DISPROPORTIONATE CORRELATION BETWEEN IMAGING AND OUTCOME IN AN INFANT WITH CEREBRAL ABSCESS

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Abstract

Objective

Brain abscesses represent organized foci of suppuration within the parenchyma. Here we report a 3 month-old girl with a very huge complicated cerebral abscess, and the course of treatment given. The patient's recovery was excellent. The follow up MRI showed only subtle porencephalic changes as the only parenchymal sequelae, which may be due to CNS plasticity in infants.

Key Words: Abscess, Cerebral, Plasticity

Introduction

Brain abscesses represent organized foci of suppuration within the parenchyma (1-3). In the event of abscess rupture and subsequent communication with the ventricular system, ependymitis develops, and enhancement of the ventricular lining is present, in addition to the characteristic ring enhancement around the abscess cavity (4).

Presentation of the case

The patient was a 3 month-old girl referred to the author's clinic because of irritability and protracted vomiting. On physical examination there was no obvious neurologic deficit except for papilledema. Brain CT scan showed a huge round hypodensity in the left frontoparietal lobe which showed ring enhancement, sized 4×6×7 cm3, after contrast injection marked vasogenic edema extended into the left frontoparietal lobe. Severe subfalcine herniation (15m) was evident (Fig 1).

Considering the density to be a cerebral abscess, the patient was treated by left frontal trephination and tap of the lesion and irrigation. During the operation more than 50 milliliters of tenacious, foul-smelling pus was drained. Cultures of pus grew anaerobic Streptococci.

We had to repeat the procedure twice within 2 weeks to reduce the mass effect. With concomitant use of phenytoin and intravenous antibiotics consisting of vancomycin, ceftriaxone and metronidazole, based on the pediatrician's advice, the girl began to recover and symptoms subsided; however after 3 weeks the infant's consciousness deteriorated and her body temperature rose. Brain CT scan showed reduction of the size of the mass; however with contrast injection, ependymal enhancement showed no sign of ventricular enlargement, hence lumbar puncture was performed which revealed purulent meningitis. The CSF culture showed growth of anaerobic streptococci, indicating that ventriculitis had occurred due to perforation of abscess wall into the ventricular cavity. On the pediatrician's advice, imipenem was added to the antibiotic regimen, and the symptoms subsided. After 3 negative CSF cultures, the patient was discharged in good health and treatment with oral antibiotics was

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continued at home for 6 more weeks.

After 3 months, in the follow up visit we noticed enlarged head circumference, therefore brain CT scan was performed which revealed communicating hydrocephalus (Fig 2). The patient was admitted to the hospital again and a medium pressure VP shunt was inserted to treat hydrocephalus. After about 3 weeks the parents again brought the child to our clinic, because of projectile vomiting and subcutaneous fluid collection around the pump; she was readmitted and following revision of the proximal shunt catheter, the patient recovered fully.

After 8 months, MRI of the brain was performed; According to this study, results showed the anatomy of the ventricular system, aqueduct and CSF pathways were normal; right posterior parietal VP shunt catheter was noted; brain parenchyma was normal. No signal change and midline shift was noted. Parallel to the left frontal horn there was a porencephalic lesion (Fig 3). The patient had normal physical examination and her psychomotor development was unremarkable.

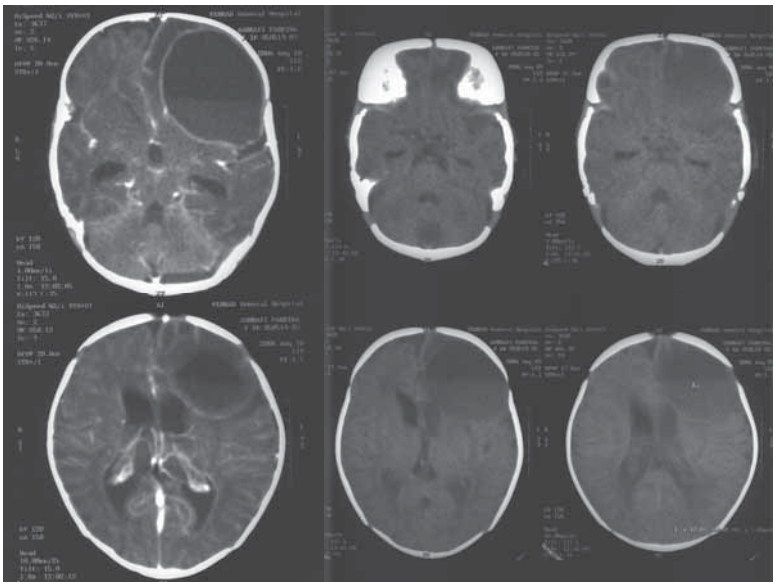

Fig 1: Brain CT scan with (left) and without (right) contrast of the infant which shows huge cerebral abscess in the left frontoparietal lobe.

