

Sonographic Appearance of Congenital Malignant Astrocytoma

Richard Alan Osborn,¹ John P. McGahan, and Arthur B. Dublin

High-resolution real-time sonography has become an accepted method for investigation of the neonatal head. The most common application of this technique in examination of the neonate is in detection of intracranial hemorrhage and its complications, although a variety of congenital and acquired intracranial abnormalities have been detected with sonography [1-3].

Case Report

A 2900 g infant was delivered at an outside hospital at about 37 weeks gestation. The pregnancy had been uncomplicated until premature rupture of membranes about 34 hr before the normal vaginal delivery. At birth Apgar scores were 5 and 7. Physical examination revealed macrocephaly with bulging fontanelles, a right parietooccipital hematoma and caput, right facial palsy, and right hemiparesis. Seizures, consisting of rightward nystagmus and eye blinking, subsequently developed. An electroencephalogram revealed decreased voltage on the right with a left frontotemporal focal discharge. A

sonogram of the head was reported to show a large intracerebral hemorrhage with mass effect. The patient was transferred to the University of California Davis Medical Center.

Sonography and computed tomography (CT) of the head were performed on the arrival. The sonogram showed an intracerebral mass, predominantly echogenic, with only very small scattered areas of decreased echogenicity (fig. 1A). No calcifications were identified. A midline shift with hydrocephalus of the left lateral ventricle was identified. A noncontrast CT scan showed a large right parietooccipital mass of primarily low density but with scattered areas of increased attenuation (blood vs. minimal calcification). There was subtle enhancement at the periphery of the mass (figs. 1B and 1C). These findings were believed to be most consistent with a neoplasm.

Because of the patient's deteriorating clinical condition, emergency decompression with subtotal resection of the mass was performed. The patient died shortly thereafter. At autopsy, a large right hemispheric neoplasm was identified. There were areas of hemorrhage (related at least in part to earlier subtotal resection) and large areas of necrosis interposed between large masses of dark gray homogeneous granular tissue (fig. 1D). The final diagnosis was a mixed anaplastic astrocytoma and fibrosarcoma.

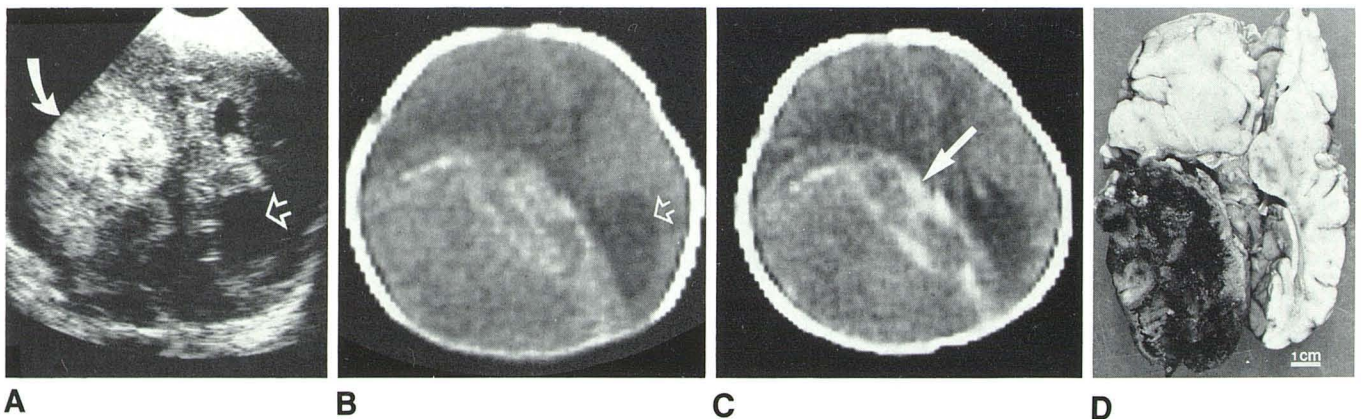


Fig. 1.—A, Semi-axial sonogram through anterior fontanelle. Highly echogenic mass (*curved arrow*) in right cerebral hemisphere. Areas of central decreased echoes and hydrocephalus of left lateral ventricle (*open arrow*). B, Noncontrast CT scan of brain. Large right hemispheric mass with peripheral

rim of increased density, mass effect, and hydrocephalus of left lateral ventricle (*arrow*). C, Contrast CT scan. Enhancement of edge of mass (*arrow*) was seen at other levels also. D, Gross anatomic specimen. Necrotic tumor involves large part of right cerebral hemisphere.

