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Diagnostic Specificity of Serum Myoglobin Radioimmunoassay for Acute Myocardial Infarction is Improved by Using Age-, Sex-, and Race-Specific Reference Ranges

To the Editor:

Many investigators have demonstrated that myoglobinemia is an early quantitative index of acute myocardial infarction (AMI) (1); others find it to be less specific than serum creatine kinase (EC 2.7.3.2) isoenzyme MB (CK-MB) (2, 3). We demonstrated that serum myoglobin concentrations are sex-, age-, and race-related and suggested that the specificity of the test might be improved by using different reference ranges according to age, sex, and race (4). The reference range arbitrarily set to be the tolerance limits for coverage of at least 99% of the population with 95% confidence, determined from data on 292 apparently healthy subjects, was 18–63 μg/L (generalized reference range). In contrast, if the data were grouped according to age, sex, and race, the upper limits of reference ranges varied from 40 μg/L (20–50 years, female, black) to 91 μg/L (20 years, male, black) (4).

We studied 55 patients admitted to the coronary care unit of our medical center: 31 white (19 men, with two ≤50 years, and 15 women, with three ≤50 years) and 24 black persons (16 men, with four ≤50 years, and eight women, with three ≤50 years). Diagnosis of AMI was based on the clinical setting plus diagnostic electrocardiographic changes, myocardial scintigraphy, or serum CK-MB concentration, or some combination of these. Blood samples were routinely drawn 0, 6, and 12 h after admission. The mean peak myoglobin concentration (± one standard error of the mean) for 20 patients with AMI was 306 (53) μg/L, compared with 51 (8) μg/L for 35 patients without AMI. Diagnostic classifications based on peak serum myoglobin concentrations are shown in the following tabulation:

<table>
<thead>
<tr>
<th>No. patients</th>
<th>Age-, sex-, race-specific reference ranges (μg/L)</th>
<th>Generalized reference range (18–63 μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>With AMI</td>
<td>+</td>
<td>19</td>
</tr>
<tr>
<td>Without AMI</td>
<td>4</td>
<td>31</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>32</td>
</tr>
</tbody>
</table>

Sensitivity, specificity, and positive predictive values of the serum myoglobin concentrations were 95%, 89%, and 83%, respectively, when the age-, sex-, race-specific reference ranges were used; and 100%, 80%, and 74%, respectively, when the generalized reference range was used.

The only falsely negative patient was an 80-year-old black man whose myoglobin concentration was 64 μg/L at the time of admission (reference range 18–91 μg/L). This value decreased to 38 and 32 μg/L, respectively, 6 and 12 h after admission, which suggests that this patient had in fact had an AMI sometime before his admission.

Of four patients with a falsely positive test by both reference ranges, three had muscle trauma—a condition known to cause an increase in serum myoglobin concentrations. The other patient, a 57-year-old white woman, had myoglobin concentrations of 267 μg/L at 6 h and 33 μg/L at 48 h after admission; the corresponding values for total CK were 243 and 75 U/L, respectively (reference range: 0–80 U/L). CK-MB was not detected. No electrocardiographic changes suggestive of AMI were observed. No myocardial scintigraphy was performed. This patient was admitted to the coronary care unit for ill-defined epigastric pain. Chronic obstructive pulmonary disease was also present. The remaining three falsely positive patients were black men with peak myoglobin concentrations of 91, 90, and 68 μg/L, respectively, which are negative when the reference range of 18–91 μg/L specific for black men is used, but are positive when the generalized reference range of 18–62 μg/L is used.

Thus the results of our study with a limited number of coronary care unit patients indicate that the specificity of myoglobin RIA can be improved, especially among black men, by using different reference ranges specific for age, sex, and race, and that the diagnostic efficiency of serum myoglobin RIA compares favorably with that of serum CK-MB reported recently by Witherspoon et al. (5). However, more data are needed to determine whether serum myoglobin RIA with age-, sex-, and race-specific reference ranges is as useful as serum CK-MB in early diagnosis of AMI.

References


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IL 1303: Viscous Specimens Can Cause Problems

To the Editor:

We would like to call attention to a problem in the analysis of arterial blood gases in specimens of extremely high viscosity. Such specimens will apparently go through the visible pathway of the IL 1303 (1) but will trigger an error code, SAMPLING ERROR. Such error messages, in our experience, have frequently been spurious and therefore may prompt the technologist to disregard the message. The specimen, run again, will reproduce the same numbers, and corresponding control specimens will run correctly. We describe a case that illustrates that acceptance of such results may be dangerous.

The problem in question presents with polycythemia secondary to dehydration and hypoxia. The patient's hematocrit concentration was 50%. The whole-blood viscosity was much above normal (4.338 Pa·s at 37°C).

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