

patients may explain the infrequent incidence of tachyphylaxis in this age group.

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## Use of the Columbia Pediatric Circle Valve for Respiratory Studies in the Neonate

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Respiratory studies in newborn infants have been hampered by the difficulty of collecting expired gas samples. Golinko and Rudolph<sup>1</sup> designed a nonbreathing valve based on the fact that most quiet healthy infants breathe through the nose. This valve, which is inserted into the infant's nostrils, has minimal resistance to respiration, a deadspace of 0.8 ml, and permits collection of expired air via an open-circuit system. However, when we attempted to measure the tidal volume in neonates at 10, 20, and 30 minutes after birth, many nondepressed infants reacted to even the most gentle insertion of the nasal valve by prolonged bouts of crying, and establishment of a quiet state was markedly delayed. Recently, Rackow and Salanitro<sup>2</sup> designed a pediatric unidirectional valve (Columbia pediatric circle valve)<sup>o</sup> which can be used with either a mask or an endotracheal tube. This valve has a deadspace of only 0.5 ml and, at the peak air velocity of a full-term infant breathing quietly, its resistance is negligible. Combined with a single canister, the valve

was employed satisfactorily in several thousand infants and children receiving inhalation anesthesia.<sup>3</sup>

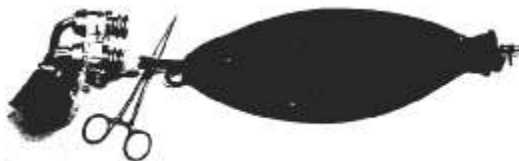
We have used the Columbia pediatric circle valve successfully for respiratory studies of the neonate by adapting the tail-end of a three- or five-liter anesthesia bag to the expiratory valve opening. The mouth of the anesthesia bag is closed by a stopper into which a two-way stopcock is incorporated for sampling (fig. 1). Two operators are necessary to complete the collection. The valve, with the expiratory unit lowermost and the pop-off tightly closed, is attached to a Rendell-Baker mask<sup>4</sup> of proper size, which is placed gently but firmly over the infant's mouth and nose. After a quiet state has been obtained (usually less than one minute), the empty bag, with the tail closed by a clamp, is connected to the expiratory-valve opening, and the clamp is released on the first inhalation. Exhaled air is collected for two or three minutes as desired. Then the tail of the bag is reclamped and the mask removed. Ten ml of air are withdrawn for carbon dioxide (and oxygen) tension determinations. The remaining gas volume is measured in a spirometer.

To date, 40 unselected clinically nondepressed neonates have been studied. At 10-12

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FIG. 1.



minutes after birth, minute volume ranged from 280 ml in an infant weighing 1,980 gm to 1,580 ml in an infant weighing 4,590 gm, and averaged 860 ml in 13 infants whose birth weights varied between 3,300 and 3,700 gm. A relationship between minute volume and body weight of the newborn has been observed by others utilizing a plethysmograph<sup>5,6</sup> or a contour face mask and double-box with spirometer<sup>7</sup> at 2½ hours to 16 days of life. Repeat measurements at 20 and 30 minutes after birth in 12 of our infants showed insignificant increases over the 10-minute values. In the absence of data for comparing our findings with other studies, no definitive statement can be made regarding the usefulness of our technique at this time. However, the method is simple and seems to offer a promising solution to a needed investigation of the effect of maternal analgesia and/or anesthesia on respiratory function of the neonate.

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#### Surgery

**SELF-INFLATING TRACHEOSTOMY CUFF** A silastic silicone rubber cuff that is self-inflating in that the tracheal-occluding shape is maintained without added air pressure has been designed. Air may be added or withdrawn using a pilot tube. The cuff is fastened to the tube with epoxy resin. One size of cuff fits several sizes of tracheostomy tubes. The tracheostomy tube is inserted with the cuff in the collapsed position. In patients with very large tracheas, a small amount of positive pressure may be added to cause tracheal occlusion, but this is usually not necessary. The cuffs are nonirritating and do not need periodic deflation and inflation. Tube and cuff can be left in place safely for the duration of a prolonged illness. (Auchincloss, J. H., and others: *A New Self-inflating Tracheostomy Cuff of Silicone Rubber for Use in Patients Requiring Mechanical Aid to Ventilation*, *Amer. Rev. Resp. Dis.* 97: 706 (April) 1968.)