Primary Synovial Sarcoma of the Orbit

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ABSTRACT

PURPOSE: To describe the clinical, pathological, and immunohistochemical characteristics and therapies of a rare case of primary synovial sarcoma in the orbit.

DESIGN: Retrospective interventional case report.

PARTICIPANT: A 6-year-old girl with pathologically proven synovial sarcoma in the orbit. The diagnosis was confirmed by immunohistochemistry.

METHODS: The patient was treated with right lateral orbital and right temporal tumor resection, followed by chemotherapy. She was followed up every 3 months for 1 year.

RESULTS: The tumor was excised, and the patient received 5 courses of chemotherapy. She did well during the initial first-year follow-up with no recurrent signs.

CONCLUSIONS: We reported the sixth case of primary synovial sarcoma in the orbit and the first case of a 6-year-old girl.

KEYWORDS: Orbital tumor, children, synovial sarcoma

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Introduction

Synovial sarcoma (SS) is a rare malignant soft-tissue neoplasm that accounts for approximately 5% to 10% of all soft-tissue tumors.[1] It occurs predominately in the upper and lower extremities of adolescents and young adults and derives from the primitive pluripotent mesenchymal stem cells.[2,3] Synovial sarcoma of the head and neck region is very rare, and sarcoma arising from the orbit is rarer still.[2,3] Therefore, a correct diagnosis with systemic treatment, including surgery and adjuvant therapies, poses a challenge for the ophthalmologists. We report the first case of a primary orbital SS in a 6-year-old girl.

Case Report

A 6-year-old girl presented to Tongji Hospital affiliated to Tongji Medical College, Huazhong University of Science and Technology, with 1-week history of gradual painless proptosis of the right eye. Ophthalmologic examination revealed 20/20 visual acuity in both eyes, no conjunctival congestion, no afferent pupillary defect, and a normal fundus. The ocular protrusion was measured by Hertel exophthalmometry. Results showed 18 mm for the right eye, 13 mm for the left eye, and the interorbital distance was 90 mm. A well-defined, nonmobile, nontender soft mass 4 cm × 3 cm in size was palpated in the temporal portion of the right orbit. The mobility of the right eye was limited in upgaze and lateral gaze. An orbital computed tomographic (CT) scan showed a uniform density soft-tissue mass in the right lateral orbital wall area extending into the orbit, the intracranial, the temporal fossa, and the adjacent soft tissues. There was no clear boundary between the mass and lateral rectus, and the neighboring orbital wall was destroyed (Figure 1). Contrast-enhanced CT combined with CT angiography showed a nonuniform enhancement soft mass 4 cm × 5.5 cm × 6.5 cm in size invading the right sphenoid and temporal bone. The mass displaced the right middle cerebral artery a little bit, and the boundary with the branch of right anterior cerebral artery was not very clear (Figure 1). Magnetic resonance imaging (MRI) of the orbit showed a mass with mixed long T1 and long T2 signals in the right retrobulbar region outside the muscle cone. The right lateral orbital wall was destroyed, the lateral rectus was compressed, and the right temporal lobe was pushed backward with a clear boundary noted (Figure 2). No abnormalities were detected on systemic examinations, including blood and urine tests, abdominal ultrasound, and chest CT.

Informed consent was obtained from her parents. The plan was to remove the mass with the help of neurosurgeons followed by the chemotherapy. Intraoperatively, a soft tumor

