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ADVANCES IN PEDIATRIC RESEARCH

Metastatic neuroblastoma presenting as refusal to use the left upper extremity in a six-year-old girl

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Abstract

Neuroblastoma is the most common extracranial neoplasm in children, commonly presenting at an advanced stage. Despite the high prevalence of metastatic disease with neuroblastoma, metastases to the central nervous system are rare and predominantly involve the spinal cord. We present a case of neuroblastoma with metastases to the brain presenting as refusal to move the left arm. The lesion initially appeared to be both a subdural and epidural hematoma on computed tomography of the head, but upon magnetic resonance imaging, was found to represent metastatic neuroblastoma. In pediatric patients with systemic symptoms and neurologic deficits, metastatic disease, such as neuroblastoma, should be included in the differential diagnosis and appropriate imaging should be obtained.

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Introduction

Neuroblastoma is the most common extracranial neoplasm in children, commonly presenting at an advanced stage. Despite the high prevalence of metastatic disease with neuroblastoma, metastases to the central nervous system (CNS) are rare and predominantly involve the spinal cord [1]. We present a case of neuroblastoma with metastases to the brain presenting as refusal to move the left upper extremity that initially appeared to be both a subdural hematoma and epidural hematoma on computed tomography (CT) of the head.

Case Report

A 6 year-old female presented to the emergency department with a chief complaint of refusal to use her left arm, beginning four hours prior to presentation when she went to brush her teeth. She also reported that her left arm was numb. According to the patient's father, he was able to passively move her arm through a full range of motion without pain. There was no history of similar symptoms or trauma to the area. The patient's father added that she was very sleepy at home, with fevers of 100 to 101 degrees Fahrenheit. The patient added that she had a headache, which she described as frontal in location, without radiation. She could not recall palliating or provoking factors, and she denied any associated neck pain. The patient's father denied any history of recent neurologic or musculoskeletal problems.

The patient had no past medical history, no past surgical history, took no medications, and had no allergies. She was up-to-date on her vaccinations and was developmentally appropriate for her age.

On physical exam, she had the following vital signs: blood pressure 108/63 mmHg, heart rate 79, respiratory rate 20, temperature 98.4°F, and oxygen saturation 100% on room air. She generally appeared

sleepy, but was easily aroused by verbal stimuli. She was normocephalic and her head was atraumatic. She had moist mucous membranes, normal tympanic membranes, and a supple neck. Her cardiac exam was unremarkable, and her lungs were clear to auscultation bilaterally. Her abdominal examination was without tenderness, masses, or organomegaly. Ocular examination revealed full extra-ocular movements on right lateral gaze, but she was unable to completely bury the left eye on left lateral gaze. Furthermore, the patient had a symmetric smile, but demonstrated decreased folding of the nasolabial area with frowning. The remaining cranial nerves were intact. She was also noted to have decreased tone in the left arm as compared to the right. Strength was 5/5 in the right upper and bilateral lower extremities. When asked to actively move her left arm, the patient reported that she was unable to do so; however, when the patient was asked to change positions, she was able to move her left arm and bear weight on it while changing positions. Sensory testing of the left extremity revealed a deficit in sensation to light touch in the distribution of the ulnar nerve, while sensory testing of the remainder of her extremities revealed no deficits. Her gait was wide-based, but she was able to stand unsupported. A musculoskeletal examination revealed full passive range of motion in the left shoulder, elbow, wrist, and articulations of the hand, without swelling or tenderness. Her pulses were strong and palpable.

Given the patient's complex presentation including fevers, several studies were obtained. Basic metabolic panel was unremarkable. Complete blood count demonstrated a white blood cell count of 4.2 K/uL (4.5-13.5), hemoglobin 7.9 g/dL (11.5-13.5), hematocrit 23.8 % (35-45), and platelet count 88 K/uL (140-400). Erythrocyte sedimentation rate was 21 mm/Hr (0-20), and a C reactive protein was 1.0 mg/dL (< 0.9). Radiographs of the left shoulder, left elbow, left wrist, and left hand were all read as within normal limits. A CT of the head was ordered given the patient's abnormal neurological exam and the pediatrics service was consulted for further evaluation. The patient was suspected by the pediatrics service to have an underlying oncologic process and was admitted for additional workup. The patient's head CT was read as having bilateral frontal extra-axial hyperdense foci, suspicious for subdural bleeding. The patient's skull was also noted to have unusual areas of thickening of concern to be indicative of thallasemia or bony metastatic disease. Images from the patient's head CT can be seen in Fig. 1 (left and middle panels). The patient was also noted to have a focus of hyperdensity in the frontoparietal area, which was suggestive of an epidural hematoma. The patient was thus emergently transferred to the pediatric intensive care unit (PICU) with neurosurgical consultation.

