GLYCOSAMINOGLYCANS IN NEUROFIBROMAS

Tetsuo Sasaki and Satoshi Onodera

Department of Dermatology, Yokohama City University School of Medicine, Yokohama, Japan and Department of Clinical Chemistry, Showa College of Pharmaceutical Sciences, Tokyo, Japan.

One of the histological characteristics of neurofibromas (NFs) of von Recklinghausen's (R) disease is that mucinous change or mucoid degeneration of the stroma is often observed. In this study we examined glycosaminoglycan (GAG) contents in NFs of R disease and the senile type, with special reference to the correspondence with their histological features.

MATERIALS AND METHODS

Eleven NFs from five patients with R disease, two senile NFs and control skin were biopsied. A part of each biopsy specimen was cut for ordinary microscopic examinations. Connective tissue around each tumor was then removed and the tumor alone was weighed. Each sample was dried in a vacuum desiccator, weighed again, and subjected to pronase digestion and deproteinization. The isolated GAGs were then fractionated and quantitated with two-dimensional electrophoresis on cellulose acetate membranes.

RESULTS AND DISCUSSION

Eight tumors were located in dermis and not encapsulated. Cellular components were more abundant, while myxomatous changes in the matrix were slighter. These findings were consistent with those of cutaneous NFs most commonly seen in patients with R disease (Fig 1a) or of senile NFs sometimes seen in elderly people. Three tumors were situated in subcutaneous tissue, encapsulated and originating in peripheral nerves. Cellular components were sparse and collagen bundles very thin and loose in the myxomatous matrix. These findings indicated plexiform NFs (Fig 1b).

Fig 1. Histopathology of a cutaneous neurofibroma (a) and a plexiform neurofibroma (b) (hematoxylin-eosin stain; x 50).
Sasaki T et al: Glycosaminoglycans in neurofibromas

GAG content, expressed as values per dry weight (DW) of the tumor tissues, together with DW / wet weight (WW) ratios is shown in Table 1 and Figure 2. The DW/WW ratios were decreased in all tumors examined compared to those in the normal controls (31.2%); the plexiform NFs being lowest (10.6%; p<0.01 vs control), and the cutaneous NFs (15.9%; p<0.01 vs control) and senile NFs (20.0%) were median between the normal controls and the plexiform NFs. In the plexiform NFs, hyaluronic acid (HA) content (6.51 μg/mg, 72% of the total GAGs) was most increased and dermatan sulfate (DS) content (1.24 μg/mg, 19%) most decreased, resulting in a marked decrease in the DS/HA ratio (0.27). In both cutaneous and senile NFs there was a moderate decrease in DS content, an increase in chondroitin sulfate and heparan sulfate content, and a slight increase in HA content, thus resulting in a moderate decrease in the DS/HA ratio (Table 1, Fig 2).

These biochemical results seem to correspond closely to the clinical and histopathological findings for these tumors.

REFERENCE


Table 1. Glycosaminoglycan content in the neurofibromas and the control dermis

<table>
<thead>
<tr>
<th>Tumor</th>
<th>DW/WW(%)</th>
<th>HA</th>
<th>GAG content (μg/mg DW tissue)</th>
<th>DS</th>
<th>CS</th>
<th>HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutaneous NF (n=8)</td>
<td>15.9±3.6</td>
<td>3.64±1.98</td>
<td>1.46±0.74</td>
<td>0.54±0.43</td>
<td>0.32±0.34</td>
<td>0.41±0.03</td>
</tr>
<tr>
<td>Plexiform NF (n=3)</td>
<td>10.6±1.8</td>
<td>6.51±4.61</td>
<td>1.24±0.22</td>
<td>0.68±0.40</td>
<td>0.04±0.06</td>
<td>0.27±0.12</td>
</tr>
<tr>
<td>Senile NF (n=2)</td>
<td>20.0±2.2</td>
<td>3.53±0.32</td>
<td>1.37±0.18</td>
<td>0.40±0.11</td>
<td>0.14±0.05</td>
<td>0.39±0.02</td>
</tr>
<tr>
<td>Control (n=2)</td>
<td>31.2±4.1</td>
<td>3.30±0.20</td>
<td>1.63±0.08</td>
<td>0.13±0.13</td>
<td>0</td>
<td>0.50±0.01</td>
</tr>
</tbody>
</table>

The values in parenthesis are fractionated GAG as a percentage of total GAGs in the individual tissue. *Mean ± SD.

Fig 2. Glycosaminoglycan content in the neurofibromas and the control dermis.