Malignant Fibrous Histiocytoma of Soft Tissue with Metaplastic Bone and Cartilage Formation: A New Radiologic Sign

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Abstract. The presence of bone and cartilage in some cases of malignant fibrous histiocytoma of the soft tissue as a microscopic finding has been reported previously but little note has been taken of the radiologic manifestations of these tumor elements. A series of five such cases with sufficient metaplastic osseous and cartilaginous elements to produce roentgenographic evidence of their presence is reported here. An additional two cases showed only histologic evidence of bone or cartilage formation.

The reactive ossification tends to be peripheral in location, involving the pseudocapsule of the sarcoma or its fibrous septa. In three there was a zoning pattern with peripheral or polar orientation, strongly suggesting the diagnosis of myositis ossificans. The latter was the diagnosis considered radiologically in four of the five cases. Malignant fibrous histiocytoma with reactive bone and cartilage must be considered in the differential diagnosis of soft tissue masses with calcific densities, particularly when these occur in tumors of the extremities.

Key words: Malignant fibrous histiocytoma – Soft tissue – Metaplastic bone and cartilage – Myositis ossificans

The role of the radiologist in evaluating soft tissue tumors is a limited one. Through the use of carefully planned plain films with selected views, xeroradiography, laminography, angiography, computerized tomography (CT), and in some cases radioisotope scanning [11], useful information can be obtained which contributes to the preoperative assessment of soft tissue tumors. The greatest value of these methods lies in determining the extent of involvement [1, 5, 7], but plain films can also offer clues as to the histologic type of a soft tissue tumor if attention is paid to the presence and pattern of calcification or ossification sometimes found in benign and malignant soft tissue masses (Table 1).

We have recently encountered a series of malignant fibrous histiocytomas (MFH) of soft tissue which were characterized by metaplastic bone and cartilage which developed in response to the tumor and which produced characteristic radiographic changes suggesting myositis ossificans [2]. The range of patterns and significance of this finding is the subject of the present report.

Materials and Methods

The cases forming the basis of this report were derived from the consultation files of one of us (HDD) and the surgical pathology files of Sinai Hospital of Baltimore from 1971 to 1981. All tumors diagnosed as malignant fibrous histiocytoma of soft tissue were reviewed for the presence of metaplastic bone and cartilage, and an attempt was made to correlate the radiologic findings in these cases with the presence of these mineralized matrix elements.

Thirty-nine cases of soft tissue malignant fibrous histiocytoma were diagnosed during this period. Seven cases were found to
Table 2. Bone and cartilage in soft tissue malignant fibrous histiocytoma

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age (years)</th>
<th>Location</th>
<th>Size (cm)</th>
<th>Treatment</th>
<th>Histology</th>
<th>Bone</th>
<th>Cartilage</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>34/M</td>
<td>Right forearm</td>
<td>3.5 x 2.5 x 2.5</td>
<td>Excision</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Lost to follow-up</td>
</tr>
<tr>
<td>2.</td>
<td>32/F</td>
<td>Right thigh</td>
<td>8.0 x 3.5 x 3.0</td>
<td>Excision</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Alive and well, 4 years</td>
</tr>
<tr>
<td>3.</td>
<td>10/F</td>
<td>Left leg</td>
<td>6.0 x 3.0 x 3.0</td>
<td>Excision</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>Alive and well, 3 years</td>
</tr>
<tr>
<td>4.</td>
<td>67/F</td>
<td>Left thigh</td>
<td>7.0 x 4.0 x 3.5</td>
<td>Excision</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>Alive and well, 7 months</td>
</tr>
<tr>
<td>5.</td>
<td>55/M</td>
<td>Left thigh</td>
<td>22.0 x 13.0 x 9.0</td>
<td>Hip disarticulation</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Alive and well, 5 months</td>
</tr>
</tbody>
</table>

Fig. 1 A-D. Case 5. A Radiograph of soft tissue MFH with myositis ossificans-like peripheral metaplastic bone formation. B Disarticulation specimen with large, deeply situated sarcoma bisected. Note sharp circumscription and hemorrhagic necrosis. Gritty areas in the peripheral pseudocapsule correspond to those areas of density seen in CT scan (C) and specimen radiograph.

Histopathology

All of the tumors showed the characteristic features of pleomorphic malignant fibrous histiocytoma with areas of storiform pattern and bizarre histiocytic and fibroblastic cellular elements [4, 9]. The pleomorphic histiocytic cells often showed foamy or vacuolated cytoplasm. Multinucleated tumor giant cells and giant cells of the Touton type were seen in variable numbers (Fig. 2A, B). Mitoses, both typical and atypical, were usually numerous. Of the various sub-types of malignant fibrous histiocytoma (myxoid, angiomatoid, inflammatory, or xanthogranulomatous) only one, Case 3, showed the histologic features of the malignant giant cell tumor of soft tissue, now regarded as a variant of MFH.

The osseous or cartilaginous elements were present in variable amounts in these five tumors. In all cases the peripherally located contain bony and cartilaginous tissue microscopically, and five of these showed punctate and curvilinear soft tissue densities strongly suggestive of myositis ossificans radiologically (Table 2).

Gross Pathology

The excised tumors ranged in size from 3.5 to 22.0 cm in their greatest dimension and were well circumscribed, usually with a thin connective tissue pseudocapsule (Fig. 1B). All five were located in the deep soft tissue of the extremities. The presence of grossly evident gritty calcific or ossified areas was recorded in four of the five cases. Specimen roentgenograms revealed trabecular bone always located in the peripheral pseudocapsule rimming the tumor or in fibrous septa extending into the mass (Fig. 1D).