A magnetic resonance imaging (MRI) scan of the brain and spine was urgently obtained, which revealed enhancing masses within the frontal bone and bilateral parietal bones that replaced the bone marrow and extended into the epidural and subdural spaces. There was effacement of the inner table of the bones of the skull, but no evidence of hematoma or hemorrhage. An image from the patient's brain MRI can be seen in Fig. 1 (right panel). There was also a 5 cm x 5 cm mass located within the inferior pole of the right kidney, which extended into the right L2-3 and L3-4 neural foramina, along with extensive retroperitoneal lymphadenopathy. A bone marrow biopsy was performed, which was consistent with metastatic neuroblastoma. Consultation was obtained with radiation oncology for whole brain irradiation, to be followed by chemotherapy.

Discussion

Neuroblastoma, a malignant neoplasm arising from neural crest cells, is the most common extracranial tumor in children [1-3]. Unfortunately, over 50% of patients have metastatic disease to the bone and marrow at the time of presentation. Despite this high rate of metastases, intracranial metastases are seen only rarely with initial presentation of neuroblastoma, with a reported incidence of approximately 0.6 percent [1]. Interestingly, the incidence of CNS involvement with recurrence of neuroblastoma is much higher, reported as being between 4-16% [1-4]. This discussion will focus on central nervous system metastases in neuroblastoma.

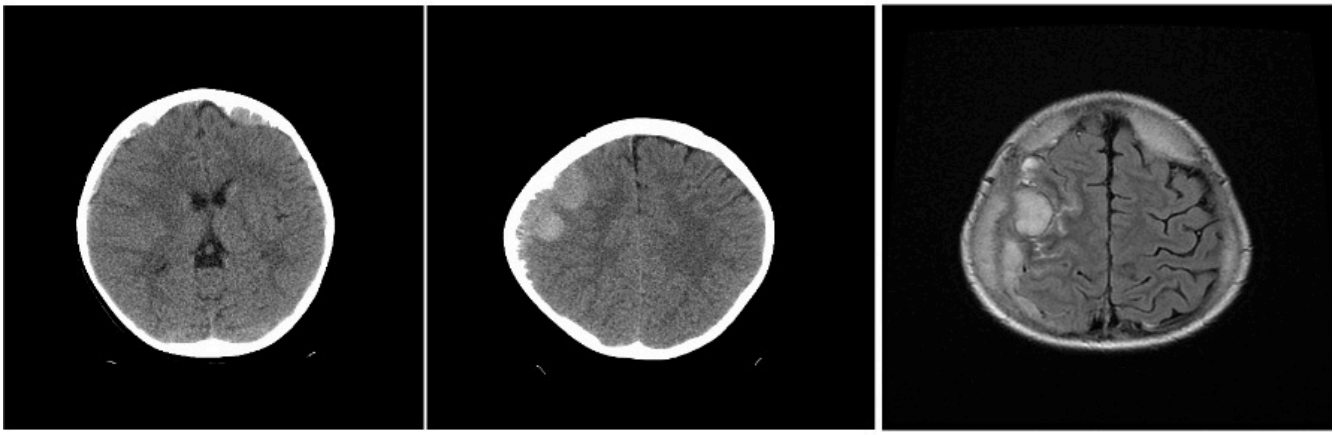

Figure 1. CT images from patient's initial presentation (left and middle panels) and MRI images obtained after admission (right panel)

Neuroblastoma is predominantly a malignancy of young children, with a median age at diagnosis of 17 months. Presentation is extremely variable, ranging from asymptomatic abdominal masses to critically ill children overwhelmed by metastatic disease [5].