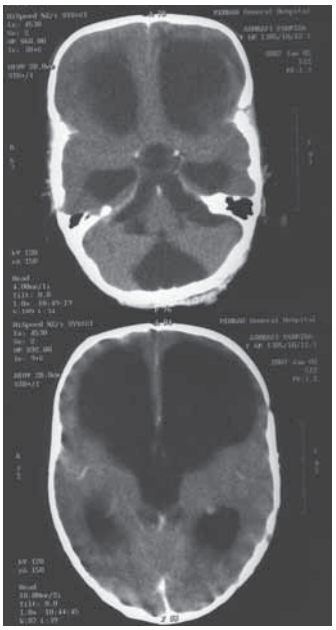

Fig 2: Brain CT scan of the infant which shows ventricular enlargement.

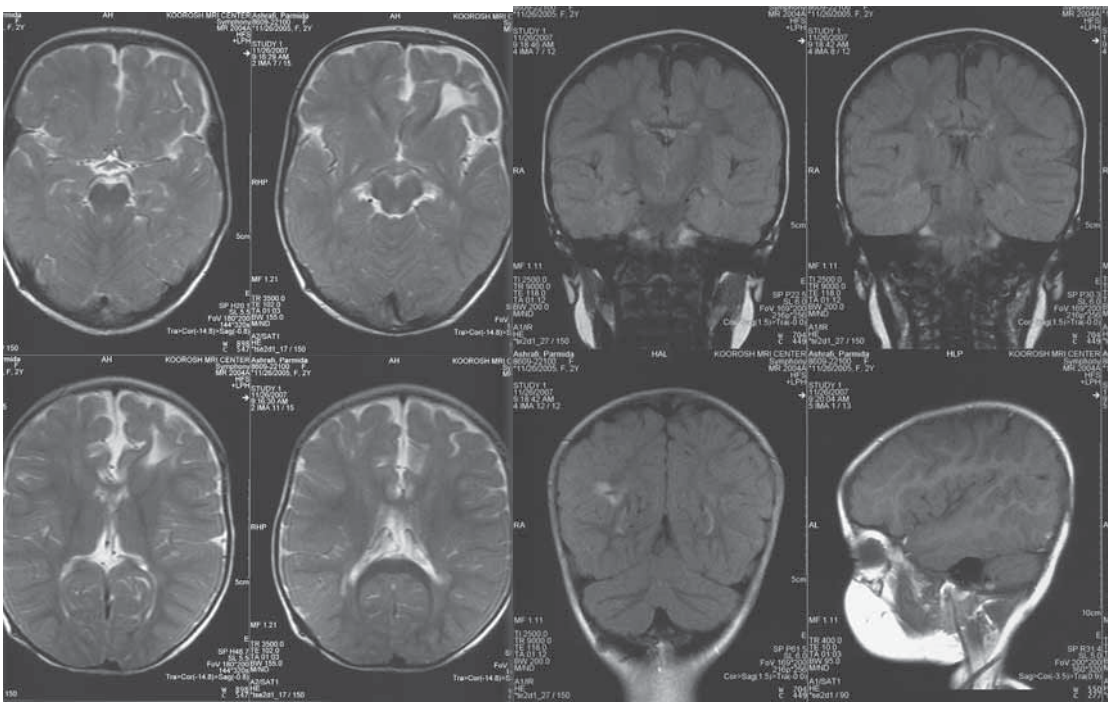

Fig 3: Brain MRI of the patient 1 year after treatment shows only mild porencephalic change parallel to the left frontal horn of lateral ventricle.

Discussion

Brain abscesses represent organized foci of suppuration within the parenchyma. In the event of abscess rupture and subsequent communication with the ventricular system, ependymitis develops, and enhancement of the ventricular lining is present, in addition to the characteristic ring enhancement around the abscess cavity. Such development heralds a poor prognosis(1-4). The clinical picture, along with laboratory findings, may be helpful in narrowing the diagnosis, but radiologic examination has become invaluable for confirmation (1, 2).

Unsuspected ventriculitis might be a source of persistent infection and therapeutic failure in the management of meningitis (3-10). Hydrocephalus after cerebral abscess has been documented in some of the case reports in documented literature (1, 11,12).

