Respiration

COLLATERAL VENTILATION Alveolar pores (pores of Kohn), as well as communications between bronchioles and alveoli and interbronchiolar communications, have been demonstrated in several species, including man. In this study, superior segments of right lower lobes of excised lungs of dogs were ventilated with helium through one cannula while the remaining four segments of the lobe were ventilated with oxygen through another cannula. When all segments of the lobe were ventilated at the same pressure, negligible amounts of helium were detected in the expirate from the lower segments. When pressure in the upper, helium-ventilated segment was elevated above that of the rest of the lobe, appreciable quantities of helium appeared in the expirate from the lower lobes, and the rate of helium transfer was proportional to the pressure gradient between upper and lower segments. Alveolar pores are normal features of lung structure and do not represent effects of wear and tear or degenerative lung changes. Collateral ventilation does not occur between lobes, but represents an important mechanism for maintenance of pulmonary gas exchange in the face of airway obstruction at the sublobar bronchial level. (*Baker, D. H., and Daly, W. J.: Collateral Ventilation Demonstrated by Helium Transfer, J. Appl. Physiol. 26: 321 (March) 1969.*)

VENTILATION-PERFUSION RATIO The distribution of pulmonary ventilation and perfusion was studied in man before and during exposure to −40 mm Hg lower-body negative pressure. Using the inhalation and intravenous injection of xenon-133, the ratio of ventilation per unit volume to perfusion per unit volume was assessed. Counters were placed anteriorly over the upper, middle, and lower lung as well as laterally over the dorsal and ventral lung. The changes in ventilation and perfusion distribution due to gravity were readily apparent, while exposure to lower-body negative pressure had no effect. These data support the concept that the distribution of ventilation and perfusion in the normal lung is essentially gravity-dependent and that the changes in lung volume, mechanics and perfusion produced by −40 mm Hg on the lower body have no appreciable effect on this distribution. (*Dowell, A. R., and others: Effect of Lower Body Negative Pressure upon Pulmonary Ventilation and Perfusion as Measured Using Xenon-133, Acrospace Med. 40: 651 (June) 1969.*)

UNILATERAL HYPOVENTILATION Effects of unilateral hypoventilation produced by occlusion of one air passage of a Carlens' tube during differential bronchospirometry on the distribution of pulmonary blood flow were studied in man by measuring elimination of 85-krypton. When the occlusive maneuver was performed during breathing of air, there was a significant shift of pulmonary blood flow from the occluded to the nonoccluded lung, and total ventilation decreased. During oxygen breathing, the shift in blood was minimal and total ventilation did not change. Thus, obstruction of one lung caused a shift of blood to unobstructed regions. The most important cause of the shift was hypoxia, since only a small change occurred during oxygen breathing. Hypercapnia was also of some importance, so that changes in gas tensions were of greater significance than mechanical factors in causing shifts of pulmonary blood flow. Decrease in total ventilation during air of breathing with one lung obstructed may reflect more optimal CO_2 elimination because of improved V/Q relationships as more blood flows through ventilated lung. (*Arborelius, M., Jr.: Influence of Unilateral Hypoventilation on Distribution of Pulmonary Blood Flow in Man, J. Appl. Physiol. 26: 101 (Jan.) 1969.*)

RESPIRATORY DEADSPACE Effects of changes in tidal volume on deadspace were investigated in patients with obstructive airway disease. Results were compared with the behavior of lung models under analogous circumstances. Absolute volumes of physiologic deadspace, and alveolar deadspace and the alveolar deadspace:tidal volume ratio could be changed by changes in tidal volume alone. The amount of tidal volume constituting physiologic deadspace (V_D/V_T) did not vary more than 0.05 with tidal volume. A change in V_D/V_T greater than 0.05 in response to a