IMAGE DIAGNOSIS

Image Diagnosis: Eccentric Target Sign of Focal Toxoplasma Encephalitis

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**CASE PRESENTATION**

A 60-year-old woman was admitted to the hospital because of low-grade fever and altered mental status of 1-month duration. The altered sensorium was gradual in onset, in the form of confusion, decreased verbal output, and progressively worsening level of consciousness. She recently had been repeating the words said to her and was not responding to the family members. At presentation, she was drowsy and disoriented. The score on the Glasgow Coma Scale (GCS) was 8 of 15 (eye opening response = 2 points, verbal response = 1 point, motor response = 5 points [E2V1M5]). Findings of the neurologic examination did not reveal neck rigidity, Kernig’s sign, or cranial nerve palsy. The patient was moving all 4 limbs equally and against gravity (ie, motor power of the limbs was at least 3 of 5 on the Medical Research Council scale). Deep tendon reflexes were normal and symmetrical, and the bilateral plantar response was flexor. However, a detailed examination of the motor system, sensory system, and gait could not be performed because of her altered mental status. Papilledema and features of retinitis were absent on fundus examination.

With a clinical possibility of a central nervous system (CNS) infection, noncontrast-enhanced computed tomography of the brain was performed, and these scans showed large areas of hypodensity in bilateral basal ganglia with adjacent areas of cerebral edema (Figure 1A). Subsequently, magnetic resonance imaging (MRI) of the brain after administration of gadolinium-based contrast agent revealed T1-weighted rim-enhancing lesion with an eccentric nodule in bilateral basal ganglia (arrow), suggestive of the “eccentric target sign.” Figure 1C. T2-weighted image shows alternating hyperintense and hypointense areas (arrow) with marked perilesional edema.

The diagnosis of cerebral toxoplasmosis is cerebral abscess or focal toxoplasma encephalitis, and these patients usually present with fever, headache, focal neurologic deficits, seizures, and altered mental status. The onset is typically subacute, and the symptoms gradually evolve and progress over several weeks. Other rare forms of cerebral toxoplasmosis are diffuse encephalitis without abscess formation and chorioretinitis.1-4

**DISCUSSION**

*T. gondii* is the most frequent opportunistic infection causing focal brain lesions or focal encephalitis in patients with HIV or AIDS. The most common form of CNS toxoplasmosis is cerebral abscess or focal toxoplasma encephalitis, and these patients usually present with fever, headache, focal neurologic deficits, seizures, and altered mental status. The onset is typically subacute, and the symptoms gradually evolve and progress over several weeks. Other rare forms of cerebral toxoplasmosis are diffuse encephalitis without abscess formation and chorioretinitis.1-4

The diagnosis of cerebral toxoplasmosis is generally suspected on the basis of brain imaging findings of RELs. They are usually multiple and occur in the basal ganglia, thalamus, or gray–white matter junction of the frontal and parietal lobes.

**Image 1A.** Noncontrast-enhanced computed tomography scan of the brain shows large areas of hypodensity in bilateral basal ganglia with adjacent areas of cerebral edema (arrow). Magnetic resonance images of the brain after administration of gadolinium-based contrast agent. Figure 1B. T1-weighted image shows rim-enhancing lesion with an eccentric nodule in bilateral basal ganglia (arrow), suggestive of the “eccentric target sign.” Figure 1C. T2-weighted image shows alternating hyperintense and hypointense areas (arrow) with marked perilesional edema.

**Keywords:** Cerebral toxoplasmosis, eccentric target sign, focal toxoplasma encephalitis, HIV

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**Image 1**: Noncontrast-enhanced computed tomography scan of the brain shows large areas of hypodensity in bilateral basal ganglia with adjacent areas of cerebral edema. Magnetic resonance images show T1-weighted rim-enhancing lesion with an eccentric nodule in bilateral basal ganglia, suggestive of the “eccentric target sign.” T2-weighted image shows alternating hyperintense and hypointense areas with marked perilesional edema.
The other differentials of RELs in patients with HIV are primary CNS lymphoma and, less commonly, tuberculous and fungal or bacterial abscesses. Nuclear imaging such as thallium chloride T1 201 (Thallium-201) single-photon emission computed tomography of the brain and 18F-2-fluoro-2-deoxy-D-glucose positron emission tomography may be used to differentiate toxoplasmosis from CNS lymphoma, because the former lesions are not hypermetabolic. The definitive diagnosis requires a stereotactic brain biopsy. Because of the associated high morbidity with the procedure, it is usually reserved for 2 conditions: 1) failure of empiric therapy for toxoplasmosis in patients with positive serologic findings for T. gondii and 2) seronegative patients.

An IgG serologic test is positive in more than 90% of patients with CNS toxoplasmosis, but only in less than 60% in HIV-infected patients without this condition. The likelihood of a REL due to toxoplasmosis is less than 10% with negative IgG serologic findings. The diagnosis of probable cerebral toxoplasmosis needs the presence of IgG antibodies and compatible imaging features in the typical clinical syndrome. The IgG antibody found in toxoplasmosis is the high-avidity type, suggesting that the immune response is secondary to the reactivation of a latent infection. Therefore, IgG elevation is typical in CNS toxoplasmosis, whereas IgM antibodies are usually absent, as in our case. The limitation of this case study is that a definite diagnosis with histopathologic analysis or polymerase chain reaction testing was not established. These tests were omitted given the adequate clinical response to antitoxoplasmosis therapy.

The eccentric target sign is described as an REL with an eccentric nodule along the wall on a brain MRI (T1 weighted with gadolinium enhancement). It represents a necrotizing abscess, and the small eccentric nodule possibly results from concentrically thickened blood vessels traversing the abscess. This radiologic finding is considered to be suggestive of cerebral toxoplasmosis with 95% specificity but is seen in only up to one-fourth of the cases. The Centers for Disease Control and Prevention, in its 2017 HIV Surveillance Report, stated that 6.2% of patients with newly diagnosed HIV were aged 60 years or above and were more likely to have a late-stage diagnosis than their younger counterparts. In the older age group, a history of risk factors for HIV, including a sexual history, is not always forthcoming. Our case highlights that recognition of an AIDS-defining illness through characteristic clinical or radiologic features (eg, eccentric target sign of cerebral toxoplasmosis) is crucial regardless of the age of the patient.

Disclosure Statement
The author has no conflicts of interest to disclose.

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Author Contributions
Samman Verma, MBBS, participated in the patient management, collected patient data, and drafted and revised the manuscript. Vidhi Singla, MD, participated in the patient management, collected patient data, and helped draft the manuscript. Aditya Singh, MBBS, and Ashok Kumar Pannu, MD, participated in the patient management and collected patient data. All authors have given final approval to the manuscript.

References