Being a rapidly spreading malignancy, neuroblastoma most often causes symptoms as a result of mass effect on or invasion of the other tissues of the body. The most common sites of metastases are bone marrow, bone cortex, lymph nodes, liver, and subcutaneous tissues [1]. Central nervous system involvement with neuroblastoma is much less common, and is most frequently seen with seeding of either the bloodstream or the cerebrospinal fluid [1]. Neurologic symptoms from neuroblastoma have been reported multiple times in the literature, however nearly all of these cases are from involvement of the spinal cord. Neuroblastoma is well-described as causing spinal cord compression, with patients presenting with paralysis, gait abnormalities, incontinence, and/or urinary retention [2,6]. Most involvement is of the lumbar spine; however rare cases with disease affecting the cervical spine have been reported [2]. Intracranial metastases from neuroblastoma may present with ophthalmologic symptoms, such as visual loss and ophthalmoplegia [7]. Patients with intracranial metastatic neuroblastoma may also present with headache, nausea, vomiting, depressed consciousness, and/or seizures [4]. Furthermore, patients with metastatic neuroblastoma frequently exhibit non-specific signs and symptoms of malignancy, including fever, malaise, fatigue, nausea, vomiting, irritability and weight loss. Signs and symptoms suggestive of neuroblastoma as the primary source of metastases in patients with CNS symptoms include a palpable abdominal mass, hypertension, flushing, tachycardia, and diarrhea [8].

Although neuroblastoma in general is most commonly diagnosed by CT of the abdomen to assess for the presence of tumors, the diagnosis of metastatic neuroblastoma to the CNS is best made by contrast-enhanced MRI [1,9]. MRI allows for assessment of extension into neuroforamina, spinal cord impingement, and intraparenchymal involvement of the brain [8]. Given that up to 50% of patients with CNS involvement with neuroblastoma may have hemorrhages, a non-contrast CT of the head remains an excellent first evaluation in the emergency department [4]. However, as in this case, intracranial metastases from neuroblastoma may appear as intracranial bleeding on head CT when no bleeding is present [1]. As neuroblastoma is a neuroendocrine tumor that secretes catecholamines, the diagnosis of neuroblastoma may also be suggested by laboratory testing. Urinary homovanillic acid and vanillylmandelic acid will be elevated in 95% of patients with neuroblastoma [8,9].

Unfortunately, patients with CNS metastases from neuroblastoma have a very poor prognosis, with survival time being reported as being from 0.1 months to 13.0 months [1]. In patients with spinal cord compression, urgent neurological surgery consultation or radiation oncology consultation should be obtained for decompression [3,8]. In patients without evidence of cord compression, consultation with a pediatrician or a pediatric oncologist should be obtained to determine the need for admission as well as to ensure proper follow-up and treatment.

Conclusions

Although neuroblastoma is a common tumor in the pediatric population, metastatic spread to the CNS is rare, with intracranial metastases from neuroblastoma being even rarer. In pediatric patients with systemic symptoms and neurologic deficits, metastatic disease, particularly neuroblastoma, should be included in the differential diagnosis and appropriate imaging should be obtained.

References

1. Balaji R, Ramachandran K, Kusumakumari P. Neuroimaging patterns of central nervous system metastases in neuroblastoma: report of 2 recent cases and literature review. J Child Neurol. 2009;24:1290-3
2. Kapoor V, Lodha R, Agarwala S. Superior mediastinal syndrome with Rowland-Payne syndrome: an unusual presentation of cervico-mediastinal neuroblatoma. Pediatr Blood Cancer. 2005; 44:280-2.
3. Katzenstein HM, Kent PM, London WB, Cohn SL. Treatment and outcome of 83 children with intraspinal neuroblastoma: the Pediatric Oncology Group experience. J Clin Oncol. 2001;19:1047-55.
4. Riyaz A, Vinayan KP. Spinal neuroblastoma masquerading as acute flaccid paralysis. Indian Pediatr. 1998;35:1015-7.
5. Lau JJ, Trobe JD, Ruiz RE, Cho RW, Wechsler DS, Shah GV, Gebarski SS. Metastatic neuroblastoma presenting with binocular blindness from intracranial compression of the optic nerves. J Neurooopthalmol. 2004;24:119-24.
6. Nazemi KJ, Malempati S. Emergency department presentation of childhood cancer. Emerg Med Clin North Am. 2009;27:477-95.
7. Matthay KK, Brisse H, Couanet D, Couturier J, Bénard J, Mosseri V et al. Central nervous system metastases in neuroblastoma: radiologic, clinical, and biologic features in 23 patients. *Cancer*. 2003;98:155-65.
8. Maris JM. Recent advances in neuroblastoma. N Engl J Med. 2010;362:2202-11.
9. Esiashvili N, Anderson C, Katzenstein HM. Neuroblastoma. Curr Probl Cancer. 2009;33:333-60.