needle hub. This valve comes connected to a length of intravenous tubing which can easily be removed, leaving the valve intact. As shown in the figure the valve is easily utilized as an air valve. Pressure is released simply by disconnecting the valve from the needle hub. The system is air tight and has been immersed in water for several hours without signs of minute air leaks. Clinically it has been used for prolonged endotracheal intubations without loss of pressure. This valve is inexpensive, disposable, has no parts to misplace, is quite light, and has become an excellent replacement for the bulky hemostat or clamp.



Magnified view of valve and valve attached to tube with inflated cuff.

A Simple Ventilometer

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Although measurement of minute volume, tidal volume, and maximum voluntary ventilation have frequently been reported as screening tests of pulmonary function, these determinations have heretofore required the use of specialized equipment. These devices are usually both costly and somewhat fragile. In order to obviate these two objections a simple, inexpensive ventilometer has been constructed from equipment which is available even in the most remote community hospital.

The components of this ventilometer are as follows: an anesthesia mask, a 90-degree mask elbow, a nonbreathing valve, 20 and 4-inch rebreathing hoses, a universal adapter with side arm, a 15 mm. male-male adapter, a 5-liter rebreathing bag, a hemostat, a 3-inch plastic suction tube, a small syringe and needle containing 0.2-0.5 ml. of water, a clock or wrist watch with a second hand, and a roll of tape. The parts of the ventilometer are assembled as shown in figure 1.

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The basic principle of the ventilometer is that once its capacity is known, the patient's minute volume can be calculated as a function of the time necessary to fill the system. The capacity of the unit is that volume of gas necessary to exert sufficient pressure to displace 0.2 ml. of water in a plastic manometer open to the atmosphere.

Calibration. The respirometer is assembled without the mask and is connected directly to the delivery hose of an anesthesia machine. The Rotameter is preferred for calibration because of its inherent accuracy (± 2 per cent error). With the rebreathing bag collapsed, two flowmeters on the anesthesia machine are adjusted so that the total flow is 15 liters per minute. At zero time, the open end of the Y tube is clamped and the rebreathing bag released. Gas is allowed to flow into the rebreathing bag and when the pressure in the system exceeds 0.5 cm. of water the water is ejected from the plastic manometer. The time to ejection is recorded in seconds. The capacity of the system is then calculated as follows: