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Disproportionate Correlation Between Imaging and Outcome in an Infant with Cerebral Abscess

Case Report

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Abstract: Brain abscesses represent organized foci of suppuration within the parenchyma. In this paper, we describe the case of a 3-month old girl with a large, complicated cerebral abscess. In addition, the course of treatment is presented. The patient's recovery was excellent. The follow-up MRI showed only subtle porencephalic changes as the only parenchymal sequels, which may have been due to central nervous system (CNS) plasticity in infants.

Keywords: *Abscess • Cerebral • CNS • Plasticity*

1. Introduction

Brain abscesses represent organized foci of suppuration within the parenchyma. In the event of an abscess rupture, there is the possibility of a subsequent communication with the ventricular system, the development of ependymitis, and the enhancement of the present ventricular lining, in addition to the characteristic ring enhancement around the abscess cavity. This development heralds a poor prognosis. The clinical picture, along with laboratory findings, may be helpful in narrowing the diagnosis, but radiologic examination has become invaluable for confirmation [1,2]. In this paper a child with a very large cerebral abscess, meningitis, ventriculitis and subsequent hydrocephalus is reported. MRI study demonstrated subtle porencephalic change as the only parenchymal sequellae and the patient recovery was excellent. This may have been due to plastic nature of the CNS in infants.

2. Presentation of the case

A 3-month old girl was referred to this 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 large, round hypodensity in the left frontoparietal lobe, which demonstrated size 4× 6× 7 cm^3 ring enhancement after contrast injection. There was marked vasogenic edema extending into the left frontoparietal lobe. Severe subfalcine herniation (15 mm) was evident (Figure 1).

Due to the impression that the patient had a cerebral abscess, treatment consisted of left frontal trephination and the lesion was tapped then irrigated. During the operation, more than 50 mL of tenacious and foul-smelling pus was drained. Cultures of the pus grew anaerobic Streptococci.

We repeated this procedure twice over a 2-week period in order to reduce the mass effect. With concomitant use of phenytoin and intravenous antibiotics consisting of vancomycin, ceftriaxone and metronidazole in measurements advised by a pediatrician, the girl began to recover and her symptoms subsided. At 3 weeks post-operation, the infant girl's consciousness

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Figure 1. Brain CT scan with (left) and without (right) contrast of the infant girl, which shows a large cerebral abscess in the left frontoparietal lobe.

