

Extracranial congenital malignant rhabdoid tumor in infant with disseminated disease: An uncommon entity and diagnostic challenge



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Key words: congenital; malignant rhabdoid tumor; pediatric; vascular.

INTRODUCTION

Malignant rhabdoid tumors (MRTs) are uncommon and aggressive tumors that typically present during childhood. Primary MRTs most often arise from the central nervous system and kidneys; however, primary tumors from other sites are occasionally reported. We present a case of an infant born with extracranial MRTs who was found to have disseminated disease involving the abdominal viscera.

CASE

A term male infant born in Kuwait was transferred to our institution at age 6 weeks for management of large extracranial tumors noted on a fetal ultrasound performed just before birth. Physical examination at birth revealed an extremely large, firm red-purple vascular-appearing extracranial tumor with central ulceration and overlying hemorrhagic crust, protruding from the right forehead and frontal scalp, obscuring the right eye and measuring up to 7 cm in diameter. A second tumor was noted in the right parotid region, elevating the ear lobe and measuring up to 4 cm.

Propranolol therapy was initiated because of suspicion for congenital hemangioma, despite an atypical clinical presentation, and resulted in only a modest reduction of the tumors' size. The tumors continued to enlarge, and a new tumor developed in

Abbreviations used:

KHE:	Kaposiform hemangioendothelioma
MRI:	magnetic resonance imaging
MRT:	malignant rhabdoid tumor
SMARCB1:	SWI/SNF-related, matrix-associated, actin-dependent regulator of chromatin, subfamily b member 1

the left parotid region, despite 1 month of propranolol therapy. The case was referred to our institution as a store-and-forward teledermatology consultation, and it was ultimately decided that our specialists would continue management.

On admission to our institution at age 6 weeks, physical examination revealed dramatic, progressive enlargement of all tumors (Fig 1, A and B) as well as hepatosplenomegaly. Peripheral blood smear obtained at admission was normal.

Magnetic resonance imaging (MRI) of the brain performed at day 1 of life was reviewed at admission and showed 2 large and highly vascular extracranial soft tissue tumors centered in the right frontal scalp and right parotid region. There was no evidence of invasion into the osseous structures, cranium, orbits, or airway. The brain was well formed without abnormality.

MRI of the brain performed at day 44 of life revealed rapid interval enlargement of the

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Funding sources: None.

Conflicts of interest: None declared.

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JAAD Case Reports 2018;4:368-72.

2352-5126

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<https://doi.org/10.1016/j.jcdr.2017.11.009>

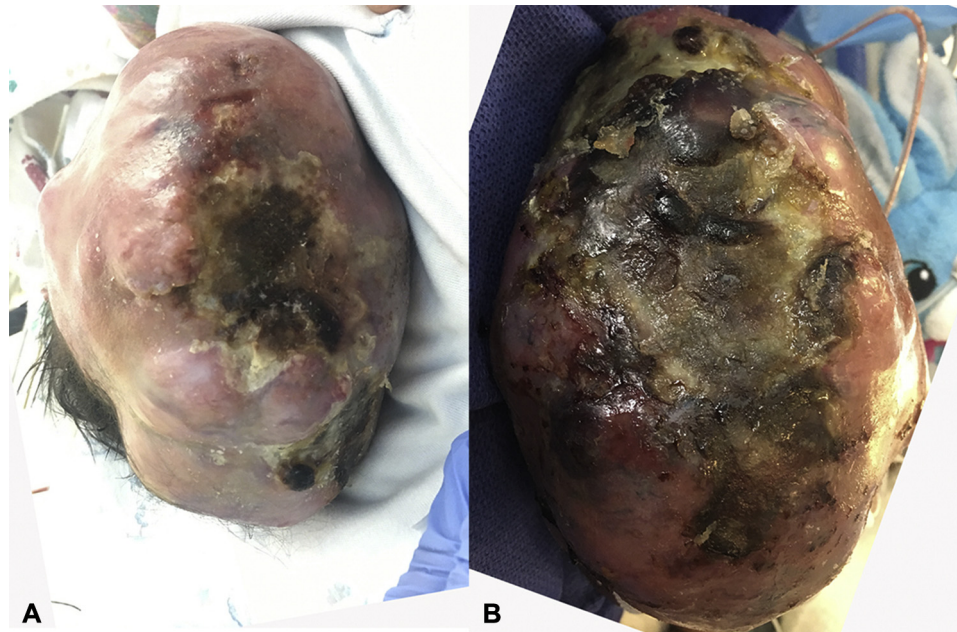


Fig 1. Superior aspect of the scalp mass of infant with malignant rhabdoid tumor. The mass shows progressive enlargement and ulceration upon transfer to our institution (**A**) and 6 days later (**B**).

