Adaptation of Ambu Respirator for High Oxygen Concentration

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Drs. Saklad and Gulati note that a non-rebreathing system, consisting of a mask and a self-inflating bag, is a valuable tool in artificial respiration. The Ambu is an example of such a method. As ordinarily employed, the Ambu delivers room air. Air is aspirated into the bag by way of a one-way valve as the bag inflates following compression. It may sometimes be desirable to add oxygen to the respired mixture by way of the oxygen inlet (fig. 1).

It may be noted that the oxygen delivered to the nipple does not enter the bag directly. Upon bag expansion a mixture of air-oxygen is admitted. The oxygen concentration in the bag is related to (1) the flow of oxygen, (2) the size of the bag compression (tidal exchange) and (3) the total volume admitted into the bag (minute volume).

To determine the oxygen concentrations which might be administered in this fashion to the patient, an experimental set-up as figure 1 was employed.

Compression of the bag at approximately 500 ml per stroke, twenty times a minute, achieved a minute volume of 10 liters per minute. Oxygen sampling was done, and the results are shown in figure 2.

Inasmuch as high oxygen concentrations may be desired with minimal flows, a reservoir consisting of an open-end breathing tube, with an oxygen inlet in the side, was attached to the tail of the bag (fig. 3). With this set-up employing the same rates of flow as in the above experiment, the oxygen percentages achieved were as in figure 2.

The addition of a "tube reservoir" to the...
apparatus makes it possible to (1) improve the oxygen concentration in the inspired air and (2) increase the likelihood of more constant oxygen concentrations delivered to the patient.

To be assured of a definite oxygen concentration, it may be advisable to use an "injector" in the delivery system and employ total flows which are equal to or exceed the minute volume exchange.

Intravenous Set

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Dr. Kim believes that by using standard extension tubing (fig. 1) incorporated into other standard intravenous equipment (fig. 2) he can obtain the following advantages:

1. Shorten the setting up time, by reusing intravenous tubing A and B (fig. 2) and discarding part C extension tubing in the cases which do not require intravenous fluids postoperatively.

2. Units can be changed or added without unnecessary movement of the needle in the patient by making the connections at the point at which part A tubing connects with part C.

3. Disturbance of the needle also can be minimized by injection of drugs in the intravenous tubing at the flush bulb (F) instead of at the E bulb.

4. If the patient needs intravenous fluids postoperatively, part A and the extension tube, part C, are sent with the patient. Part B is disconnected and kept for re-use. When blood is being administered another extension tubing, part D, is required to connect part B tubing to part A, instead of just a needle, as shown in figure 2.

This system facilitates the administration of thiopental, succinylcholine drip and intravenous dextrose for a series of surgical cases and also reduces the incidence of infiltration and contamination of intravenous tubing.

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