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Carcinomatous Encephalitis: CT and MR Findings

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Intracranial metastases from carcinoma are common, occurring in up to 24% of cancer patients at autopsy [1]. Typically, intracranial metastatic disease is characterized by multiple intracerebral mass lesions near the gray-white junction with surrounding edema. Diffuse involvement of the brain without dominant mass lesions may occur with leptomeningeal spread of primary brain tumors, lymphoproliferative malignancies, and carcinomas [2]. Another form of diffuse neoplastic involvement of the brain is the rare carcinomatous encephalitis. This term was initially used by Madow and Alpers in 1951 [3] to describe the diffuse spread of carcinoma cells to the brain parenchyma and meninges without formation of macroscopic masses. To our knowledge, this entity has not been reported in the radiology literature. We present the case of a 60-year-old woman with clinical features of subacute encephalopathy and hemiparesis. CT and MR imaging revealed innumerable tiny nodules scattered throughout the gray and white matter of the brain, corresponding to nodules of papillary adenocarcinoma found at brain biopsy.

Case Report

A 60-year-old woman presented with a 2-month history of progressive inactivity, anorexia, confusion, weakness, and paucity of speech, as noted by her family. She was brought to the emergency room after being completely bedridden for 1 day and unresponsive for several hours. Physical examination on admission revealed a mildly cachectic Asian woman with rare spontaneous movements of the right side of her body. She did not respond to voice commands and did not exhibit speech. She had localized pain on her right side, but exhibited decerebrate posturing to pain on the left. There was diffuse paratonia with no response to plantar stroke. There was a left central facial paresis and right gaze preference. There was no nuchal rigidity. Routine laboratory examination of CSF revealed normal protein glucose, and cell count on three separate occasions.

Because of the history of hemiparesis, a noncontrast CT scan was performed and was normal. The contrast-enhanced CT scan (GE 9800, 0.65 g I/kg body weight) showed multiple small nodules of enhancement in the cerebral cortical gray and white matter and basal ganglia (Fig. 1A). There was no visible edema surrounding any of these lesions. The leptomeninges showed no abnormal enhancement.

MR images (Diasonics MT/S, 0.35 T) were obtained using T1-weighted (TR = 500 msec, TE = 30 msec) and T2-weighted (TR = 2000 msec, TE = 30 and 60 msec) multislice spin-echo techniques. T2-weighted images revealed innumerable tiny foci of high signal scattered throughout the parenchyma of the cerebrum, basal ganglia, cerebellum, and brainstem (Figs. 1B and 2). Gray and white matter appeared equally involved. The lesions ranged in size from 1 to 5 mm and no large mass was seen. No surrounding edema was present. On T1-weighted images, the lesions were isointense with brain. Many more lesions were seen with T2-weighted MR images than with contrast-enhanced CT scans. Brainstem and cerebellar lesions clearly identified by MR were missed by CT. An intraarterial digital subtraction angiogram was normal, with no evidence of vessel irregularities, abnormal staining, or mass effect.

A brain biopsy was performed through a burr hole in the nondominant (right) frontal lobe. Grossly, the leptomeninges and underlying brain appeared normal. Multiple biopsy specimens of the frontal cortex and white matter were obtained. All specimens showed multiple, well-circumscribed, small nodules of adenocarcinoma of the papillary type that stained positively for mucin.

The patient was treated with whole-brain radiation, but no change in her clinical status has been observed. A chest radiograph revealed a left lower-lobe consolidation, but no evidence of a mass lesion. No thyroid mass was palpable. No other search for the primary adenocarcinoma has been undertaken.

Discussion

The clinical, radiographic, and pathologic features of this case are typical of carcinomatous encephalitis. As described by Madow and Alpers [3], patients with this disease frequently have an organic mental syndrome and hemiparesis. Other frequent findings are signs of meningeal irritation and seizures. As focal neurological signs may be absent, the patient may be thought to have a toxic or metabolic encephalopathy [4]. Pathologically, diffuse infiltration of the brain parenchyma is seen, often with a tendency to group in the perivascular spaces. Involvement of the meninges may or may not be present [4]. Carcinoma of the lung is the most common primary source. Another term that has been used to describe this entity prior to Madow and Alpers is "metastatic miliary carcinomatosis" [5].