extracranial tumors, now with coalescence and increased extent along the right scalp, periorbital soft tissues, face, and neck. A new lesion was noted in the left parotid region. These tumors demonstrated heterogeneous enhancement. Dynamic contrast enhanced imaging showed no evidence of avid arterial enhancement. Prominent, tortuous veins were noted at the periphery of the tumors and appeared to drain via numerous facial veins and the jugular venous systems, bilaterally. Prominent branches of the bilateral ophthalmic arteries and branches of bilateral external carotid arteries were noted to course through the tumors.

The presence of hepatosplenomegaly on physical exam prompted a search for disseminated disease. Whole body MRI performed at day of life 44 (Fig 2) revealed additional solid tumors throughout the abdomen, the largest of which arose from the porta hepatis, bilateral adrenal glands, and bilateral kidneys. Echocardiography showed dilation of the superior vena cava and innominate vein, presumably due to increased venous return from the large hypervascular tumors.

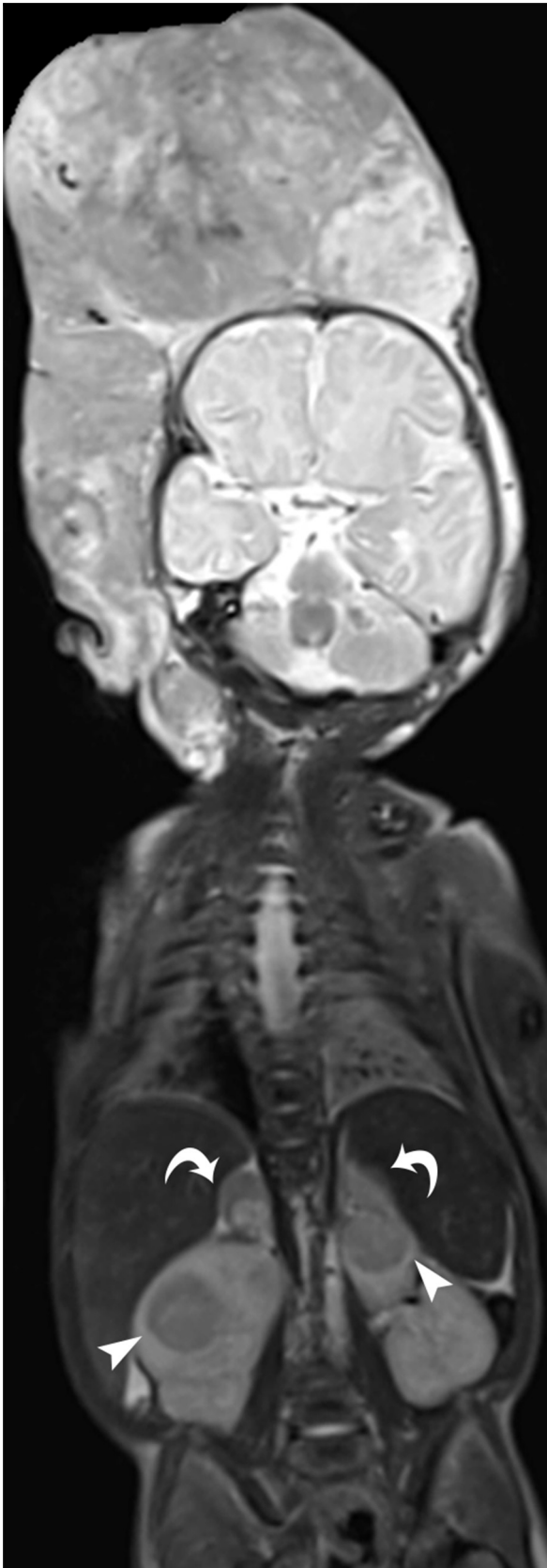
The clinical and radiographic discordance, rapid growth despite therapy, and presence of disseminated disease were highly suspicious for an aggressive, vascular tumor. Thus, cerebral angiography, limited embolization (Fig 3, A and B), and biopsy of the extracranial tumor were performed. The tumor continued to enlarge despite embolization.

