Thermal Monitoring in Continuous Mechanical Ventilation

To the Editor:

In their report of a seven-year-old boy suffering from bronchospastic tracheobronchitis related to tracheal burns, Klein and Graves indicated that “excessive gas temperatures” during continuous mechanical ventilation were the probable cause. Since the metal manifold thermometer was out of calibration, a glass thermometer was used, and the temperature of the inspired gas was found to be in excess of 43°C.

Unfortunately, the new Puritan-Bennett No. 0426 thermometer, which reads in both Fahrenheit and centigrade scales, is not capable of being recalibrated and must be replaced when drift occurs.

Klein and Graves stressed the importance of thermal monitoring, recalibration of thermometers, and “wrist” checking the gas flow in the same manner that a baby’s formula is checked.

In studies at this institution which incorporated multichannel thermal monitoring (Yellow Springs Tele-Thermometer, model 4002) throughout a respirator (Bennett MA-1) circuit, gas temperatures were recorded at various sites from the ventilator-humidifier “pot” to the patient interface or “wye.” Error attributed to placement of the thermometer has been discussed elsewhere. Although the temperature in the “pot” exceeded 60°C, the inspired gas at the patient interface never reached body temperature in this particular disposable circuit (B and F) (Fig 1).

We found a wide variation in the thermal capacity of Cascade equipment from ventilator to ventilator, suggesting that periodic recalibration of the heating elements be instituted and that dependence on the accuracy of the heating element’s dial be discouraged. One should also be aware that the loss of heat is more pronounced in disposable ventilator circuits than permanent tubing because of thinner wall structure.

Although one group of researchers found that high humidity potentiated oxygen toxicity in experimental animals, the importance of maintaining adequately humidified inspired gas while a patient is being mechanically ventilated is physiologically sound. Effective thermal monitoring can be instrumental in preventing overhydration, humidity deficit, or thermal injury to an already debilitated airway. Such caution is strategic in the total care of patients receiving continuous mechanical ventilation.

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References
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Figure 1. Temperature vs settings of humidifier (Cascade) and time.