A Lung Model for Testing Respiratory Quotient Measurements

To the Editor—In a recent issue of Anesthesiology, Damask and associates1 presented an article entitled, "A Systematic Method for Validation of Gas Exchange Measurements." They evaluated the accuracy of two commercially available instruments for metabolic studies. This type of investigation is of great interest and we feel that it is very important to test this type of equipment. We also think that a similar test ought to be performed with instruments constructed for awake, spontaneously breathing patients. The test method presented by Damask et al., has certain disadvantages; for example, only a fixed RQ level can be tested and CO₂ production and O₂ consumption cannot be analyzed together. Also, the effect of heat and humidity on measurements cannot be controlled. These problems can be solved by using the oxygen-consuming lung model we have presented.2 In this lung model, oxygen consumption is achieved by burning hydrogen gas delivered via a precision rotameter.

\[ 2 \text{H}_2 + \text{O}_2 \rightarrow 2 \text{H}_2\text{O} \]

Two volumes of H₂ consume one volume of O₂, which results in water vapor and heat. By the use of a cooling jacket around the lung model, the expiratory gas can be kept at 37º C and 100% water saturation. Carbon dioxide production is achieved through delivery of CO₂ into the lung model. Thus, both O₂ consumption and CO₂ production can be altered independently, which means that any RQ level can be tested. This lung model also mimicks the human situation as regards heat and humidity of expiratory gases, and can be used both for spontaneous and controlled ventilation.

Ola Stenqvist, M.D., Ph.D.
Hans Sonander, M.D.
Consultant Anesthetists
Department of Anesthesiology
Sahlgren Hospital
S-413 45 Gothenburg
Sweden

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