Sarcoidosis and Gas Exchange Measures

To the Editor:

Dr. Medinger and her colleagues are to be commended for presenting data assessing the severity of sarcoidosis in 48 patients by using cardiopulmonary exercise testing with gas exchange measurements (July 2001). They noted that abnormalities in resting diffusing capacity of the lung for carbon monoxide (DLco) [an index of pulmonary capillary blood volume and maldistribution of ventilation] and peak exercise alveolar-arterial oxygen pressure difference (P[A-a]O2) [an index of impaired oxygen transfer] correlated especially well with the severity of radiographic findings.

Their collected data include arterial blood analyses and concurrent measurements of end-tidal PCO2 and mixed expired carbon dioxide at peak exercise. Accordingly, it would be relatively simple for them to retrospectively calculate the concurrent peak exercise arterial–end tidal PCO2 P(a-et)CO2 and dead space/tidal volume ratio (Vd/Vt), both indexes of wasted ventilation. In our experience, exercise P(a-et)CO2 and Vd/Vt both correlate with the severity of interstitial lung disease and abnormalities in resting DLCO and exercise P(A-a)O2 and are more frequently abnormal than P(A-a)O2 yet, as previously noted, neither exercise P(a-et)CO2 nor Vd/Vt tend to be calculated by many other investigators even when necessary data were available to them. Therefore, I encourage these investigators to calculate and correlate these two exercise indexes of wasted ventilation, P(a-et)CO2 and Vd/Vt, with their other reported measurements in their 48 patients.

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To the Editor:

We appreciate Dr. Hansen’s observations about our recent report of exercise measurements in 48 patients with sarcoidosis. Drs. Hansen and Wasserman concluded from their own analysis of exercise testing in 42 patients with a variety of interstitial lung diseases, that pulmonary vascular disease was a more significant impairment than ventilatory restriction in their patients. The objective of their analysis was to determine the pathophysiologic factor limiting peak exercise performance. They found that exercise impairment had a better negative correlation with the peak physiological dead space ventilation (P Vd/Vt) than with peak PaO2 (P PaO2). Furthermore, they found an excellent correlation of P Vd/Vt with peak arterial end-tidal carbon dioxide pressure difference [P P(a-et)CO2], and of P PaO2 with peak alveolar-arterial oxygen pressure difference [P P(A-a)O2].

The objective of our analysis was more pedestrian, namely the determination of a sensitive test to follow extent of disease in patients with sarcoidosis. Reviewing our data to analyze P Vd/Vt and P P(a-et)CO2 measurements, we found that P Vd/Vt correlated only moderately with P P(a-et)CO2 (r = 0.52), and that P PaO2 correlated well with P P(A-a)O2 (r = 0.97). P Vd/Vt was calculated using the arterial and concomitant mixed expired CO2 measurements at the point of P P(a-et)CO2 measurement. Table 1 shows the level of significance (calculated p) of these additional measurements relative to the radiographic extent of disease, across all radiographic stages of sarcoidosis (0–4) and across limited stage disease (0–2). We used a single factor analysis of variance (p = 0.05). The P Vd/Vt and P P(a-et)CO2 are significant across all radiographic stages of sarcoidosis. However, in contrast to our finding for the P P(A-a)O2 data (∆P(A-a)O2/∆Vd/Vt), the significance of Vd/Vt and P(a-et)CO2 is lost by subtracting the resting measurements from each and factoring the change in Vd/Vt.

Furthermore, we found that the P Vd/Vt correlated only moderately well with the diffusion measurements in the 30 patients with matched data (r = 0.78 for all radiographic stages; 0.65 for stages 0–2). P P(a-et)CO2 did not correlate well with radiographic stage (r = 0.47). ∆P(A-a)O2/∆Vd/Vt had the best correlation with diffusion in these patients (r = 0.88 for all stages and 0.81 for stages 0–2).

Hansen and Wasserman’s article included 4 of 41 patients with sarcoidosis. Most of their patients had asbestosis, pulmonary alveolar proteinosis, and idiopathic interstitial lung disease, all of which have a lower lobe predilection. Our patients all had biopsy-proven sarcoidosis, which characteristically involves the upper lobes of the lung. The upper lobes have a higher resting ventilation/perfusion ratio (V/Q) state than the lower lobes. Hence, interstitial disease favoring this region may have a relatively greater tendency to reduce overall V/Q ratio than to reduce perfusion during exercise. This may explain our finding of greatest significance in the association of ∆P(A-a)O2/∆Vd/Vt with the radiographic stage in stages 0–2 sarcoidosis.

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Table 1—Level of Significance (p Value) of Additional Measurements

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