Histopathologic examination (Fig 4, A and B) revealed a diagnosis of malignant rhabdoid tumor (MRT), suggested by typical nuclear and cytoplasmic features and loss of INI-1 (SMARCB1 [SWI/SNF-related, matrix-associated, actin-dependent regulator of chromatin, subfamily b member 1]) protein expression. Due to the poor prognosis of metastatic congenital rhabdoid tumor and after discussion with the patient's family and his team of specialists, the decision for palliative chemotherapy was made. The patient ultimately succumbed to multisystem organ failure on day 60 of life.

DISCUSSION

The differential diagnosis for this large, vascular extracranial soft tissue mass noted at birth includes vascular tumors such as congenital hemangioma and Kaposiform hemangioendothelioma (KHE). Other vascular solid tumors, such as neuroblastoma and sarcomas, including angiosarcoma, rhabdomyosarcoma, and fibrosarcoma were also considered, especially in the setting of associated solid organ involvement and rapid growth despite therapy.

While an unusual congenital hemangioma was an initial consideration given the vascular appearance of the tumors, significant postnatal growth typically does not occur and essentially ruled out this diagnosis on clinical grounds. Imaging features of the tumors were also unusual for congenital hemangiomas, which commonly demonstrate signal



flow voids within or adjacent to lesions (suggesting high-flow vascularity) and avid, homogenous-to-slightly heterogeneous early enhancement after administration of intravenous contrast agents. KHE was another diagnostic consideration given rapid growth, but the prototypical consumptive coagulopathy (Kasabach-Merritt phenomenon) was absent. Moreover, the evolving clinical course and presence of widespread metastases were atypical for KHE.

Whole-body MRI is a noninvasive method ideal for detection of multifocal disease in at-risk patients and is especially advantageous in children due to its high-contrast and spatial resolution and lack of ionizing radiation. In this patient with worrisome physical examination findings of disseminated disease (organomegaly), whole-body MRI was especially useful to assess tumor burden. Still, these numerous congenital disseminated tumors were difficult to confidently diagnose on the basis of imaging and clinical features alone, and histopathologic examination was ultimately necessary to determine the etiology.

MRTs are uncommon, yet among the most aggressive tumors presenting in childhood. They are characterized histologically by large polygonal cells; eccentric nuclei; macronucleoli; abundant cytoplasm; and eosinophilic, hyaline, perinuclear inclusions. In most tumors, the *hSNF5/INI1 (SMARCB1)* tumor suppressor gene is inactivated, resulting in lack of normal nuclear expression of INI-1.¹

Primary MRTs commonly arise from the central nervous system and kidneys, where they were originally described. However primary extrarenal, extracranial tumors originating from the orbit, head and neck, mediastinum, and other organ systems have also been reported.² Regardless of the primary tumor origin, MRT diagnoses in children <2 years of age, particularly those with disseminated disease, are associated with extremely poor outcomes. Reported survival rates for children with metastatic MRT range from 5 days to 5 months.^{3,4}

In our case presentation of an infant with disseminated MRTs, we highlight the differential diagnosis of vascular soft tissue masses presenting in the

Fig 2. Coronal short-T1 inversion recovery whole-body magnetic resonance imaging performed on day 44 of life reveals extension of the extracranial mass along the right scalp and face soft tissues. Additional solid masses were observed throughout the abdomen in the bilateral adrenal glands (*curved arrows*) and kidneys (*arrowheads*).