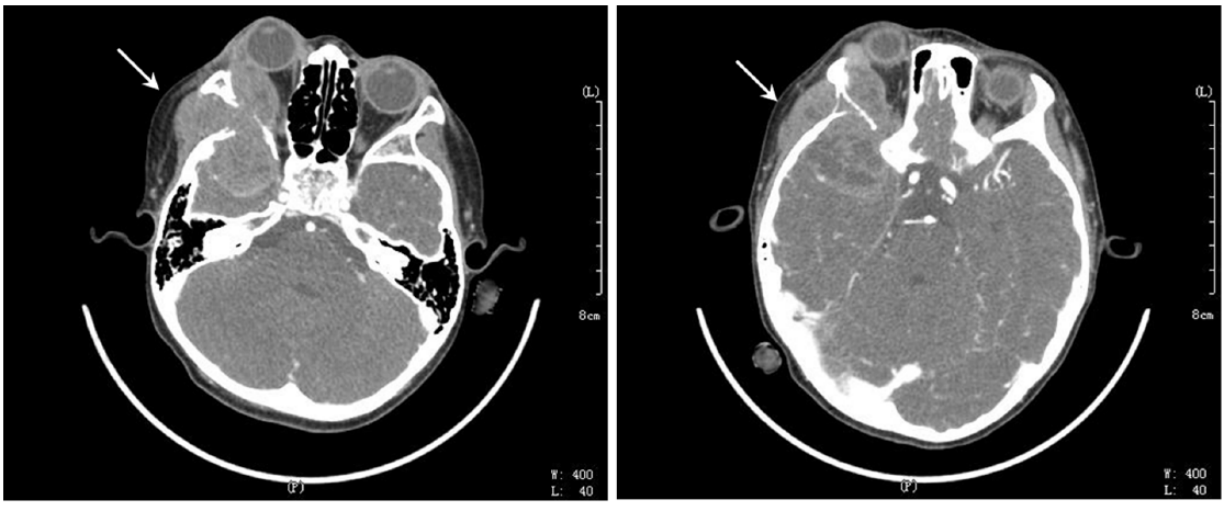

Figure 1. Computed tomographic scan of the orbit (layer A and layer B) demonstrates a heterogeneous soft-tissue mass in the right lateral orbital wall area.

invading the right squama temporalis, the sphenoid ridge, and the lateral orbital wall was noted. It was located mainly in the lateral epidural and periorbital fascia with 4 cm × 3 cm × 3 cm in size. The boundary was clear and the blood supply was rich. No metastatic lesion was found. So the tumor was completely removed successfully. Tissue specimens obtained demonstrated monophasic SS with spindle-shaped mesenchymal cells (Figure 3). Immunohistochemical stains were positive for vimentin, CD99, calponin, and Bcl-2 and negative for α-smooth muscle actin (α-SMA), muscle-specific actin (MSA), CD34, S-100, myeloperoxidase (MPO), epithelial membrane antigen (EMA), Hector Battifora mesothelial epitope-1, phosphoenolpyruvate carboxykinase (PCK), and cytokeratin 7 (CK7) (Figure 4). After the right lateral orbital and right temporal tumor resection, the patient began postoperative chemotherapy with CVADIC (cyclophosphamide [CTX] 500 mg/m^2 intravenously; d_1, vincristine [VCR] 1.5 mg/m^2 intravenously; d_1-d_5, adriamycin [ADM] 50 mg/m^2 intravenously; d1, dacarbazine [DTIC] 200 mg/m^2 intravenously; d_1-d_5, Q21d). She received 5 courses of chemotherapy in the 1-year follow-up, and no sign of tumor relapse or metastasis was detected.

Discussion

Synovial sarcoma often presents in children and young adults and primarily occurs in the para-articular regions of the extremities. Other locations, such as head, neck, abdomen wall, lung, and kidney, have also been reported.[4-7] The orbit is a rare location for primary SS, with only 5 previously reported cases according to the research results from PubMed.[2,8-11]

Histopathologically, SS is categorized into 3 main patterns: monophasic fibrous containing entirely spindle cells, biphasic containing both epithelioid and spindle cell components, and poorly differentiated containing both monophasic and biphasic regions along with poorly differentiated areas.[12] Three of the reported primary orbit SS cases were biphasic, 1 had calcification, and 1 was poorly differentiated.[2,8-11] In the present case, the sarcoma was composed of spindle cells, which was the first reported case of monophasic SS in the orbit.

Histopathology and immunohistochemistry are critical tools in SS diagnosis. Coexpression of vimentin, CD99, Bcl-2, and calponin and negative stains for S-100, α-SMA, and MSA together suggest SS and could be helpful to rule out other mesenchymal masses.[2,13] Vimentin is more frequently shown in spindled areas than epithelial areas, whereas EMA and CK7 are more frequently shown in epithelial component than spindled component.[13] CD34 and MPO are myeloid sarcoma markers, both of which are negative in the present case.[14]

Radiology is also helpful to characterize the tumor. Calcification may be evident in CT scans. Mixed solid and cystic appearance may be seen, which is probably caused by hemorrhage or necrosis. Magnetic resonance imaging usually reveals a heterogeneous mass with long T1 and long T2 signals. Sometimes, a cystic appearance is presented, so a benign tumor may be misdiagnosed. However, radiological examinations are useful in the detection of metastatic lesions, which are very important for treatment and prognosis.