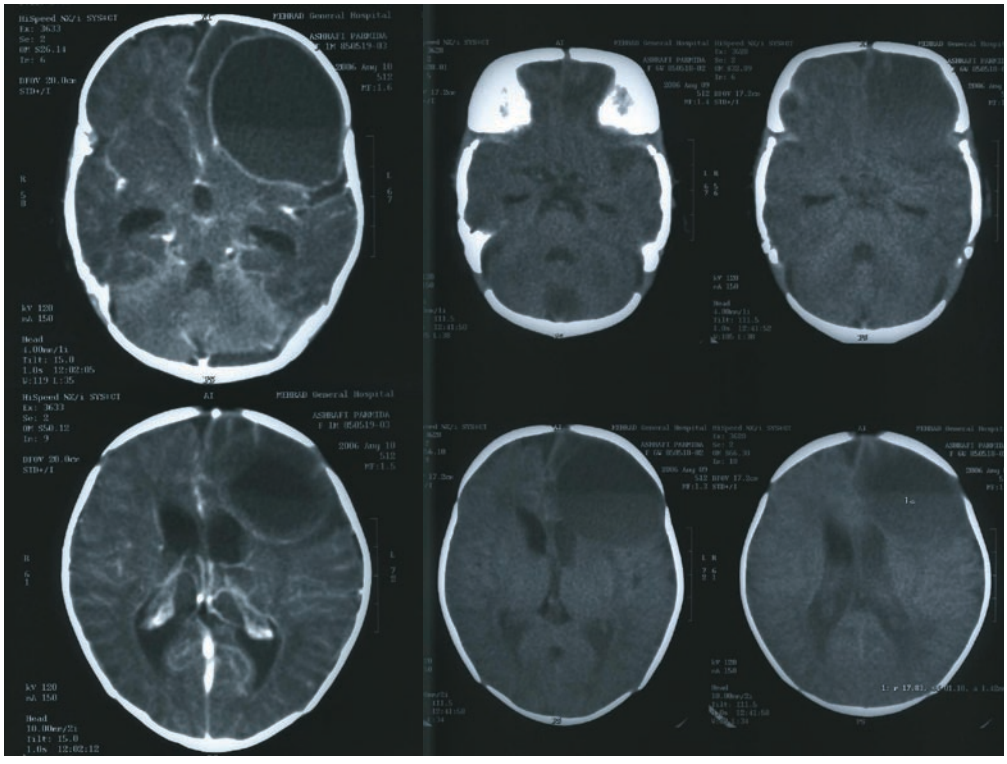
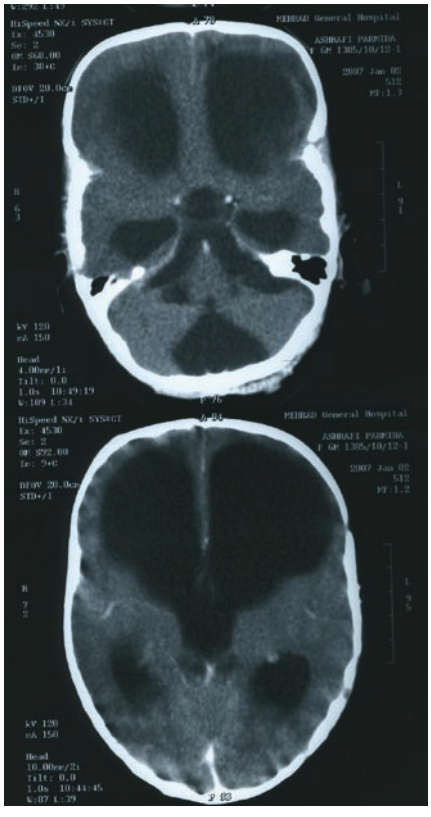


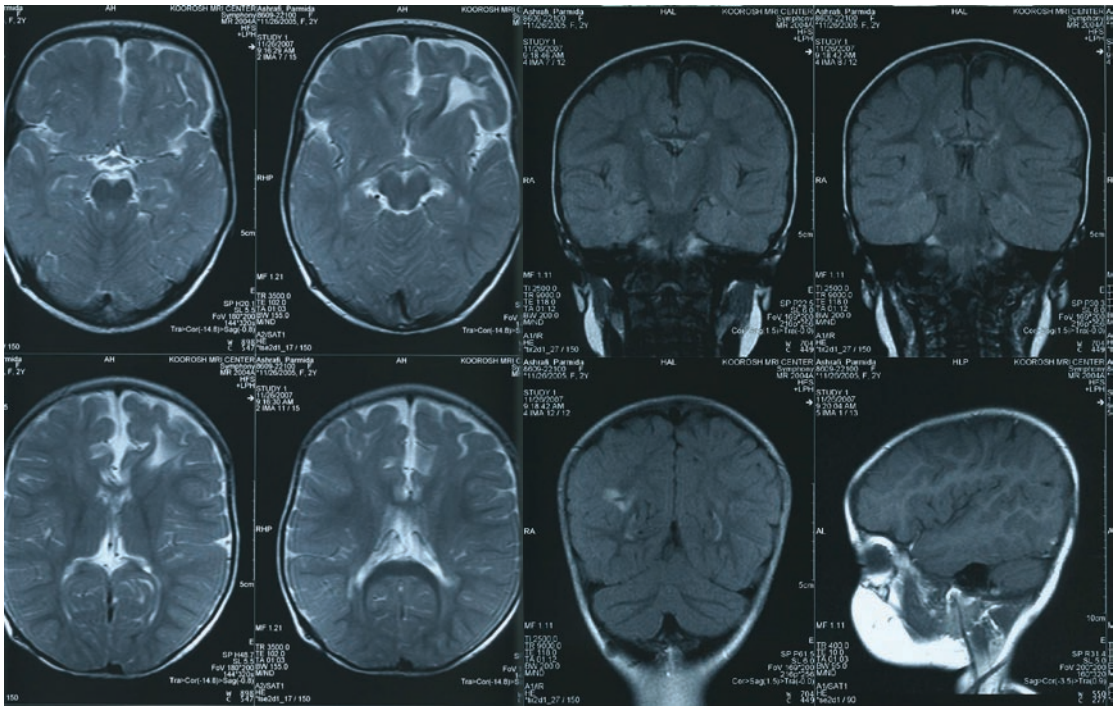
Figure 2. Brain CT scan of the infant showing ventricular enlargement.



