PEEP and the Mapleson D Circuit

To the Editor:—Infants and children, especially critically ill ones, are more prone to airway closure and hypoxemia than are adults because of a higher closing volume that encroaches on the functional residual capacity (FRC). This may necessitate the use of positive end-expiratory pressure (PEEP) or continuous positive airway pressure (CPAP) during or after anesthesia. The Mapleson D anesthesia circuit is the most popular breathing system used for administration of anesthesia as well as for oxygenation during transport of critically ill pediatric patients weighing 20 kg or less.

Gregory et al applied CPAP to the Mapleson D circuit by varying occlusion of the tail of the rebreathing bag; a tube connected to a Sommers T-piece within the Mapleson D with its tip 30 cm underwater acted as a pop-off valve. We find this system effective although cumbersome. Consequently, we assembled the following apparatus to incorporate a PEEP valve in the Mapleson D circuit. The device (fig. 1) consists of a Vital Signs PEEP valve in the expiratory limb and a Hudson unidirectional valve in the inspiratory limb. These valves are located in a loop consisting of plastic corrugated tubings, a “Y” and “T” adaptor, and various couplings. The entire assembly is interposed between the expiratory limb and the pop-off valve with a rebreathing bag. This is a lightweight device that can be fabricated from readily available components. The Vital Signs PEEP valve is a threshold resistor and can be used predictably in any position. Potentially dangerous high pressures during coughing or bucking are less likely to develop. Each valve assembly has one definite pressure setting in increments of 2.5, 5, 7.5, 10, and 12.5 cmH2O. The Hudson one-way valve likewise is light and has a low inspiratory resistance.

Expired gas flows from the Mapleson expiratory limb to the “Y” adaptor, the PEEP valve, and thence to the pop-off valve and bag assembly. On inspiration, gas flows to the patient from the bag through the inspiratory limb, inspiratory valve, and the Mapleson corrugated tubing.

This device has been most effective in meeting requirements for PEEP and CPAP during the perioperative period in more than 40 patients. Its simplicity and positional flexibility are major advantages over previously described apparatus designed to accomplish the same purpose.

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REFERENCES


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