Pleomorphic Large Cell Sarcoma of the Spleen with Rhabdomyosarcomatous Differentiation*

JERRY Z. GONG, M.D.,1 JAMES D. SULLIVAN, M.D.,2 SAUL TEICHBERG, Ph.D.,1 and STEVEN I. HAJDU, M.D.1

Division of Surgical Pathology and Cytopathology, Department of Pathology,1 and the Department of Surgery,2 North Shore University Hospital, Manhasset, New York 11030

ABSTRACT

An unusual case is reported of pleomorphic large cell sarcoma of the spleen with rhabdomyosarcomatous differentiation in a 34-year old male. According to our knowledge, such a neoplasm has never been reported in the literature.

Introduction

The spleen is an organ of mesenchymal derivation in which sarcomas may be found. However, primary sarcoma of the spleen is rare. Neoplasms of the spleen with vasoformative elements, fibroblasts, and adipose cells have been reported in the literature.1 Primary sarcoma with skeletal muscle differentiation, according to our knowledge, has never been reported.

Case Report

A 34-year old white male presented with persistent cough, fever, and night sweat. Clinical evaluation with consideration of recent travel to Malaysia included peripheral blood smear and bone marrow biopsy studies that showed no abnormality. CT scan of the abdomen revealed massive splenomegaly [figure 1] and small intrahepatic nodules. Lymphadenopathy limited to the splenic hilum was also noted. Clinical and radiologic impressions were malignant lymphoma. On abdominal and retroperitoneal exploration, after the diagnosis of pleomorphic malignant tumor, favor sarcoma was rendered on intraoperative frozen section, splenectomy, distal pancreatectomy, retroperitoneal lymphadenectomy, and biopsy of the liver were performed. The patient had an uneventful postoperative course and was discharged one week after surgery, pending readmission for further treatment.

The spleen was massively enlarged, weighing 3200 grams. The capsule of the spleen was intact but there were multiple subcapsular tumor nodules. The splenic vessels were patent but they were compressed by enlarged hilar lymph nodes. The cut surface showed a large mass, measuring $20 \times 16 \times 10 \text{ cm.}$, almost completely replacing the spleen. The
tumor appeared pink to white, fleshy, with large areas of necrosis and multiple foci of hemorrhage [figure 2].

Microscopically, there was no distinct growth pattern. The tumor was composed of haphazardly arranged pleomorphic cells with numerous elongated spindle cells and polygonal tumor giant cells. The tumor cells showed distinct cell borders. The cytoplasm was acidophilic and occasionally showed striations in elongated and giant cells but the majority of cells showed ground glass, rhabdoid appearance without distant features of muscle differentiation. The nuclei were enlarged and contained prominent nucleoli. Atypical mitotic figures were frequent. There were many

Figure 1. CT scan shows a mass occupying the entire spleen.

Figure 2. Gross appearance of the tumor. The enlarged spleen contains a mass measuring 20 × 16 × 10 cm. The tumor is characterized by solid nodules with areas of necrosis and hemorrhage.
LARGE CELL SARCOMA OF THE SPLEEN

305

binucleated and multinucleated round and pleomorphic neoplastic cells. Areas with apoptosis and necrosis were many. Tumor cells were closely packed and the intercellular matrix was sparse [figures 3,4].

Typical cytologic features of high grade pleomorphic sarcoma were evident. The tumor infiltrated the splenic capsule with microscopic extension into soft tissues and lymph nodes in the hilum of the spleen. Tumor emboli were found in the splenic vein. Small nodules excised from the omentum and the liver contained neoplastic cells similar to those in the spleen.

Immunohistochemical stains showed strong positive reaction for vimentin and focal positive reaction for myoglobin. Smooth muscle actin, S-100 protein and neuroendocrine, endothelial, hematopoetic, epithelial, and germ cell markers were all negative.

Ultrastructurally, the cytoplasm of the tumor cells contained fairly elaborate rough endoplasmic reticulum, Golgi apparatus, focal basal lamina as well as occasional elongated bundles of thin filaments. Within the elongated filament clusters a dark band, resembling the Z band of striated muscle, was evident at focal sites [figure 5].

Cytogenetic study of neoplastic cells after routine plating showed a karyotype of 50–58, XY, with add (2)(p11), del(3), t(1;3)(p22;p13), +4, +4, +5, +add(5)(p15), +7, −8, −13, 2× del(15)(q15q26), −Y, +X, random loss, +marker.

