Magnetic resonance images of brain-stem encephalitis

Case report

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The clinical and radiological findings in a case of brain-stem encephalitis are described with special emphasis on the serial magnetic resonance imaging. This pathological condition should be differentiated from brain-stem tumors, which may present with similar symptoms.

KEY WORDS • diagnostic imaging • magnetic resonance imaging • brain stem • encephalitis

Brain-stem encephalitis is a rare disorder. The classical form is characterized by acute progressive ophthalmoplegia, ataxia, and hyporeflexia; patients suffering from this condition usually recover completely. The computerized tomography (CT) scan is frequently normal, but occasionally shows a low-density lesion in the brain stem. We report a patient with brain-stem encephalitis who presented with right abducens palsy and ataxia. The appearance on CT scanning and magnetic resonance imaging (MRI) is described.

Case Report

This 44-year-old man complained of a headache, general fatigue, and a sore throat, followed by diplopia, gait disturbance, and numbness of the limbs. These symptoms gradually worsened. He was transferred to Shinsuma Hospital 19 days after onset.

Examination. He was alert and cooperative. There was a complete right sixth nerve palsy, but the other cranial nerves were normal. Motor system examination was normal, with symmetrical deep-tendon reflexes and flexor plantar response. There was dysmetria, but alternating movement was normal. His gait was ataxic. There was no objective sensory loss but the patient complained of numbness of the limbs.

The cerebrospinal fluid (CSF) was obtained at normal opening pressure. Analysis of the CSF revealed 46 polymorphonuclear cells and 272 lymphocytes/cu mm, a protein level of 72 mg/dl, normal glucose concentration, and negative cultures for bacteria and fungi. Serological testing of the blood and CSF was negative for enteroviruses, arboviruses, cytomegalovirus, influenza viruses, mumps virus, herpes simplex viruses, adenovirus, and syphilis. A CT scan revealed enlargement of the pons. Irregular enhancement by the contrast medium was noted in the upper right region of the pons (Fig. 1a and b). In the MRI scans, the abnormality was clearly discernible. In the spin-echo images with 2100-msec pulse sequence repetition time (TR) and 80-msec echo delay time (TE), which are dependent on T2 relaxation time, bright areas were found not only in the enlarged pons but also in the midbrain and the left thalamic region (Fig. 2a and b). The inversion recovery 2100(TR)/500(read pulse: TI)/40(TE) images, which are dependent on T1 relaxation time, showed dark areas in the same regions as the spin-echo images (Fig. 2c and d). The T1 relaxation time of the abnormal area of the pons was calculated to be 524 msec from the computed T1 image, and T2 relaxation time was 162 msec.

Course. The patient was treated with betamethasone, 12 mg/day (0.2 mg/kg/day). He gradually improved, and there were no residual neurological abnormalities except a combination of slight numbness of the hands and feet about 3 weeks after admission. A CT scan performed 10 days after admission was normal (Fig. 1c), but the MRI did not return to normal until 50 days after admission when the patient showed complete re-
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FIG. 1. a: Non-contrast-enhanced computerized tomography (CT) scan on admission revealing enlargement of the pons. b: Contrast-enhanced CT scan on admission revealing irregular enhancement in the upper right region of the pons. c: Contrast-enhanced CT scan 10 days after admission was normal.

covery (Fig. 2e, f, and g). Two months after admission he was discharged with no neurological abnormalities except a combination of slight numbness of the hands and feet.

Discussion

In the case presented here, the prodromal viral syndrome, characteristic neurological deficits, and CSF lymphocytosis strongly suggested infectious or postinfectious viral brain-stem encephalitis. 1 Computerized tomography of brain-stem encephalitis has been reported to show reversible enhanced low-density areas. 7 There are, however, only three reports of MRI of this disorder, 4, 5 revealing in all cases pontine enlargement and an increased intensity area in the pons. 4, 5 In our case, CT scans revealed a low-density area in the pons,

FIG. 2. Magnetic resonance imaging. a: Axial spin-echo (SE) 2100/80 image on admission revealing a bright area in the left thalamic region. b: Sagittal SE 2100/80 image on admission showing enlargements and bright areas in the midbrain and the pons. c and d: Axial and sagittal inversion recovery (IR) 2100/500/40 images on admission revealing dark areas in the same regions as in the SE images. e and f: The axial and sagittal SE 2100/80 images taken 50 days after admission were normal. g: The axial IR 2100/500/40 image taken 50 days after admission was normal.
MRI of brain-stem encephalitis

with irregular enhancement by the contrast medium; however, this abnormality disappeared about 1 month after onset despite continued neurological abnormalities. On the other hand, MRI revealed an abnormal intensity area not only in the pons but also in the midbrain and left thalamic region, even after most of the neurological abnormalities had disappeared. These facts suggest that MRI is superior to CT for detecting and monitoring brain-stem encephalitis.

The contrast resolution in MRI derives mainly from differences in the relaxation time of the various tissues. In the spin-echo images used in our study, the pulse sequence repetition time (TR) was 2100 msec and the echo delay time (TE) was 80 msec. These images with a long TR and a long TE are dependent on T2 relaxation time. The inversion recovery images are T1-weighted. In the inversion recovery images, the time between the 180 inversion pulse and the read pulse (TI) was 500 msec; TR was 2100 msec and TE was 40 msec. The lesions in our case exhibited a bright intensity in spin-echo 2100(TR)/80(TE) images and a dark intensity in inversion recovery 2100(TR)/500(TI)/40(TE) images. This can be interpreted as the result of prolongation of both the T1 and T2 relaxation times. Actually, the T1 relaxation time of the pons in this case was 524 msec (normal 427 ± 75 msec) and the T2 relaxation time was 162 msec (normal 61 ± 11 msec). These facts are consistent with an earlier report. Infection of the brain causes a breakdown of the blood-brain barrier, allowing leakage of macromolecules from the intravascular space into the extracellular space of the brain. This vasogenic edema increases the amount of free water, which results in prolongation of the T1 and T2 relaxation times.

Patients with brain-stem tumors have symptoms resembling those of brain-stem encephalitis, and it is sometimes difficult to differentiate between these disorders in CT scans. Further study is needed to determine whether MRI can differentiate between these disorders on the basis of the absolute values of the T1 and T2 relaxation times.

References


Manuscript received November 21, 1985.
Accepted in final form June 25, 1986.
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