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MULTIPLE INTRACRANIAL TUBERCULOMAS IN A CHILD *

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Intracranial tuberculomas continue to be a serious complication of central nervous system tuberculosis. Tuberculomas are conglomerates of tubercles resulting from hematogenous spread of tuberculous infection. Modern neuroimaging studies such as magnetic resonance imaging and molecular biologic techniques such as polymerase chain reaction are helpful in the diagnosis of central nervous system tuberculosis and tuberculomas. We report a boy with multiple intracranial tuberculomas diagnosed and treated with the aids of magnetic resonance and polymerase chain reaction techniques.
Key words: intracranial tuberculoma, gadolinium-DTPA-enhanced magnetic resonance imaging, polymerase chain reaction.

Tuberculosis is still a major cause of serious illness in the developing world. Tuberculosis of the central nervous system (CNS), although uncommon in children, continues to be a severe, life-threatening form of tuberculosis. Neurologic sequelae are common and the mortality rate ranges from 15 to 35 percent. Tuberculomas are the most common parenchymal form of CNS tuberculosis.

We report a boy with multiple intracranial tuberculomas diagnosed with the aid of gadolinium-DTPA-enhanced magnetic resonance (MR) studies.

Case Report

A 14-year-old boy was referred from a local hospital with a one-month history of double vision and ptosis. the had an eight-month history of progressively severe headache. He also had generalized convulsions with vomiting and fever beginning six months previously. His mother had a history of tuberculosis diagnosed and treated 2.4 years prior; the family history was otherwise unremarkable.

On physical examination his height and weight were at the fifth percentile (152 cm and 37 kg, respectively). He had bilateral ptosis more prominent on the left eye. His left pupil was mildly dilated and responded poorly to light; elevation of both

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eyes and convergence were also limited. The plantar response was extensor on the right side. His vital signs were stable and the physical examination was otherwise unremarkable.

Complete blood cell count, urinalysis and blood chemistry were all normal as were the chest roentgenograms. Cerebrospinal fluid (CSF) examination revealed a total of 90 cells/mm^3 with a lymphocyte predominance. CSF protein was 32 mg/dl, and cultures including for tuberculosis and fungi were all negative. Tuberculin skin test was negative. Polymerase chain reaction (PCR) in the CSF was positive for tuberculosis. A cranial computed tomography revealed communicating hydrocephalus, and cranial magnetic resonance imaging was performed.

After gadolinium injection, T1-weighted MR images showed multiple tuberculomas enhancing in the mesencephalon, suprasellar cistern and bilateral hippocampi (Figs. 1, 2).

The patient's signs and symptoms gradually subsided after the start of antituberculous therapy with isoniazid, pyrazinamide and ethambutol, and responded better to a ventriculoperitoneal shunt. He was discharged from the hospital in good clinical condition without any gaze palsy.

