Primary Primitive Neuroectodermal Tumor of the Orbit

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INTRODUCTION

Peripheral primitive neuroectodermal tumors are a group of soft tissue tumors of presumed neural crest origin arising outside the central and sympathetic nervous systems. These extracranial, primitive, small, round cell tumors show evidence of neural differentiation on light microscopy, immunohistochemical analysis, and electron microscopy. They are further subdivided into Askin's tumor (thoracopulmonary region), pigmented neuroectodermal tumor, and Ewing's sarcoma. Peripheral primitive neuroectodermal tumors and Ewing's sarcoma express elevated levels of the glycoprotein p30-32, a product of the MIC 2 gene, which is highly selective and unique for these cells.

Primary orbital primitive neuroectodermal tumors are extremely rare. To the best of our knowledge, only seven cases have been reported, including two in adults. We describe a case of primary orbital primitive neuroectodermal tumor and its immunohistochemical and electron microscopic findings.

CASE REPORT

A 13-year-old girl presented with a mass in the left lower lid of 5 months' duration. An examina-
(Figure 2). Periodic acid–Schiff staining was negative.

Sections were studied immunohistochemically for neuron-specific enolase, synaptophysin, MIC 2 antigen, vimentin, desmin, cytokeratin, S-100, actin, and leukocyte common antigen using the avidin–biotin indirect technique. The antibodies were applied with appropriate positive control slides. For negative control, buffered saline was used instead of the primary antibody. The tumor cells were positive for neuron-specific enolase, MIC 2 antigen (Figure 3), and synaptophysin. The tumor cells were negative for vimentin, desmin, S-100, actin, leukocyte common antigen, and cytokeratin. Ultrastructurally, cytoplasmic filaments and neurosecretory granules were identified.

On the basis of these findings, a diagnosis of primitive neuroectodermal tumor was made. The results of an extensive systemic evaluation that included a computed tomography scan of the chest, abdomen, pelvis, and bone for any primary or metastatic deposit were negative. Phased chemotherapy was started prior to surgery to reduce the size of the tumor, but the patient died 3 months after the initial diagnosis.

**DISCUSSION**

Peripheral primitive neuroectodermal tumor was first recognized as an entity in the late 1970s. It closely resembles extrasosseous Ewing’s sarcoma. The peak age of incidence of peripheral primitive neuroectodermal tumor is in adolescence and there is no gender predilection. Orbital primitive neuroectodermal tumors are heterogeneous clinically and histopathologically. There is a predilection for these tumors to arise in the lateral orbit. The current case had an inferior orbital location. The mass was nontender, unlike the painful mass typically described in peripheral primitive neuroectodermal tumors.

Microscopically, primitive neuroectodermal tumors are cellular with a monotonous pattern of small, round cells with hyperchromatic nuclei and a high nuclear–cytoplasmic ratio. Rosettes may be focal or absent. Extraskeletal Ewing’s sarcoma was ruled out by negative staining for periodic acid–Schiff. Other round cell tumors, including rhabdomyosarcoma, lymphoma–leukemia, and metastatic neuroblastoma, were excluded by immunohistochemistry. Although no rosettes were identified on light microscopy, establishing the neural differentiation immunohistochemically led to the diagnosis of primitive neuroectodermal tumor. This included positive staining for neuron-specific enolase, MIC 2 antigen, and synaptophysin. The differentiation from extraskeletal Ewing’s sarcoma was made by the presence of dense core neurosecretory granules on electron microscopy. The MIC 2 gene that codes for the surface glycoprotein p30-32 is expressed on the cell membranes of primitive neuroectodermal tumors and Ewing’s sarcoma.

The treatments of both primitive neuroectodermal tumors and extrasosseous Ewing’s sarcoma are
similar. Treatment is aggressive because most patients with primitive neuroectodermal tumors die 2 or 3 years after diagnosis. The most effective treatment is surgery with combination chemotherapy and high-dose radiation therapy. Despite aggressive chemotherapy, this patient died of systemic complications during the course of treatment, exemplifying the need for early diagnosis of and multimodality therapy for this malignant neuroectodermal tumor.

REFERENCES