The characteristic t(X;18)(p11.2;q11.2) translocation is a cytogenetic hallmark of SS, which presents in nearly all SS and does not occur in other forms of sarcomas.[15] In the present case, we confirmed the diagnosis by histology and immunohistochemistry, so the identification of a t(X,18) translocation was not performed. However, it is considered that molecular genetics methods will be increasingly used in the diagnosis of orbital soft tissue tumors because they provide more specificity than standard immunohistochemistry examination.[15]

Surgical resection is the primary treatment of SS. In the present case, the patient received a complete excision as the tumor had a clear tumor-free margin. Synovial sarcoma is believed to be relatively more chemosensitive than other soft-tissue

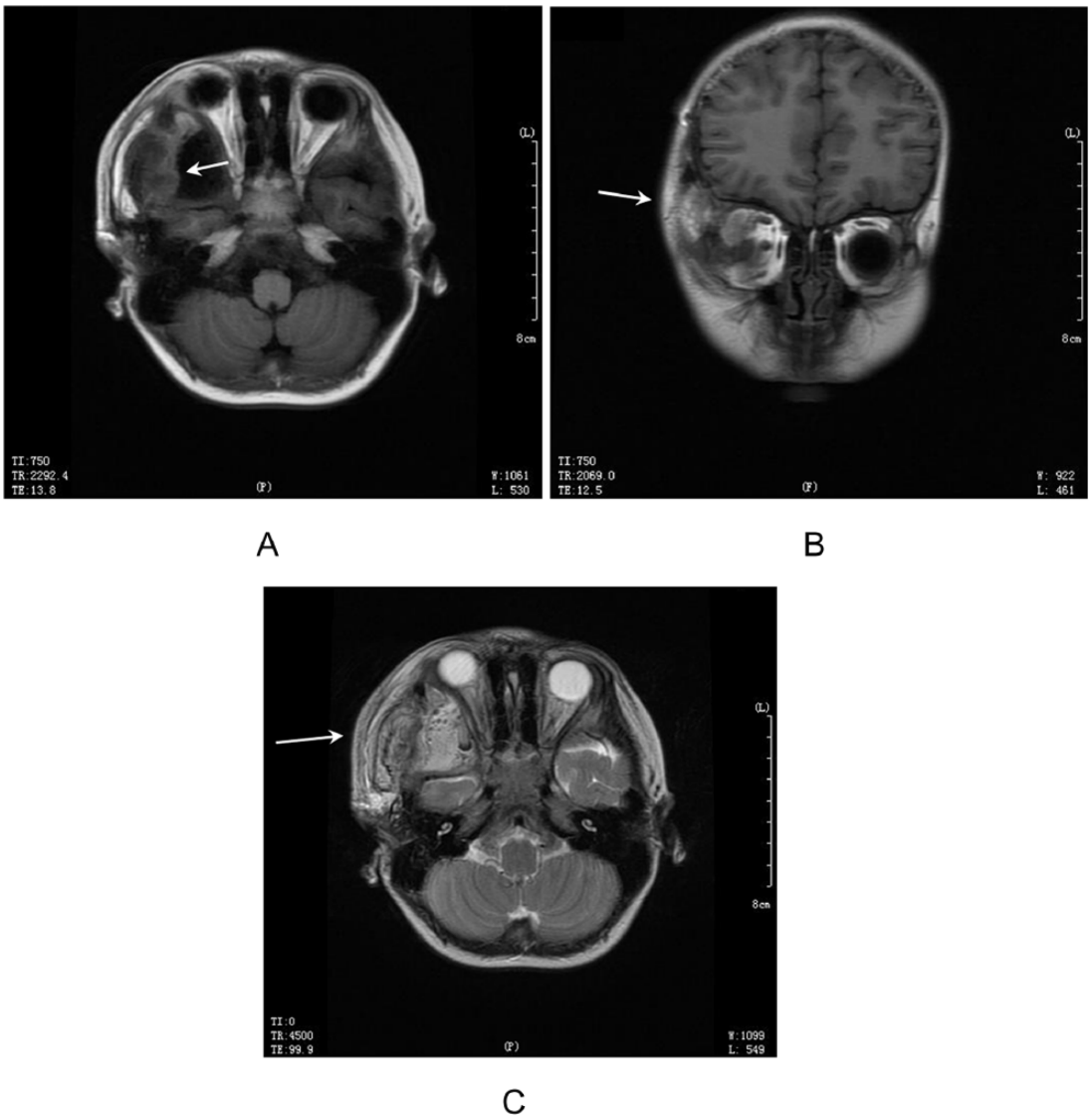

Figure 2. Magnetic resonance imaging of the orbit demonstrates a mass with mixed long T1 and long T2 signals in the right retrobulbar region outside the muscle cone: (A, B) T1-weighted and (C) T2-weighted image.

