Magnetic Resonance and diffusion-weighted imaging findings of herpes simplex virus encephalitis associated with haemorrhage

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Section: Neuroradiology
Area of Interest: Head and neck Neuroradiology brain
Procedure: Diagnostic procedure
Imaging Technique: MR
Imaging Technique: CT
Imaging Technique: MR-Diffusion/Perfusion
Special Focus: Infection Case Type: Clinical Cases
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Patient: 27 years, female

Clinical History:

The patient presented with 2-day history of fever, headache, neck stiffness, and photophobia. The medical history and routine laboratory tests were insignificant. Cerebrospinal fluid (CSF) analysis revealed a cell count of 140/mm³, with 85% lymphocytes. Polymerase chain reaction (PCR) of CSF was positive for herpes simplex virus type 1 (HSV-1) infection.

Imaging Findings:

The patient underwent CT examination of the brain which was unremarkable (Fig. 1). Due to rapid neurological deterioration MR imaging of the brain was performed. T1-weighted images showed cortical swelling with loss of the grey-white matter junction and focal haemorrhage, in the right temporal lobe (Fig. 2). Sparing of the deep grey nuclei was noted. T2-weighted and FLAIR images showed unilateral, cortical and subcortical high signal intensity involving the hippocampus and extending to the parahippocampal gyrus (Figs. 3, 4). There was mass effect with collapse of the temporal horn of the right lateral ventricle (Fig. 4). Gadolinium-enhanced T1-weighted images showed no contrast enhancement of the brain parenchyma or the meninges (Fig. 5). Diffusion weighted MR images showed isointensity in the right temporal lobe and hippocampus (Fig. 6), with increased apparent diffusion coefficient (ADC) values (Fig. 7).

Discussion:

HSV-1 is the most common cause of sporadic viral meningoencephalitis [1]. Incidence is 1/250, 000-1, 000, 000 persons annually [2]. Half of the patients are younger than 50 years. Clinical manifestations include fever, headache, neck stiffness, seizures, neurologic deficits (dysphagia, epilepsy, hemiparesis), and depressed mental state. Although the mortality rate of HSV encephalitis runs up to 70% in untreated patients, it can be reduced to 20% by starting therapy [1, 2]. Because acyclovir therapy is safe, it is recommended that the drug be administered early after onset of clinical manifestations.

Encephalitis results from reactivation of latent viral infection of the trigeminal ganglion. The virus has a predilection for the inferior frontal lobes and the limbic system (the medial temporal lobes, the insula and cingulate gyrus).
Typically, the basal ganglia and putamen are spared [3]. On CT images affected areas appear normal early in the course of herpes encephalitis, or hypodense as the infection proceeds [1]. Haemorrhage is considered a late feature of disease. After the IV administration of contrast, parenchymal enhancement may vary from absent to patchy or gyriform. Occasionally, adjacent meninges show minimal enhancement. T1-weighted MR images show cortical swelling, with loss of gray-white junction associated with mass effect. Within oedematous brain, subacute haemorrhage may present as increased signal on both T1- and T2-weighted images. On gradient echo sequences, haemorrhage may present as foci of hypointensity. On T2-weighted and FLAIR images, bilateral asymmetric cortical and subcortical hyperintensity with relative white matter sparing is seen [1, 2].

Initially, the infection may appear unilateral on imaging, but overtime involvement of the contralateral lobes may become apparent. After the course of the acute inflammatory stage, gliosis and atrophy at the sites of brain destruction may present. Calcifications may or may not be present.

Diffusion weighted imaging (DWI) may depict parenchymal alterations before abnormalities are noted on T2 or FLAIR images. DWI may reveal a greater extent and number of lesions [1, 2, 4]. Cytotoxic brain oedema is the cause of restricted diffusion associated with reduction of the ADC. Development of vasogenic oedema is characterised by elevated diffusion with high ADC values [4].

Our patient was immediately started on intravenous acyclovir. After a week of therapy the patient was released with no neurological deficits.

**Differential Diagnosis List:** HSV 1 encephalitis with haemorrhage, Other encephalitides, Cerebral ischaemia, Status epilepticus, Limbic encephalitis, Infiltrating neoplasm

**Final Diagnosis:** HSV 1 encephalitis with haemorrhage

**References:**


Description: Axial CT of the brain shows no abnormal findings in right temporal lobe. Origin: Dept Radiology, GenHospioannina
Description: Axial T1-weighted MR image shows oedematous right temporal lobe, with loss of distinction between grey and white matter (asterisk). A focus of haemorrhage is seen as increased signal within oedematous brain (arrow). Origin: GenHospIoannina
Description: Axial T2-weighted MR image shows unilateral hyperintensity involving the cortex and subcortical white matter of right temporal lobe (arrow), extending to the parahippocampal gyrus. Origin: GenHospIoannina
Description: Corresponding FLAIR MR image shows markedly oedematous right temporal lobe. Note absence of temporal horn of right lateral ventricle due to collapse. Origin: GenHospIoannina
Description: Axial gadolinium-enhanced T1-weighted MR image shows no obvious enhancement of right temporal lobe and the meninges. Origin: GenHospIoannina
Figure 6

Description: ADC map shows increased ADC consistent with vasogenic oedema (arrowhead). Origin: GenHospIoannina
Figure 7

Description: Axial DWI (b1000) reveals affected area in right medial temporal lobe and hippocampus (arrowhead) as isointense. Origin: GenHospIoannina