CNS toxoplasmosis in an immunocompetent individual

Rajoo Ramachandran, MBBS, MD; Prabhu Radhan, MBBS, MD; Rajamani Anand, MBBS; Ilanchezhian Subramanian, MBBS, MD; Roy Santosham, MBBS, DMRD, MD; and Venakata Sai, MBBS, DMRD, DNB, PhD

Toxoplasmosis is a serious and life-threatening disease in humans with a high prevalence in immunocompromised persons. The disease has a wide spectrum, depending on the immune status of the person. A CNS manifestation of toxoplasmosis in an immunocompetent person is very rare and often undetected. Our case of CNS toxoplasmosis in an immunocompetent person emphasizes the radiological diagnosis, which was further confirmed by advanced microbiology technique.
intense homogeneous enhancement on contrast administration (Figs. 3A and B).

Initially, in view of the patient's age, history, and imaging features, a diagnosis of metastasis from an unknown primary was made. The patient was further evaluated for localization of the primary lesion. USG of the abdomen, bone scintigraphy, and CT of the thorax were performed and found to be normal. The patient's symptoms worsened in the next three days, and a repeat CECT of the brain was done. This showed multiple homogeneously enhancing, hyperdense lesions with surrounding perilesional edema involving both the cerebral hemispheres (Figs. 4A and B). Adding this information to that on the MRI and CT brain images, the possibility of primary CNS lymphoma was raised.

The patient underwent MRI of the brain on the same day. This showed new lesions involving the left thalamus and globus pallidus (Fig. 5A). The lesion involving the left thalamus showed restricted diffusion on DWI (Fig. 5B) and low signal on ADC (Fig. 5C). MR spectroscopy showed an elevated lipid lactate peak (Figs. 6A and B). In view of the multiplicity of lesions and the onset of newer lesions within a span of one week (showing mixed, nodular enhancement pattern and a raised lipid lactate peak on MR spectroscopy), the possibility of CNS toxoplasmosis was raised. A sample from lumbar puncture was sent for PCR analysis. CSF analysis showed elevated Toxoplasma IgG of more than 200 (Ref range > 10 in an immunocompetent person) and an IgM greater than 3.1 (Ref range > 1.2 in an immunocompetent person). Toxoserology confirmed the radiological diagnosis of CNS toxoplasmosis. The patient was discharged against medical advice. Followup revealed that...
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On MRI, cerebral toxoplasmosis appears as hypointense lesions on T1-weighted images and may show peripheral hyperintensity (which helps to differentiate it from CNS lymphoma). The lesions on T2 and FLAIR images have high or mixed signal intensity. On contrast-enhanced T1-weighted images, the lesions show rimlike enhancement with surrounding hypointense areas (representing edema) (12).

A study done by Vastava et al observed imaging characteristics of cerebral toxoplasmosis in immunocompetent persons. This showed radiating enhancement in cortical/subcortical regions having very few nodular or ring-enhancing lesions—quite different from those in the immunocompromised patients (10). A previous report by Brightbill et al on 27 patients with toxoplasma encephalitis demonstrated three different MR imaging patterns: 37% had predominantly T2-weighted hyperintense lesions, 37% had T2-weighted isoointense lesions, and 26% had lesions with mixed signal on T2-weighted images (13).

On DWI, the central portion of toxoplasmic lesions does not show restricted diffusion, which is a characteristic finding observed in pyogenic abscesses. However, the presence of hemorrhage within the walls of toxoplasmic lesions may demonstrate peripheral hyperintensity. In addition, the measured ADC values are greater than that of unaffected white matter (14).

Like toxoplasmosis, CNS lymphoma also has a predilection for the basal ganglia. Unifocal and multifocal involvements are observed in both conditions. Both have varied patterns of enhancement, edema, and mass effect on CT images, and increased signal intensity on T2-weighted MR images. Lesions in lymphoma are usually more locally infiltrative; hence, a butterfly-like pattern of spread and enhancement favors lymphoma more than toxoplasmosis. In addition to this, lymphomatous lesions are usually larger than those of toxoplasmosis (15) and tend to have a periventricular distribution (7).

SPECT and PET have been known to play a role in distinguishing toxoplasmosis and other infections from CNS lymphoma. In comparison with cerebral toxoplasmosis or other infections, lymphoma has a greater thallium uptake on SPECT images (16).

The other differential diagnoses for multiple intraparenchymal brain lesions include tuberculoma, aspergillosis, progressive multifocal leukoencephalopathy, bacterial abscess, and cryptococcosis (17, 18).

In our case, with the multiplicity of lesions and onset of newer lesions within a span of one week, showing a mixed, nodular enhancement pattern and raised lipid lactate peak on MR spectroscopy, a diagnosis of CNS toxoplasmosis was made.