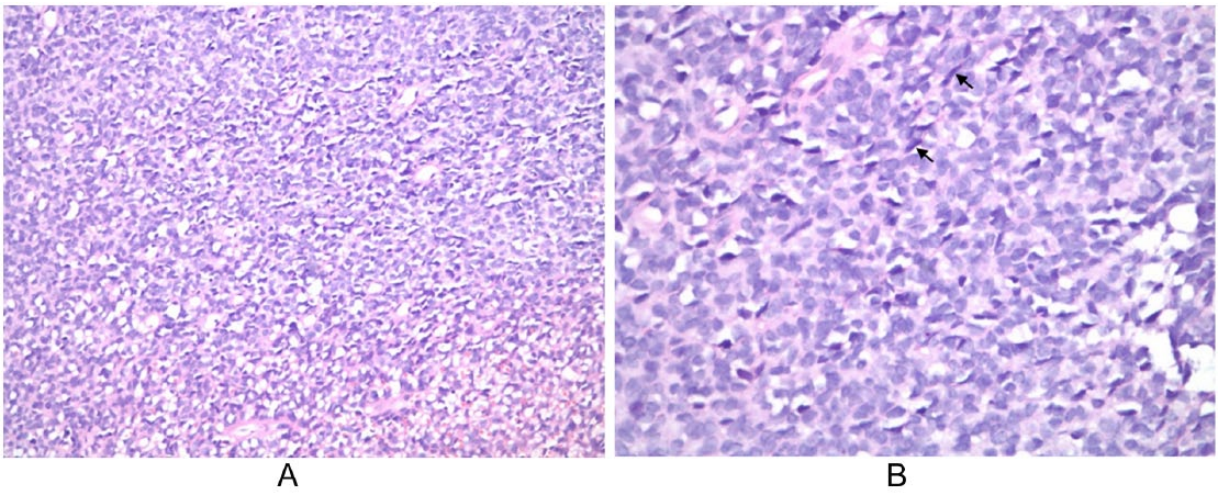

Figure 3. Histologic section of the monophasic synovial sarcoma. The tumor is mainly composed of spindled component which is characterized by elongated cells with ovoid pale-staining nuclei, inconspicuous nucleoli, and scanty cytoplasm (hematoxylin-eosin, original magnification ×20 [A], ×40 [B]).