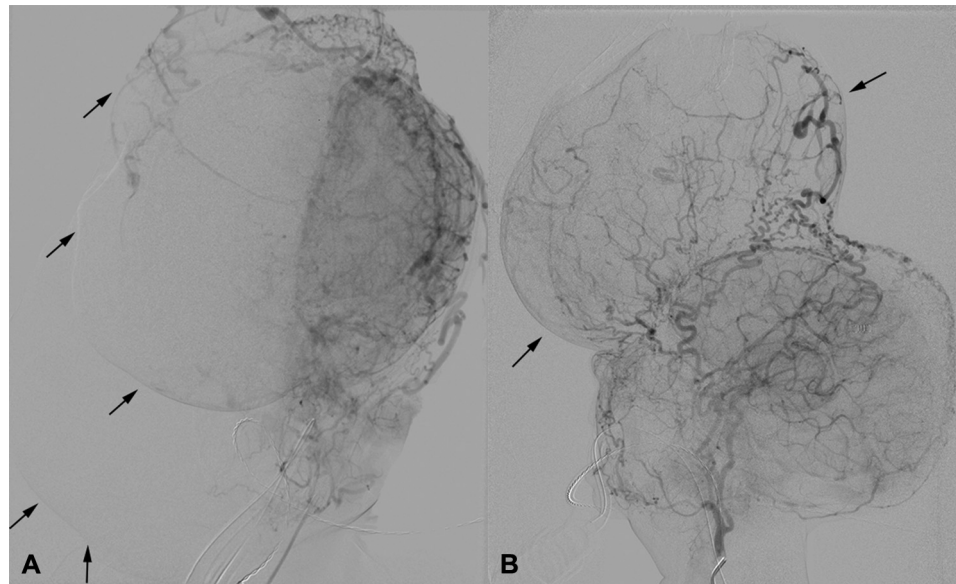


Fig 3. Anterior-posterior (**A**) and lateral (**B**) views from a left common carotid artery angiogram demonstrate hypervascular, extracranial soft tissue tumors (*arrows*) that extend in all directions. Multiple branches from the bilateral internal and external carotid arteries contribute to the arterial supply of the mass, which also showed evidence of intratumoral arteriovenous shunting.

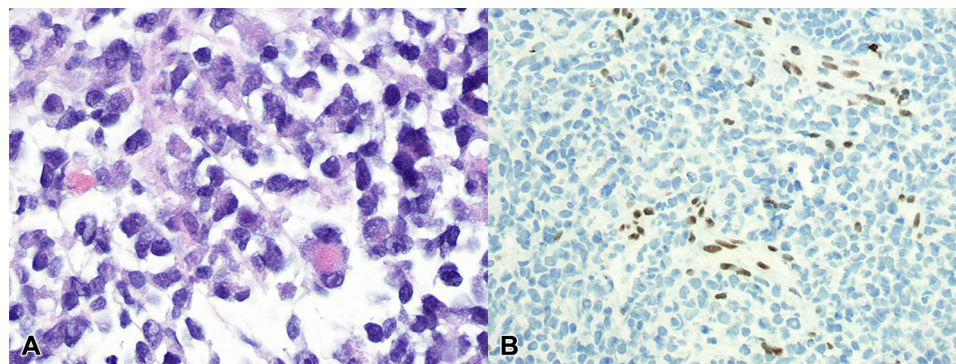


Fig 4. Histologic examination of tissue from infant with malignant rhabdoid tumors. Staining shows sheets of poorly cohesive polygonal cells. Tumor cells have large eccentric vesicular nuclei, some with prominent nucleoli. **A**, Eosinophilic perinuclear cytoplasmic inclusions. **B**, Loss of INI-1 protein expression demonstrated by immunohistochemistry is highly suggestive of the diagnosis. Positive staining of endothelial cells provides an internal control. (**A**, Hematoxylin-eosin stain; **B**, INI-1 stain; original magnifications: **A**, $\times 400$; **B**, $\times 200$.)

perinatal period. Such cases can be challenging, and considerations include vascular and other malignant tumors. In this child who was initially treated for presumed congenital hemangioma, a high level of suspicion for alternative diagnoses was maintained. A collaboration between primary and consulting providers who recognized atypical clinical and imaging features, such as rapid growth and widespread disseminated disease, ultimately led to the discovery of this uncommon and fatal disease. In our case,

exclusion of treatable diseases allowed the child's family and care providers to make informed decisions regarding his ongoing management, which shifted toward comfort measures and emphasized his quality of life.

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