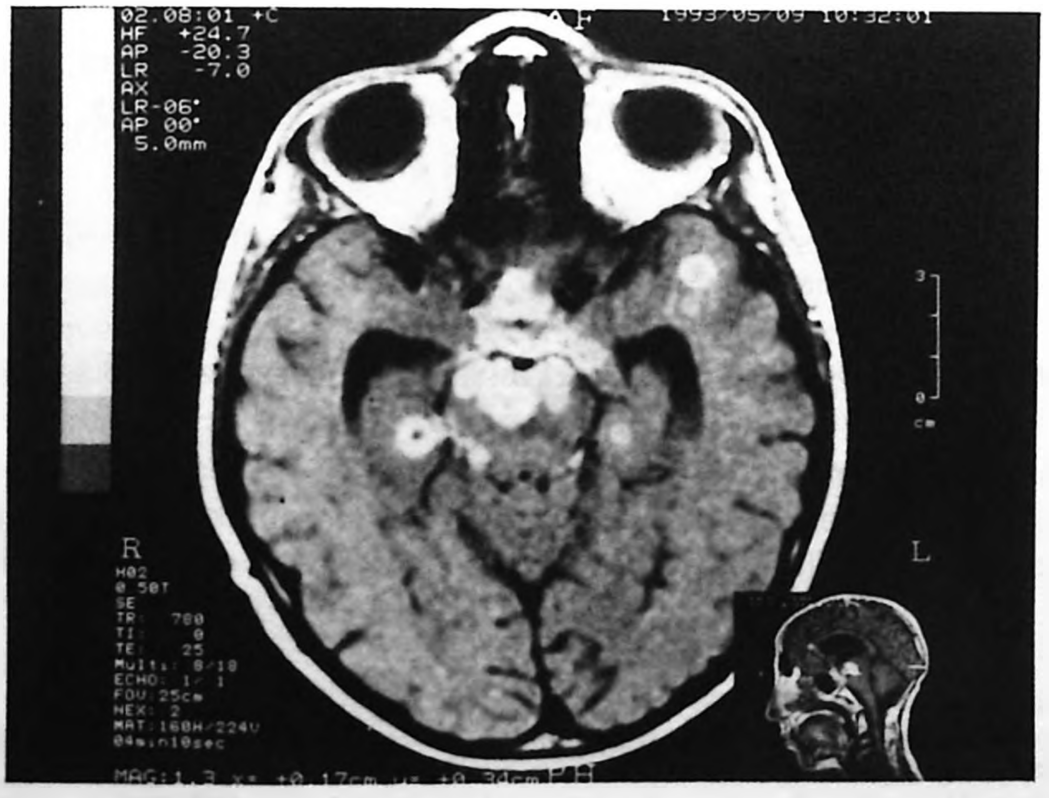

Fig. 1: Axial T1-weighted MR image after gadolinium injection showed multiple tuberculomas enhancing in the mesencephalon, suprasellar cistern and bilateral hippocampi, and a nodular enhancing lesion in the corpus callosum was noted on the sagittal "survey" view.

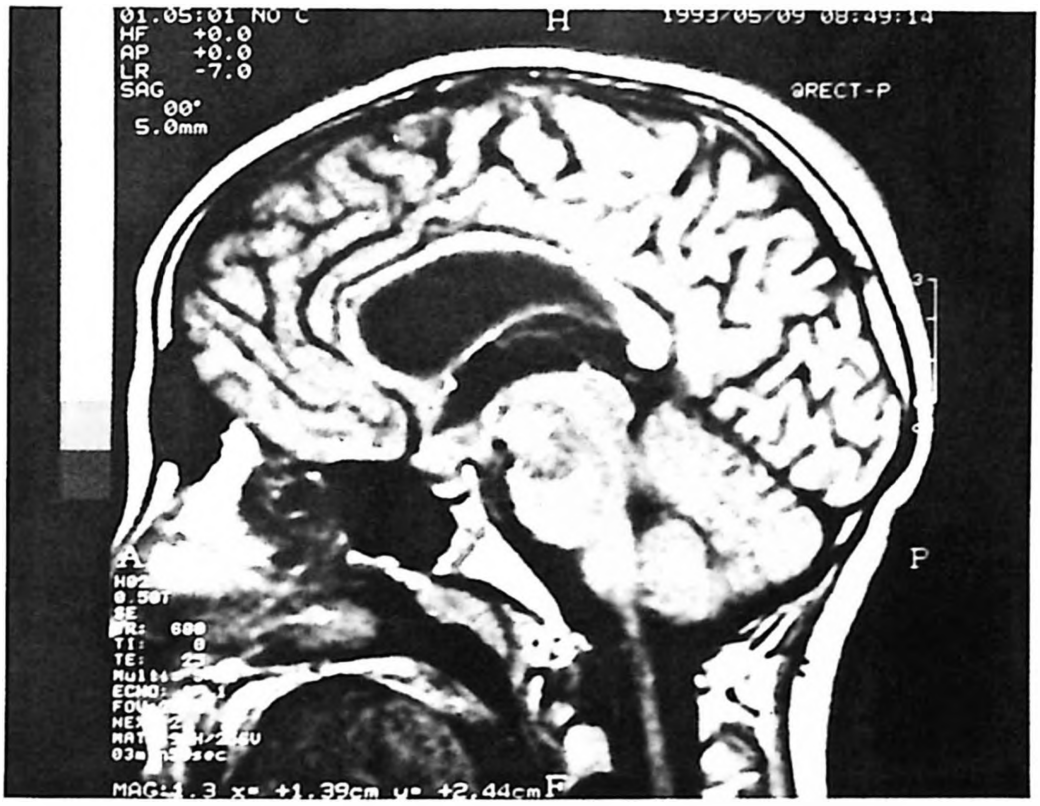

Fig. 2: Sagittal T1-weighted image showing tuberculomas in the mesencephalon and suprasellar cistern. There was a minute hyperintense lesion in the corpus callosum.

