RESULTS

A comparison of results between the test-strip method and the TDX reference method is displayed in Figure 1.

Potentially toxic values greater than 20 μg/ml obtained by the test-strip method were readily correlated with the TDX reference method. Disagreement occurred in one sample which had a level of 21 μg/ml by the test-strip method, compared to 16 μg/ml by the reference method.

DISCUSSION

Serum theophylline measurements using the test-strip method correlate well with the reference method. Where an Ames Seralyser instrument is used for other strip-tests such as glucose and CK measurement, use of the test-strip offers a relatively inexpensive (50¢) and rapid method of checking serum theophylline concentrations.

Victor E. Turckington, M.Sc.; and Amin A. Nani, M.D.,
Department of Laboratory Medicine,
Ottawa General Hospital
and University of Ottawa, Ottawa, Ontario, Canada

REFERENCES


Treadmill Exercise Test Performance Index

In analyzing the results of a group of serial treadmill exercise tests done as part of a research study, we were frustrated by the difficulty of comparing the different test results obtained in each patient under varying research conditions. Dissecting each test for its components of performance (time on treadmill, peak heart rate, blood pressure responses, et cetera) was laborious, and did not seem to provide sufficiently meaningful comparisons. In this particular study, serial treadmill exercise tests had been done in patients with stable angina pectoris, according to a modified Bruce protocol from stage zero. During a control phase, and then at various times during placebo and antianginal drug therapy, attempts to define objective evidences of treatment responses were unsatisfactory, even though that was the object of treadmill exercise testing.

With the aim of improving our ability to compare serial treadmill exercise test results, all of which were done with identical protocol, the following performance index was devised:

\[
\text{PERFORMANCE INDEX (PI)} = \frac{\text{Time on treadmill in seconds}}{\text{Peak systolic blood pressure \times peak heart rate \times } 10^{-4}} = \frac{\text{Time on treadmill in seconds}}{\text{Double product \times } 10^{-4}}
\]

Our preliminary assessment of this performance index, using the peak systolic blood pressure to calculate the double-product, indicates it to be of value in comparing exercise performance in serial treadmill studies. For example, as one would expect, this index reflects the effects of physical training very nicely. Thus, the PI for a person after 10 min on the treadmill, with peak systolic blood pressure of 200 mm Hg and a peak heart rate of 160 beats/min would be

\[
\frac{600}{200 \times 160 \times 10^{-4}} = \frac{720}{190 \times 150 \times 10^{-4}} = 1.88
\]

If, after training, treadmill time increased to 12 min and the peak blood pressure and heart rate were 190 mm Hg and 150 beats/min, respectively, PI would rise to

\[
\frac{720}{190 \times 150 \times 10^{-4}} = 2.53
\]

Having received encouragement about the performance index from Dr. Thomas Sheffield at the University of Alabama, we are trying to get further information about possible past use of such indices. We will appreciate any information from the readers of this journal. In any case, we hope others will test the utility of the performance index in assessing their exercise test data.

Albert J. Miller, M.D., F.C.C.P., and I. Martin Grais, M.D., F.C.C.P.,
Northwestern University Medical School,
Chicago

Reprint requests: Dr. Miller, Dept. of Medicine, Northwestern Memorial Hospital, 250 E. Superior, Chicago, IL 60611.

Immunoglobulin Abnormalities in Bronchoalveolar Lavage Specimens from Amiodarone-treated Subjects

To the Editor:

Amiodarone pneumonitis (AP) is an iatrogenic syndrome, well-described during the last few years.\textsuperscript{14} Pulmonary lesions, seemingly related in part to a toxic phenomenon, with accumulation within the phagocytic cells (ie, alveolar macrophages) of phospholipid lamellar bodies, may also result from an associated immunologic mechanism. Several lines of evidence argue for the latter, particularly the presence of numerous alveolar lymphocytes with a decreased T1/T2 ratio in the bronchoalveolar lavage (BAL) specimens.
Table 1—Comparison of Amiodarone-treated Subjects and Normal Subjects

<table>
<thead>
<tr>
<th></th>
<th>Albumine µg/ml</th>
<th>IgG µg/ml</th>
<th>IgM ng/ml</th>
<th>IgG/Alb µg/µg</th>
<th>IgM/Alb ng/µg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal subjects</td>
<td>26.5±11.2</td>
<td>4.9±4.3</td>
<td>11±14.5</td>
<td>0.16±0.09</td>
<td>0.37±0.37</td>
</tr>
<tr>
<td>Patients with Amiodarone pneumonitis</td>
<td>p&lt;0.05*</td>
<td>p&lt;0.01*</td>
<td>3750±3900</td>
<td>1.13±0.55</td>
<td>21.5±6.55</td>
</tr>
<tr>
<td>Amiodarone-treated subjects</td>
<td>30.3±9.2</td>
<td>12±6</td>
<td>106.5±145.6</td>
<td>0.48±0.376</td>
<td>2.9±3.5</td>
</tr>
<tr>
<td></td>
<td>NS</td>
<td>p&lt;0.05</td>
<td>p&lt;0.05</td>
<td>NS</td>
<td>p&lt;0.01</td>
</tr>
</tbody>
</table>

