camera system provides a complete view from the perspective of the laryngoscopist, including essential oropharyngeal elements.

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**Alveolar Oxygen Partial Pressure, Alveolar Carbon Dioxide Partial Pressure, and the Alveolar Gas Equation**

To the Editor.—I wish to comment on a frequent misconception found in many textbooks of anesthesia and critical care concerning the alveolar gas equation. The usual form of the equation has led to the incorrect conclusion that a change in alveolar oxygen partial pressure (Pao2) following a change in alveolar ventilation (VA) is secondary to a change in the alveolar carbon dioxide partial pressure (Paco2). Paco2 does not change secondary to changes in Pao2, but depends on three factors: inspired oxygen partial pressure (Pao2), oxygen consumption (VO2) and alveolar ventilation. These three factors can be altered clinically to affect Paco2.

The alveolar gas equation, in its simplest form, derives Paco2 from the expression Paco2 = R • VO2/(VA − VO2), where R is the respiratory exchange ratio.1-3 From this original form of the equation, it follows that Paco2 is the production of carbon dioxide. To overcome practical problems in the measurement of Paco2, a second equation was derived: Paco2 = (VA − VO2) • VO2/VA.4 Further, a second equation relates Paco2 to VO2: Paco2 = (VA − VO2) • VO2/VA.5

Substituting equation 3 into equation 2, one finds that

\[ \text{R} \times \text{VO2} = \frac{\text{VA} \times \text{Paco2}}{(\text{VO2} - 47)} \]

or

\[ \frac{\text{VO2}}{\text{VA}} = \frac{\text{Paco2}}{\text{R} \times (\text{VO2} - 47)}. \]

Equation 4 demonstrates how the ratio VO2/VA from equation 1 is directly related to Paco2. Substituting equation 4 into equation 1, Paco2 = Pao2 − Paco2/R. Some authors assume that the alveolar gas equation also illustrates the underlying physiology and conclude that changes in Paco2 result in changes in Pao2.4

Therefore, the term Paco2/R in the alveolar gas equation is used as an indirect measure of VO2/VA. Further, the alveolar gas equation is one only valid under steady-state conditions with no inspired carbon dioxide, and as Paco2 approaches 1.0, a correction factor must be applied to allow for differences in inspired and expired volumes. This is explained more completely by Hlastala.5

**References**


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