Discussion

Tuberculomas represent the most common parenchymal form of the CNS tuberculoses[1]. Only 15 to 40 percent of tuberculomas are multiple, and 60 percent are infratentorial, more commonly in children[1]. The frontal and parietal lobes are most commonly involved[2]. A prolonged febrile illness progressing to vomiting and lethargy is the usual course of intracranial tuberculoma. Signs and symptoms of increased intracranial pressure, such as headache, seizures and gaze palsies are common, as in our patient.

Intracranial tuberculomas are space-occupying masses of granulomatous tissue that result from hematogenous spread from a distant focus of tuberculous infection. They originate as a conglomerate of small tubercles that join to form a mature tuberculoma composed of a necrotic caseous center surrounded by a capsule containing collagenous tissue, epithelioid cells, Langhans giant cells and lymphocytes[3]. Tuberculomas are mostly diagnosed during antituberculous treatment and are uncommon in patients with active tuberculosis.

New neurological signs such as ocular motility disorders and hydrocephalus during antituberculous treatment are not unusual with tuberculomas, and these

signs and symptoms seen 10 days to five months after the start of treatment have led to the recognition of most tuberculomas[4]. Paradoxical expansion of cerebral tuberculomas and the appearance of symptoms during antituberculous treatment are explained by a complex host-organism interaction. Chemotherapy of any tuberculous locus causes destruction of acid fast bacilli and liberation of tuberculoprotein, probably invoking an inflammatory response with resulting edema and swelling of the focus. The mechanism may be similar to cervical lymph node enlargement due to trapping of antigen-reactive lymphocytes[4].

In all reports of MR with gadolinium-DTPA enhancement, intracranial tuberculomas have showed homogenous enhancement. Without gadolinium-DTPA enhancement, the MR images are generally insensitive to detection of active meningeal inflammation and granulomas. MRI is the technique of choice for the detection of subtle brain involvement in central nervous system tuberculosis and tuberculomas[6]. The signal intensity of granulomas on MRI is usually isointense to the gray matter on both T1- and T2-weighted images. On gadolinium-DTPA-enhanced T1-weighted images, granulomas often appear as conglomerated ring-enhancing nodules, as in our case[6]. Gadolinium-DTPA-enhanced MR imaging appears to be superior to computerized tomography in the evaluation of active or subtle intracranial tuberculosis[1,6].

The diagnosis of intracranial tuberculoma should rest on proper integration of data from clinical manifestations, cerebrospinal fluid analysis and neuroimaging studies. Objective evidence of systemic tuberculosis or exposure to disease may be absent in up to 70 percent of cases[3]. Tuberculous abscesses, gliomas, metastases, meningiomas, cysticercosis, coccidiomycosis and tuberous sclerosis should all be considered in the differential diagnosis[7]. There was also no evidence of systemic tuberculosis in our patient. Our patient did not have all the diagnostic criteria, such as positive smears for acid fast bacilli, positive cultures or a positive tuberculin test[8]. There was also no close family member with active tuberculosis. His CSF findings with a lymphocyte predominance and low glucose were compatible with tuberculous meningitis. Polymerase chain reaction for mycobacterium tuberculosis was positive in the CSF.

PCR is found to be a rapid diagnostic method for the diagnosis of CNS tuberculosis, especially tuberculous meningitis[9]. PCR is more sensitive than the conventional bacteriological methods, which are inadequate for the early and exact diagnosis of CNS tuberculosis. There are few organisms in the CSF for demonstration by direct smear; cultural identification takes six to eight weeks and unfortunately culture yields are mostly poor, as in our case. Under these circumstances, the use of PCR, especially in developing countries, is feasible[9].

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