Periventricular signal abnormality, detected in 78% of cases with MR imaging, most likely reflects the periventricular inflammatory change observed at pathology (13).

In our patient although a very huge cerebral abscess, meningitis, ventriculitis and subsequently hydrocephalus occurred subsequently, the follow up MRI study showed only subtle porencephalic change as the only paranchymal sequelae and patient recovery was excellent; this may well be due to CNS plasticity in infants.

Children have remarkable ability to recover from early brain injuries. Mechanisms of brain plasticity include a change in the balance of excitation and inhibition, a long-term potentiation or long-term depression, a change in neuronal membrane excitability, and the anatomical changes, which need a longer period of time. The molecular mechanisms of brain plasticity are under intensive research. Calcium ions, calcium channels, NMDA receptors, free radicals, lipid peroxides and neurotrophins play a major role in these processes. At present, the neurophysiologic and MRI techniques can demonstrate the plasticity in children with brain injuries. Quantitative EEG and magnetic resonance spectroscopy are useful tools in the determination of plastic changes in children with cerebral palsy (14-17).

Given these findings, one might predict that in cerebral abscess even in cases with huge lesions and multiple radiological abnormalities, judicious use of modern radiological techniques and appropriate treatment

modalities can minimize the consequent clinical and radiological sequelae, especially in infants due to their cerebral plasticity.

References

1. Adams RD, Victor M, Ropper ALl. Pinciples of Neurologt. New York, NY: McGraw-Hill; 1997:712-716.
2. Kirkpatrick JB. Neurologic infections due to bacteria, fungi and parasites. In: Davis RL, Robertson DM, eds. Tesabook of Neuropatholog. Baltimore, Md: Williams & Wilkins; 1997:845-853.
3. Bakshi R, Kinkel P, Mechtler L. Cerebral ventricular empyema associated with severe adult pyogenic meningitis: computed tomography findings. Clin Neurol Neurosurg 1997;99:252–255.
4. Melanie B, Fukui, Robert L. Williams, Sanjay Mudigonda. CT and MR Imaging Features of Pyogenic Ventriculitis. AJNR Am J Neuroradiol 2001 September; 22:1510–1516.
5. Barloon TJ, Yuh WT, Knepper LE, Biller J, Ryals TJ, Sato Y. Cerebral ventriculitis: MR findings. J Comput Assist Tomogr 1990;14:272–275.
6. Bodino J, Lylyk P, Del Valle M, Wasserman JP, Leiguarda R, Monges J. Computed tomography in purulent meningitis. Am J Dis Child 1982;136:495–501.
7. Wormser G, Strashun A. Ventriculitis complicating gram negative meninigitis in an adult: diagnosis by radioisotope brain scanning and computerized tomography. Mt Sinai J Med 1980; 47:575–578.
8. Vachon L, Mikity V. Computed tomography and ultrasound in purulent ventriculitis. J Ultrasound Med 1987;6:269–271.
9. Kaiser A, McGee Z. Aminoglycoside therapy of gram negative bacillary meningitis. N Engl J Med 1975;293:1215–1220.
10. Rahal JJ, Hyams P, Simberkoff M. Combined intrathecal and intramuscular gentamicin for gram negative meningitis: pharmacologic study of 21 patients. N Engl J Med 1974;290: 1394–1398.
11. Bakshi R, Kinkel P, Mechtler L. Cerebral ventricular empyema associated with severe adult pyogenic meningitis: computed tomography findings. Clin Neurol Neurosurg 1997;99: 252–255.
12. Zimmerman R, Patel S, Bilaniuk L. Demonstration of purulent bacterial intracranial infections by computed tomography. AJR Am J Roentgenol 1976;127:155–165.
13. Lee H. Unilateral pyogenic ventriculitis. J Nucl Med 1977;18: 403
14. Kułak W, Sobaniec W. Molecular mechanisms of brain plasticity: neurophysiologic and neuroimaging studies in the developing patients. Annals Academiae Medicae Bialostocensis 2004; 49: 229-236.
15. Alder J, Thakker-Varia S, Bangasser DA, Kuroiwa M, Plummer MR, Shors TJ, Black IB. Brain-Derived Neurotrophic Factor-induced gene expression reveals novel actions of VGF in hippocampal synaptic plasticity J Neurosci 2003; 26: 10800-8.
16. Walecki J. Proton magnetic resonance spectroscopy in children with spastic diplegia. Neurosci Lett 2004; 363: 62-4.
17. Kułak W, Sobaniec W. Spectral analysis and EEG coherence in children with cerebral palsy: spastic diplegia. Przegl Lek 2003; 60(: Suppl 1):1-5.