CNS toxoplasmosis should be considered as an important differential diagnosis in immunocompetent patients with neurological findings and unknown etiology. CT and MRI play an important role in early diagnosis and assist the clinician to provide effective management and prevent further complications.
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References

1. Kornienko VN, Pronin IN. Diagnostic neuroradiology. Springer Verlag. (2009) ISBN:3540756523.
2. Grant I, Gold J, Rosenblum M, Niedzwiecki D, Armstrong D. Toxoplasma gondii serology in HIV-infected patients: the development of central nervous system toxoplasmosis. AIDS 1990; 4:519-21. [PubMed]
3. Venkatasatya SA, Kumar GA, Pratap VS, Vivekananda DV, Madhukar R, Shyam S. Neurological manifestations in HIV infected patients around Varnasi, India. African Journal of Neuroscience 2006; 25:33-40.
4. B. Carme, F. Bissuel, D. Ajzenberg, R. Bouyne, C. Aznar, M. Demar, S. Bichat, D. Louvel, A. M. Bourbigot, C. Peneau, P. Neron, and M. L. Darté. Severe acquired toxoplasmosis in immunocompetent adult patients in French Guiana. Journal of Clinical Microbiology, Nov. 2002, p. 4037–4044 Vol. 40, No. 11 0095-1137/02/$04.00 DOI: 10.1128/JCM.40.11.4037–4044.2002. [PubMed]
5. Alice B. Smith, Lt Col, USAF, James G. Smirniotopoulos, MD, and Elisabeth J. Rushing, COL, USA. Central nervous system infections associated with human immunodeficiency virus infection: Radiologic-pathologic correlation. Radiographics November-December 2008. [PubMed]
6. Ali Nawaz Khan, MBBS, FRCS, FRCR, FRCSR; Chief Editor: James G Smirniotopoulos, MD. Imaging in CNS toxoplasmosis. Medscape, June 11 2013.
7. Gregory Tse Lee, MD, Fernando Antelo, MD, and , Anton A. Mikotic, MD. Cerebral Toxoplasmosis. Radiographics July-August 2009. [PubMed]
8. Jeffrey L. Jones, Valerie Dargelas, Jacquelin Roberts, Cindy Press, Jack S. Remington and Jose G. Montoya. Risk factors for Toxoplasma gondii infection in the United States. Journal of Clinical Infectious Disease September 2009 [PubMed]
9. Porter SB, Sande MA. Toxoplasmosis of the central nervous system in the acquired immuno deficiency syndrome. N Engl J Med 1992; 327(23): 1643–1648. [PubMed]
10. P.B. Vastava, S. Pradhan, S. Jha, K.N. Prasad, S. Kumar, R.K. Gupta. MRI features of toxoplasma encephalitis in the immunocompetent host. Neuroradiology 2002 Oct;44(10):834-8. Epub 2002 Aug 24. [PubMed]
11. Grossman RI, Yousem DM. Neuroradiology: the requisites. 2nd ed. Philadelphia, Pa: Mosby, Elsevier Inc.; 2003, 224–23.
12. Osborn AG, Blaser SI, Salzman KL, et al. Diagnostic imaging: brain. Salt Lake City, Utah: Amirsys, 2004, 70–73.
13. Brightbill TC, Post MJ, Hensley GT, Ruiz A. MR of toxoplasma encephalitis: signal characteristics on T2-weighted images and pathologic correlation. J Comput Assist Tomogr 1996;20:417-22. [PubMed]
14. Chong-Han CH, Cortez C, Tung GA. Diffusion-weighted MRI of cerebral toxoplasma abscess. Am J Roentgenol. 2003;181:1711-1714. [PubMed]
15. Balakrishnan J, Becker PS, Kumar AJ, Zinreich SJ, McArthur JC, Bryan RN. Acquired immunodeficiency syndrome: correlation of radiologic and pathologic findings in brain. Radiographics 1990; 10(2): 201–215. [PubMed]
16. Lorberboym M, Wallach F, Estok L, et al. Thallium-201 retention in focal intracranial lesions for differential diagnosis of primary lymphoma and non-malignant lesions in AIDS patients. J Nuc Med 1998; 39(8): 1366–1369. [PubMed]
17. Ciricillo SF, Rosenblum ML. Use of CT and MR imaging to distinguish intracranial lesions and to define the need for biopsy in AIDS patients. J Neurosurg 1990; 73(5): 720–724. [PubMed]
18. Chang L, Cornford ME, Chiang FL, Ernst TM, Sun NC, Miller BL. Radiologic-pathologic correlation: cerebral toxoplasmosis and lymphoma in AIDS. AJNR Am J Neuroradiol 1995; 16(8): 1653–1663. [PubMed]