Evaluation of ceruloplasmin concentration in prognosis of human cancer.

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Abstract

The serum ceruloplasmin concentration was determined in cancer patients before and after radiotherapy, and after relapse of cancer. The ceruloplasmin concentration in patients who responded to therapy, decreased to the range of normal controls. In patients who did not respond to treatment, the ceruloplasmin concentration was more or less elevated. In patients with relapse of cancer, the ceruloplasmin concentration was higher than before treatment.

KEYWORDS: ceruloplasmin, cancer, prognosis, relapse

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Evaluation of Ceruloplasmin Concentration in Prognosis of Human Cancer

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Ceruloplasmin is a copper protein with feroxidase activity present in mammalian serum (1, 2). Its elevation in patients with some types of malignant tumors has been reported by several investigators, and earlier studies revealed that there was a positive correlation between the ceruloplasmin values and the clinical condition of patients (3–5). In patients who responded to therapy, the ceruloplasmin concentration stopped increasing and then fell, whereas it remained high or became higher in those who did not respond to therapy (7). In the present study, the serum ceruloplasmin concentration was examined in cancer patients who did not respond to radiotherapy and in those with relapsing cancers.

Materials and Methods

The patients with Stage II and Stage III cancer of the cervix uteri received three radium applications followed by Cobalt 60 radiation 18 to 22 times. Blood was collected from these patients before treatment, when tumors regressed to 2/3 of the original size and when cancer relapsed. The serum was separated and stored at -20°C till test. Relapse of cancer was confirmed histologically.

The assay of ceruloplasmin activity was performed according to the spectrophotometric procedure of Ravin et al. at 37°C, in the presence of 0.01M EDTA to prevent non-specific substrate oxidation (6). The statistical analysis was done using Student’s “t” test. Results were considered significant when p < 0.05.

Results

Table 1 shows the serum ceruloplasmin concentration in cervical cancer patients who responded to treatment. The ceruloplasmin concentration in cervical cancer patients was 31.9–40.9 mg/dl as compared to 27.0 mg/dl in control. In Stage II cancer patients, a 15% decrease of ceruloplasmin concentration was observed after treatment. In Stage III cancer patients, a 39% decrease was observed after treatment.

In patients who did not respond to radio-
Table 1  Serum ceruloplasmin concentration in cervical cancer patients responding to radiotherapy

<table>
<thead>
<tr>
<th>Stage of cancer</th>
<th>No. of patients</th>
<th>Ceruloplasmin concentration</th>
<th>Before therapy</th>
<th>After therapy (%Ratio)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>26</td>
<td>27.7±2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>10</td>
<td>31.9±3.8</td>
<td>27.0±3.0 (85%)</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>8</td>
<td>40.9±3.2</td>
<td>25.0±5.0 (61%)</td>
<td></td>
</tr>
</tbody>
</table>

a: Healthy women of similar ages  
b: Mean ± SEM (mg/dl).  
c: %Ratio to the concentration before therapy.

Table 2  Serum ceruloplasmin concentration in cervical cancer patients not responding to radiotherapy

<table>
<thead>
<tr>
<th>Stage of cancer</th>
<th>No. of patients</th>
<th>Ceruloplasmin concentration</th>
<th>Before therapy</th>
<th>After therapy (%Ratio)</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>6</td>
<td>34.1±3.1</td>
<td>45.1±3.2 (132)</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>6</td>
<td>40.4±3.2</td>
<td>43.3±5.2 (107)</td>
<td></td>
</tr>
</tbody>
</table>

a: Mean ± SEM (mg/dl).  
b: %Ratio to the concentration before therapy.

c: %Ratio to the concentration before therapy.

Table 3  Serum ceruloplasmin concentration in patients showing relapse of cancer

<table>
<thead>
<tr>
<th>Type of cancer</th>
<th>No. of patients</th>
<th>Ceruloplasmin concentration</th>
<th>Before therapy</th>
<th>After relapse (%Ratio)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>26</td>
<td>26.3±3.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast</td>
<td>5</td>
<td>33.5±2.4</td>
<td>43.1±3.2 (129)</td>
<td></td>
</tr>
<tr>
<td>Penis</td>
<td>6</td>
<td>36.0±1.0</td>
<td>51.8±4.2 (144)</td>
<td></td>
</tr>
<tr>
<td>Mouth</td>
<td>4</td>
<td>34.8±1.1</td>
<td>37.9±2.3 (109)</td>
<td></td>
</tr>
</tbody>
</table>

a: Healthy persons of similar ages.  
b: Mean ± SEM (mg/dl).  
c: %Ratio to the concentration before therapy.

discussion

The ceruloplasmin concentration showed a positive correlation with the regression of tumors in cervical cancer patients. The arrest of rise and the subsequent fall of the ceruloplasmin concentration in patients under treatments marked the onset of remission. Similar statistically significant changes of the ceruloplasmin concentration in untreated and treated patients have been reported in patients with Hodgkin's disease (5).

The ceruloplasmin concentration was significantly elevated in patients with relapse of cancers of the breast, the penis and the mouth. This result suggests that the ceruloplasmin concentration might be a useful marker in early detection of relapse. However, this requires further investigations.

References

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