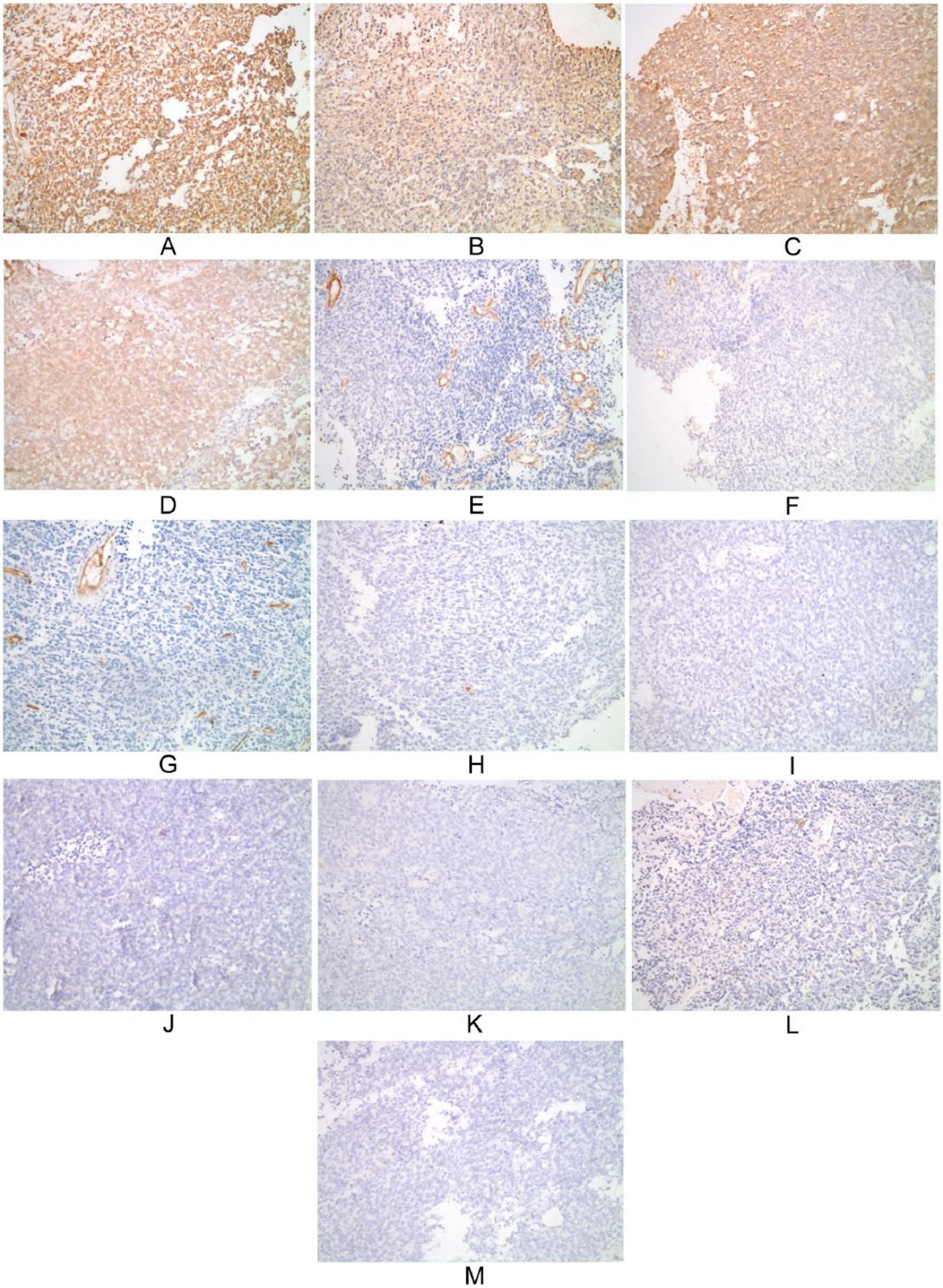

Figure 4. Immunohistochemical stains of the monophasic synovial sarcoma. The tumor is positive for (A) vimentin, (B) CD99, (C) calponin, and (D) Bcl-2 and negative for (E) α-SMA, (F) MSA, (G) CD34, (H) S-100, (I) MPO, (J) EMA, (K) HBME-1, (L) PCK, and (M) CK7 (original magnification, ×20). Antibodies were as follows: anti-vimentin, anti-CD99, anti-calponin, anti-Bcl-2, anti–α-SMA, anti-MSA, anti-CD34, anti-S-100, anti-MPO, anti-EMA, anti-HBME-1, anti-PCK, and anti-CK7. The species were all rabbit. α-SMA indicates α-smooth muscle actin; CK7, cytokeratin 7; EMA, epithelial membrane antigen; HBME-1, Hector Battifora mesothelial epitope-1; MPO, myeloperoxidase; MSA, muscle-specific actin; PCK, phosphoenolpyruvate carboxykinase.

sarcomas, especially in children.[16] In the present case, the patient received 5 courses of postoperative chemotherapy of CVADIC, and no sign of tumor relapse or metastasis was detected in the 1-year follow-up. Radiotherapy has also been recommended in stage III (T2, N0, M0, G3 OR any T, N1, M0, any G) disease as it can decrease the local recurrence.[17] Immunotherapy has substantial potential and provides a novel approach in SS combinatorial treatment. Promising results have been reported in adoptive T-cell therapy targeting immunogenic cancer testis antigen NY-ESO-1 in SS with wide expression of it.[18] Future studies will focus on targeted therapy which is more effective and specific to prevent tumor relapse and/or metastasis.

Author Contributions

PX and JC conceived the study concept and design, was involved with patient care, and drafted the manuscript and literature review. All authors have read and approved the final version of the manuscript.

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