deteriorated and she was febrile. Brain CT scan showed a reduction in the size of the mass, but with contrast injection demonstrated ependymal enhancement. There was no sign of ventricular enlargement, so lumbar puncture was performed that showed purulent meningitis. The cerebrospinal fluid (CSF) culture grew anaerobic Streptococci as well. On advice from a pediatrician, imipenem was added to the antibiotic regimen, and the symptoms subsided. The patient was discharged in good health after 3 negative CSF cultures and with a prescription for a 6-week course of oral antibiotics.

At 3-months' follow-up visit, we noted an enlarged head circumference, then ordered a brain CT scan, which revealed a communicating hydrocephalus (Figure 2). The patient was admitted to the hospital again and a medium pressure ventriculoperitoneal (VP) shunt was inserted to treat hydrocephalus. Approximately 3-weeks after this second procedure, the parents brought the child back to our clinic due to projectile vomiting and subcutaneous fluid collection around the pump. The infant girl was re-admitted to hospital and underwent a procedure to revise the proximal shunt catheter. The patient fully recovered a second time. After 8 months, the patient underwent magnetic resonance imaging (MRI) of the brain. The MRI study demonstrated normal the anatomy of the ventricular system, aqueduct, and CSF pathways. We noted a right posterior parietal VP shunt

Figure 3. Brain MRI of the patient 1-year post treatment shows only mild porencephalic change parallel to the left frontal horn of lateral ventricle.



catheter. Brain parenchyma was normal. There was no signal change or midline shift. The MRI study showed a porencephalic lesion, parallel to the left frontal horn (Figure 3) The patient had normal physical examination and her psychomotor development was unremarkable.

3. Conclusion

Pyogenic ventriculitis is an uncommon complication of intracranial infection in adults that has been variably referred to as ependymitis, ventricular empyema, pyocephalus, and ventriculitis [3-7]. Unsuspected ventriculitis might be a source of persistent infection and therapeutic failure in the management of meningitis [8,9]. Hydrocephalus after cerebral abscess has been documented in some of the case reports in the literature [1,10,11].

Periventricular signal abnormality, detected in 78% of cases with MR imaging, most likely reflects the periventricular inflammatory change observed at pathology [12].

Although our patient had a very large cerebral abscess, meningitis, ventriculitis and subsequent hydrocephalus, the follow-up MRI study showed only subtle porencephalic change as the only parenchymal sequellae, and the patient recovery was excellent. This may be due to CNS plasticity in infants.

Children have the 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 anatomical changes that require longer periods of time.

The molecular mechanism of brain plasticity is under intensive research. The following neurotrophins play a major role in these processes: calcium ions, calcium channels, NMDA receptors, free radicals, lipid peroxides and neurotrophins.

At present, the neurophysiologic and MRI techniques are able to disclose 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 [13-16].

Given these findings, one might predict that cerebral abscesses, even in cases with large-size lesions and multiple radiological abnormalities, judicious use of modern radiological techniques and use of appropriate treatment modalities can minimize the consequent clinical and radiological sequels particularly in infants, who have cerebral plasticity.

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