The patient was readmitted ten days after discharge because of progressive shortness of breath with acute worsening. Chest x-ray and CT scan showed massive left pleural effusion and two nodules, each measuring less than one centimeter, in the right upper lobe and the right middle lobe of the lung. Abdominal and retroperitoneal radiologic examinations showed no new findings. Chemotherapy with intravenous adriamycin was started for three days but discontinued because of progressive worsening of the clinical course due to respiratory insufficiency, acidosis, and hyperkalemia. The patient expired two weeks after admission.

Discussion

Some of the soft tissue sarcomas are highly undifferentiated without clearly defined origin. Many of these tumors remain as completely primitive, undifferentiated sarcomas but others may undergo differentiation and develop into specific types of soft tissue sarco-
mas. The proportion of recognizable and specific neoplastic elements can be variable and problematic. It is well known that cytoplasmic cross-striation is a rare feature in both pleomorphic RMS as well as in embryonal RMS. Gaffney et al\(^2\) failed to find cross-striation in 11 cases of pleomorphic rhabdomyosarcoma even though they showed positive stains for myoglobin and desmin. Our case is comprised mostly of undifferentiated sarcomatous cells with approximately 5% of the cells showing rhabdomyosarcomatous features. These cells stained positive for myoglobin and showed ultrastructural evidence of cytoplasmic myofilaments. Hence, we feel that it is proper to define the neoplasm as pleomorphic large cell sarcoma with rhabdomyosarcomatous differentiation.

Malignant soft tissue neoplasms of the spleen are rare. Angiosarcoma is considered the most frequent primary sarcoma followed by malignant fibrous histiocytoma and liposarcoma.\(^1,3\) Inflammatory processes in the spleen which mimic soft tissue tumors have also been

---

**Figure 4.** Giant polygonal and strap cells are common features. (Haematoxylin-eosin, \(\times400\)).

**Figure 5.** Electron micrograph of a neoplastic cell with an elongated bundle of relatively parallel thin filaments. Note the alignment of the filaments to form a Z band-like dense structure perpendicular to the filaments (arrow). Other suggestive bands are also present (\(\times63,000\)).
reported. Hajdu studied 121 cases of pleomorphic RMS and found that the most frequent locations were thigh (37%), shoulder (11%), arm (9%), leg (9%), and chest wall (7%). Primary pleomorphic RMS in spleen was not found. He also studied metastatic pleomorphic RMS in autopsied cases. Among 25 cases with metastasis, there were only two cases with metastasis to the spleen. In both cases, the metastases were microscopic foci. Overall, metastasis of soft tissue sarcomas to the spleen was far less frequent than metastasis to other major organs. In only 13 of 151 autopsied cases were metastases to the spleen identified.

The present case showed typical features of primary malignant soft tissue neoplasm. Histologically, the tumor was composed of a large solid mass with frequent necrosis and hemorrhage. Clinically, the tumor was characterized by a rapidly expanding mass with documented liver and pulmonary metastases. Repeated whole body computed tomography scan and ultrasonography studies failed to reveal primary site other than the spleen. These findings, together with pathologic observations, strongly suggest that the spleen is the most likely primary site of the tumor.

Although the etiology of primary splenic sarcomas is uncertain, it is believed that malignant fibrous histiocytoma, angiosarcoma, and liposarcoma develop from primitive mesodermal elements. Splenic sarcoma with rhabdomyosarcomatous differentiation as well as classic pleomorphic RMS have never been reported in the literature, hence their etiology has never been studied. Rhabdomyosarcomatous differentiation of uterus and soft tissue neoplasms has been reported. Reports of RMS in organs devoid of skeletal muscle suggest growth and differentiation from primitive undifferentiated mesenchymal tissue.

In our case, intracellular striations and primitive myofilaments were only observed in a few cells. Despite positive vimentin reaction in almost every cell, few cells showed positive reaction for myoglobin. These findings suggest that this tumor represents early stage arrest of growth in the spectrum of progressive development from undifferentiated sarcoma, which lacks specific intracellular organelles, to differentiated pleomorphic RMS which contains cytoplasmic myoglobin and myofilaments.

A distinct pattern of t(2;13) translocation has been reported in alveolar and embryonal RMS. Although our case showed multiple cytogenetic abnormalities, it lacked this translocation. However, another common finding in embryonal RMS with rearrangement of chromosome 1p(22) did occur in our case. Since reports of cytogenetic changes in pleomorphic RMS are scarce, no distinct association between cytogenetic abnormality and histologic type can be elucidated from this study.

Acknowledgment
We thank Mei L. Wu for her excellent secretarial assistance.

References