Magnetic resonance imaging and computerized tomography scanning of herpes simplex encephalitis

Report of two cases

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The authors present two cases of herpes simplex encephalitis (HSE) in which computerized tomography (CT) scanning and magnetic resonance imaging (MRI) were performed. They also review the literature on the use of these imaging modalities in cases of HSE. The striking changes noted in these cases on T2-weighted magnetic resonance images in comparison to the CT findings suggest that MRI will help speed recognition of nonhemorrhagic HSE abnormalities.

KEY WORDS • magnetic resonance imaging • herpes simplex encephalitis • computerized tomography • diagnostic imaging

Herpes simplex encephalitis (HSE, Type I) is an uncommon, potentially fatal disease that can be effectively treated with acyclovir. For optimum outcome, rapid diagnosis and institution of therapy are paramount. It has been suggested that magnetic resonance imaging (MRI) may be more sensitive than computerized tomography (CT) in detecting HSE; however, there are few examples in the literature of the use of MRI in cases of HSE. We present the cases of two patients with HSE who underwent both MRI and CT scanning, and we review the literature on use of these imaging modalities in cases of HSE with special attention to the location of the lesions and the frequency of hemorrhage.

Case Reports

Case 1
This 42-year-old white woman was well until 3 days prior to admission when she developed headache, fever, nausea, and increasing lethargy. On admission to a local hospital she was disoriented but had no focal neurological deficit. Computerized tomography without contrast enhancement was normal. Cerebrospinal fluid (CSF) obtained at lumbar puncture revealed a white blood cell (WBC) count of 176/cu mm (81% lymphocytes, 5% monocytes, 14% basophils), a red blood cell (RBC) count of 4/cu mm, a protein concentration of 64 gm/100 ml, and a glucose level of 74 mg/100 ml (serum glucose level 120 mg/100 ml). Electroencephalography showed diffuse slowing and disorganization with bitemporal delta waves. Four days after admission and 7 days after the onset of symptoms, an MRI study at a second institution showed an increased signal in the bitemporal and right parietal areas on T2-weighted images (Fig. 1). The patient was transferred to the University of Cincinnati Medical Center (UCMC) and was given acyclovir (30 mg/kg/day). Results of brain biopsy were consistent with HSE. The patient survived but with substantial persistent neurological deficit.

Case 2
This 22-year-old white man developed headache, intermittent fever, and vomiting 7 days prior to admission. His symptoms waxed and waned for several days and he actually was able to play in a college football game 5 days prior to admission. Initial evaluation at a local hospital revealed no focal neurological deficit, although a CT scan showed low attenuation adjacent to the right sylvian fissure (Fig. 2). The patient was transferred to UCMC where an emergency angiogram disclosed a subtle mass effect in the right temporal region, without associated vascular abnormality. An
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FIG. 1. Case 1. Magnetic resonance images showing the "transsylvian sign" of herpes simplex encephalitis Type I. Both the 1.5-Tesla coronal view (TR 2500, TE 80; left) and the 1.5-Tesla axial view (TR 2500, TE 40; right) demonstrate bitemporal high-signal areas with involvement of the insula on the right.

FIG. 2. Case 2. Computerized tomography scan without contrast enhancement showing low attenuation and adjacent hemorrhage in the right temporal lobe.

FIG. 3. Case 2. 1.5-Tesla magnetic resonance images obtained on the same day as the computerized tomography scan shown in Fig. 2. Both the coronal view (TR 2500, TE 120; left) and the axial view (TR 2000, TE 80; right) show increased signal in the right temporal lobe, with involvement of the insula. The hypointense signal in the right temporal area (seen left) represents hemorrhage.

FIG. 4. Case 2. T1-weighted magnetic resonance image, 1.5-Tesla coronal view (TR 600, TE 25), showing a low signal in the right temporal lobe and insula. The area of hemorrhage seen on the corresponding computerized tomography scan (Fig. 2) and in the T2-weighted images (Fig. 3) is not identifiable.

MRI study showed increased signal in the right temporal lobe on T2-weighted images, with involvement of the insula (Fig. 3). The small area of hemorrhage identified on CT showed a relatively low signal on MRI (Figs. 3 and 4). Analysis of CSF obtained at lumbar puncture revealed 223 WBC's/cu mm (95% lymphocytes, 3% monocytes, 2% basophils), 20 RBC's/cu mm, and a glucose level of 63 mg/100 ml (serum glucose 132 mg/100 ml). Acyclovir therapy (30 mg/kg/day) was begun the evening of admission to UCMC. During the course of his illness, there was more than a fourfold increase in the patient's herpes simplex serum antibody titer. Despite minor setbacks, he generally showed steady improvement over the next 2 weeks and was discharged without neurological deficit.

Discussion

A review of the literature on MRI and CT scanning in cases of HSE disclosed 20 articles published between 1976 and 1987, including a total of 147 patients. Three of the articles presented examples of MRI, while nearly all the patients reported had undergone CT scanning. Variations in reporting methods made analysis of the data difficult in some cases; however, from the authors' stated findings and a review of the published images we were able to obtain information concerning the CT and MRI findings.

Of the 147 initial CT investigations, 91 were reported to be abnormal and 56 normal. Many of the normal initial studies were performed with early-generation CT scanners. In addition, many normal examinations were performed within 3 days after the onset of symptoms. The location of the abnormality was reported in 55 of the 91 initially abnormal CT examinations; 28 were right-sided (51%), 15 left-sided (27%), and 12 bilateral (22%). Only 11 of the patients were reported to have hemorrhage associated with the lesion on their initial scan. A small number of hemorrhages were shown on follow-up scans. The temporal lobe was the dom-
inant focus of involvement in the abnormal initial scans, and there was no definite example of exclusive involvement of a frontal, parietal, or occipital lobe without concurrent temporal lobe involvement. The most common CT abnormality was a low-attenuation area without abnormal enhancement. In several cases abnormalities were demonstrated on follow-up CT scans after an initially normal CT examination. Enzmann, et al., observed that more extensive CT abnormalities tended to occur in patients having some delay between the onset of symptoms and imaging.

Since rapid diagnosis and treatment can change the clinical outcome in cases of HSE, awareness of this disease needs to be heightened and the typical imaging characteristics require emphasis. In our Case 2, there was good correlation between the CT and MRI findings (Figs. 2 and 3). The high signal on T2-weighted MRI was more striking than the low attenuation on CT in the same area (Figs. 2 and 3). The striking MRI changes in cases of HSE will likely speed recognition of non-hemorrhagic HSE abnormalities; however, long-term additional study of this is necessary. Computed tomography is generally considered to be more sensitive than MRI in the detection of acute hemorrhage, and this was confirmed by the findings in Case 2.

It should be noted that there was involvement of the insula in both of the cases reported above as well as in several previous reports. An abnormality on both sides of the sylvian fissure (a transsylvian sign), is a useful imaging finding that suggests HSE, especially if the abnormality is bilateral. Middle cerebral artery infarction may also result in abnormalities both lateral and medial to the sylvian fissure; however, the typical arterial distribution is easily recognized in most cases.

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References