Received July 11, 1983; accepted after revision November 9, 1983.

¹ All authors: Department of Radiology, Division of Diagnostic Radiology, University of California, Davis Medical Center, 4301 X St., Room 109R, Sacramento, CA 95187. Address reprint requests to J. P. McGahan.

Discussion

Although neuroectodermal tumors constitute a relatively common form of malignancy in childhood [4], brain tumors are very rare in infants under 2 months of age [5, 6]. Since first reported by Maier [7] in 1861, Takaku et al. [5] in 1978 found only 103 such tumors in the literature that had histologic verification. In this group, teratomas constituted about 50% of the lesions, with gliomas the next most common tumor. Supratentorial lesions were more common than infratentorial tumors, as opposed to the distribution reported later in childhood. The clinical outcome was generally poor, even with early diagnosis and surgical intervention.

The sonographic diagnosis of brain tumors in young children has been reported [1, 8, 9]. Most have been tumors detected beyond the neonatal period. The reported sonographic characterizations of brain tumors are those of an echogenic mass that may have cystic components, particularly when complicated by necrosis or previous hemorrhage. Areas of calcification may be seen with associated distal acoustic shadowing [10].

Acute hemorrhage, whether in the germinal matrix, intraventricular, or intraparenchymal, also appears as an echogenic mass. It may be associated with hydrocephalus and, when large, a mass effect. As the hemorrhage ages, it may become more anechoic with cystic areas that may represent regions of porencephaly [10]. Therefore, in our case, the sonographic findings of a densely echogenic mass with contralateral hydrocephalus and mass effect could be interpreted as a parenchymal hemorrhage. While future sonographic developments (including tissue characterization and sonographically specific contrast agents) may be of benefit in separating tumor from hemorrhage, these methods are not yet widely applicable [11, 12]. CT correctly indicated the bulk of the mass to be nonhemorrhagic, with an appearance and pattern of contrast enhancement suggesting neoplasm as the more likely etiology.

In conclusion, the sonographic appearances of tumor and hemorrhage are not always sufficiently distinct to allow their accurate diagnosis. As others have noted, CT is a comple-

mentary examination and its early use is urged in cases with any unusual clinical or sonographic feature [10, 13].

REFERENCES

1. Babcock DS, Han BK. The accuracy of high resolution, real-time ultrasonography of the head in infancy. *Radiology* **1981**; 139:665-676
2. Grant EG, Schellinger D, Borts FT. Real-time sonography of the neonatal and infant head. *AJNR* **1980**;1:487-492, *AJR* **1981**; 136:265-270
3. London DA, Carroll BA, Enzmann DR. Sonography of ventricular size and germinal matrix hemorrhage in premature infants. *AJNR* **1980**;1:295-300, *AJR* **1980**;135:559-564
4. Gold EB, Gordis L. Patterns of incidence of brain tumors in children. *Ann Neurol* **1979**;5:565-568
5. Takaku A, Kodama N, Ohara H, Hori S. Brain tumor in newborn babies. *Childs Brain* **1978**;4:365-375
6. Arnstein LH, Boldrey E, Naffziger HC. A case report and survey of brain tumors during the neonatal period. *J Neurosurg* **1951**;8:315-319
7. Maier R. Kombinierte Geshwulst im Grosshirn. *Virchows Arch Pathol* **1861**;20:536-541
8. Horbar JD, Leahy K, Lucey J. Real-time ultrasonography. Its use in diagnosis and management of neonatal hydrocephalus. *Am J Dis Child* **1982**;136:693-696
9. Smith WL, Menezes A, Franken EA. Cranial ultrasound in the diagnosis of malignant brain tumors. *JCU* **1983**;11:97-100
10. Babcock D, Han BK. *Cranial ultrasonography of infants*. Baltimore: Williams & Wilkins, **1981**:196-198, 226-227
11. Mattrey RF, Leopold GR, vanSonnenberg E, Gosink BB, Scheible FW, Long DM. Perfluorochemicals as liver- and spleen-seeking ultrasound contrast agents. *J Ultrasound Med* **1983**;2:173-176
12. Benson DM, Waldroup LD. Ultrasonic characterization of fetal lung, liver, and placenta for the purpose of assessing fetal maturity. In: *Eighth international symposium on ultrasonic imaging and tissue characterization*. Washington, DC: National Bureau of Standards, **1983**
13. Edwards MK, Brown DL, Muller J, Grossman CB, Chua GT. Cribside neurosonography: real-time sonography for intracranial investigation of the neonate. *AJNR* **1980**;1:501-505, *AJR* **1981**;136:271-276