*Comparison to normal subjects.

from such patients, which gives to AP the same BAL cellular profile as hypersensitivity pneumonitis.4,5

To further analyze the immunologic processes involved in this disease, we evaluated the presence of both IgG and IgM in the BAL fluids from patients with AP. Immunoglobulins were quantitated by ELISA (enzyme linked immunosorbent assay). Albumin content was separately determined by immunonephelometric study. The assays were initially performed in four male patients (age 70±6 years) treated for arrhythmia or angina pectoris with oral amiodarone (1,000 mg/week) for a mean duration of 66±69 months (range, 22 to 156 months; mean cumulative dose, 373±250g). In these patients, AP was diagnosed on the basis of diffuse interstitial and/or alveolar opacities on chest roentgenographic films, associated with a mild-to-severe dyspnea and hypoxemia and an inflammatory syndrome. Every other etiology, especially acute cardiac failure, was ruled out by appropriate investigations (including cardiac catheterization). All patients subsequently improved after withdrawal of the drug associated with steroids, further confirming the diagnosis.

In these patients, an important elevation of IgG and, moreover, IgM (Table 1) in BAL fluid was found when compared to normal subjects. However, this phenomenon was accompanied by severe exudative lesions suggested by a high albumin level in BAL fluid from patients with AP. This exudation may explain in part the increased immunoglobulin levels, but IgG- and IgM-to-albumin ratios were significantly higher than in normal subjects, suggesting the hypothesis of a local production (or active transportation) of immunoglobulins in such patients.

To evaluate the relevance of these findings in AP, we also determined immunoglobulin levels in BAL fluid from subjects treated with amiodarone, but exhibiting no pulmonary abnormality, neither radiologically nor clinically, and with normal pulmonary function test results. Immunoglobulin and albumin values were assayed in BAL fluid of 6 amiodarone-treated subjects (age, 62±12 yrs) receiving amiodarone (1,000 mg/week, except in one case, 3,000 mg/week) for a mean duration of 35±26 months (range, 6 to 60 months; mean cumulative dose, 162±100 g). All data are shown on table 1.

Our results show an elevation of both IgG and IgM levels in BAL fluid of amiodarone-treated subjects, but at a lower degree than in patients with AP. However, the most striking difference between these two groups is the absence in the former group of albumin level increase in BAL fluid. This fact suggests that, when there is no obvious pulmonary involvement, there is no exudative alveolar lesions, only increased immunoglobulin levels. Thus, our findings may be interpreted as enhanced local immunoglobulin production in the alveolar structures. It is noticeable that this increased production also predominates on the IgM fraction, for only IgM-to-albumin ratio is significantly different from normal subjects in these cases. This point reflects another similarity with hypersensitivity pneumonitis, where IgM increase in BAL fluid has been reported.6 We conclude that immunological abnormalities do exist in the lungs of patients treated with amiodarone but exhibiting no pneumonitis. These abnormalities are attested by immunoglobulin (mainly IgM) level elevation in BAL fluid, and may represent the first immunological marker of an evolution towards hypersensitivity pneumonitis.

D. Sandron, M.D.; D. Israel-Biet, M.D.; A. Venet, M.D.; and J. Chretien, M.D., Hôpital Laennec, Paris, France

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Association of Ulcerative Colitis and Sarcoidosis?

To the Editor:

We recently encountered three patients with classical ulcerative colitis who developed histologically-proven sarcoidosis, stage III, in the course of their disease. In all three patients, no granuloma was seen on histologic examination of the biopsy specimen taken from the colonic mucosa, sulphasalazine was not administered prior to establishment of a diagnosis of sarcoidosis, and the chest X-ray findings were not consistent with the unexplained bronchopulmonary disease sometimes associated with ulcerative colitis.4 Although this association may be coincidental,2 we suggest a possible common initiating factor(s) in both disorders, in light of current knowledge about the immunoregulatory defects postulated for both disorders, namely: 1) heightened activity of circulatory killer and natural killer lymphocytes; 2) excess of helper T-lymphocytes in sites of disease activity in the intestinal mucosa and alveolar wall, respectively; and 3) the presence of circulating immune complexes and autoantibodies.4,5

Israel Rubinstein, M.D.; and Gerald L. Baum, M.D., FCCP, The Chaim Sheba Medical Center, Tel Hashomer and Sackler School of Medicine, Tel-Aviv University, Israel

Communications to the Editor