Abstract. Objective: The purpose of this work was to investigate the relationship between the tumor volume and the endogenous selenium levels in untreated head and neck cancer patients. Materials and Methods: One hundred consecutive patients were included in this study. We measured the endogenous levels of selenium in the serum and the whole blood of all patients by atomic absorption spectrometry. Additionally, the activity of glutathione peroxidase and the concentration of malondialdehyde were observed. The resectability of the tumor was used as an independent marker of the tumor volume. Results: Thirty-one out of 100 patients had resectable tumors, while 69 patients were characterized as unresectable. The following median results were obtained (resectable versus unresectable): Serum Se 0.90 µmol/l versus 0.78 µmol/l (p = 0.024); whole blood Se 1.00 µmol/l versus 0.93 µmol/l (p = 0.139); glutathione peroxidase 145 U/l versus 148 U/l (p = 0.93); and malondialdehyde 2.21 mmol/l versus 2.6 mmol/l (p = 0.84). Conclusion: The concentration of serum selenium shows a significant relationship with tumor resectability in patients with advanced head and neck cancer.

Patients with malignant diseases are characterized by a changed status in serum trace elements (1). We have previously reported data about the status of trace elements in untreated head and neck cancer patients showing decreased serum concentrations of selenium and zinc as well as increased serum concentration of copper (2). These elements are essential co-factors of different detoxifying enzyme systems such as glutathione peroxidase, superoxide dismutase and different isoenzymes of deiodase. Due to decreased enzyme activities, the endogenous concentration of aggressive free radicals is elevated and this phenomenon seems to be an essential base for the higher toxicities of various antineoplastic agents (3).

The present study investigates the relationship between the stage of the malignant disease and the concentration of selenium in the serum and whole blood of patients with advanced head and neck cancer. We examine, in the hypothesis, that the concentration of the trace element is related to the tumor volume and may be a new serum marker of tumor activity.

Materials and Methods

Patients. One hundred patients with advanced head and neck cancer were included to the study (UICC II – 5 patients, UICC III – 25 patients, UICC IV – 70 patients) before starting any kind of antineoplastic therapy. Fifteen women and 85 men took part in the study. The median age was 5 years (range 30-82 years). Tumor localization is summarized in Table I. The complete data of the patients have been previously published (2).

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Key Words: Head and neck cancer, serum selenium, resectability.
Results

Table II summarizes the results of atomic absorption spectrometry. A significant difference was seen only in the median serum selenium concentration between both groups. The statistical analysis showed only a trend to lower selenium concentrations in the group of patients with larger tumors. The redox data of both groups are compared in Table III. These measurements showed no difference in the activity of the glutathione peroxidase. Malondialdehyde was higher in patients with non resectable tumors, however, a significant difference could not be established because of the wide range in the individual MDA concentrations.

Discussion

Tumor markers are characterized by a low sensitivity in head and neck cancer patients (4). Previous investigations have shown that changed serum levels of trace or ultra trace elements may have a diagnostic role as independent tumor markers (5, 6). The decreased concentration of selenium is one of the serum characteristics in patients with advanced head and neck cancer (7). It has often been observed together with changed immunosuppressive situation, as described by the reduced function of lymphocytes (8, 9). Previous studies have also discussed the role of serum selenium as a marker of tumor activity in patients with hematological malignancies (10), indicating a correlation between the actual serum selenium level and the effectiveness of antineoplastic treatment. Our data also suggest a correlation between the median serum selenium level and the possible treatment schedule.

References


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Table I. Tumor localization.

<table>
<thead>
<tr>
<th>Tumor</th>
<th>Resectable (n=31)</th>
<th>Non resectable (n=69)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oropharynx</td>
<td>8</td>
<td>24</td>
<td>32</td>
</tr>
<tr>
<td>Hypopharynx</td>
<td>5</td>
<td>23</td>
<td>28</td>
</tr>
<tr>
<td>Supraglottis</td>
<td>4</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Glottis</td>
<td>5</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>Others</td>
<td>7</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

Table II. Median (range) selenium levels (atomic absorption spectrometry).

<table>
<thead>
<tr>
<th>Tumor</th>
<th>Resectable (n=31)</th>
<th>Non resectable (n=69)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum (μmol/l)</td>
<td>0.90</td>
<td>0.78</td>
<td>0.02</td>
</tr>
<tr>
<td>(0.54-2.08)</td>
<td>(0.39-1.50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole blood</td>
<td>1.00</td>
<td>0.93</td>
<td>0.14</td>
</tr>
<tr>
<td>(μmol/l)</td>
<td>(0.54-1.54)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table III. Median (range) data of redox status

<table>
<thead>
<tr>
<th>Tumor</th>
<th>Resectable (n=31)</th>
<th>Non resectable (n=69)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glutathione peroxidase</td>
<td>145</td>
<td>148</td>
<td>0.93</td>
</tr>
<tr>
<td>(Units / l)</td>
<td>(92-215)</td>
<td>(12.9-234)</td>
<td></td>
</tr>
<tr>
<td>Malondialdehyde (μmol/l)</td>
<td>2.205</td>
<td>2.56</td>
<td>0.85</td>
</tr>
<tr>
<td>(1.24-11.5)</td>
<td>(1.07-12.5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>