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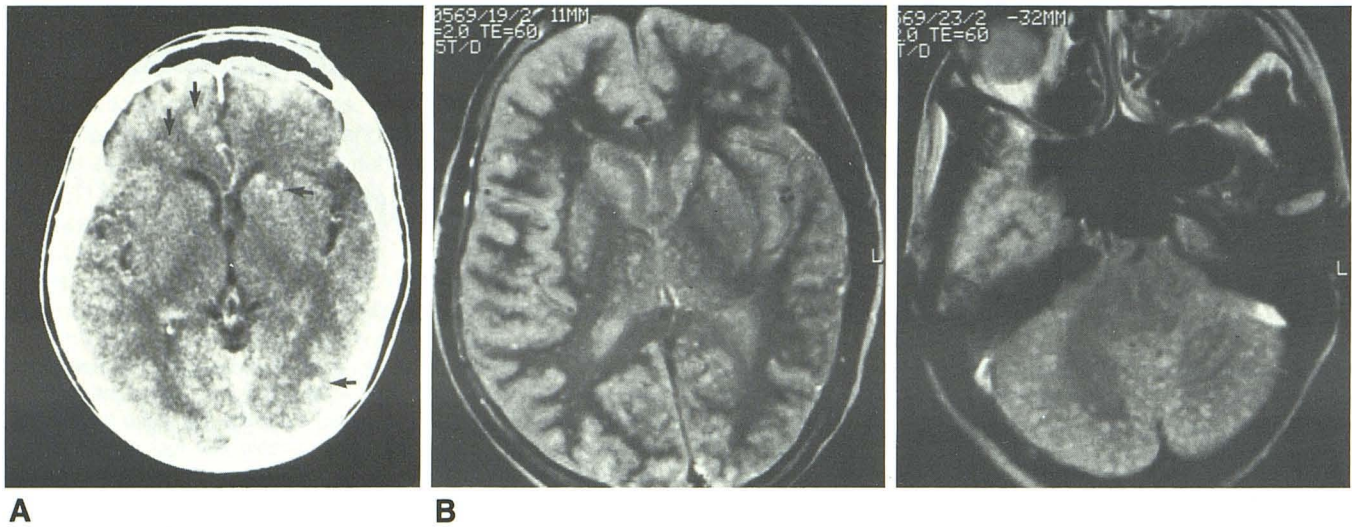


Fig. 1.—A, Contrast-enhanced CT scan shows multiple small, rounded contrast-enhancing lesions, most prominent in frontal, occipital, and striatal areas (arrows).

B, T2-weighted MR image (SE 2000/60) at similar level as part A shows multiple foci of high signal diffusely scattered throughout brain. Involvement of thalami, basal ganglia, and white-matter tracts are more clearly seen with MR than with CT.

Fig. 2.—T2-weighted MR image (SE 2000/60) of posterior fossa also shows multiple tiny foci of high signal in gray and white matter of cerebellum and brainstem. Contrast-enhanced CT study at this level showed no abnormality.

Although the four cases described by Madow and Alpers accounted for 3.8% of all their brain metastases, recent literature about carcinomatous encephalitis has been scant, implying that the true incidence may be somewhat lower. We could find no other description of the imaging characteristics of the disease. The CT and MR appearance in this case were similar to the published autopsy findings of innumerable tiny nodules scattered throughout the brain. Prior to biopsy, we considered disseminated fungal, parasitic, and mycobacterial infection in the differential diagnosis. However, we could find no other reports of a similar appearance with these entities either. Therefore, the CT and MR findings of multiple tiny parenchymal nodules may be specific for carcinomatous encephalitis. As might be expected, MR was much more sensitive to the presence of these lesions, detecting many more than contrast-enhanced CT did, especially in the posterior fossa. Since MR is becoming the screening technique of choice because of its increased sensitivity for most nonacute

CNS diseases [6], carcinomatous encephalitis may be seen more frequently than previously described. This entity should be considered in patients presenting with encephalopathy.

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