Leg weakness and decreased vision

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A 21-year-old woman consulted her physician because of weakness of both legs and decreased vision in the left eye. Magnetic resonance (MR) images are shown below *(Figures 1–4)*.

For diagnosis and discussion, see the following page.

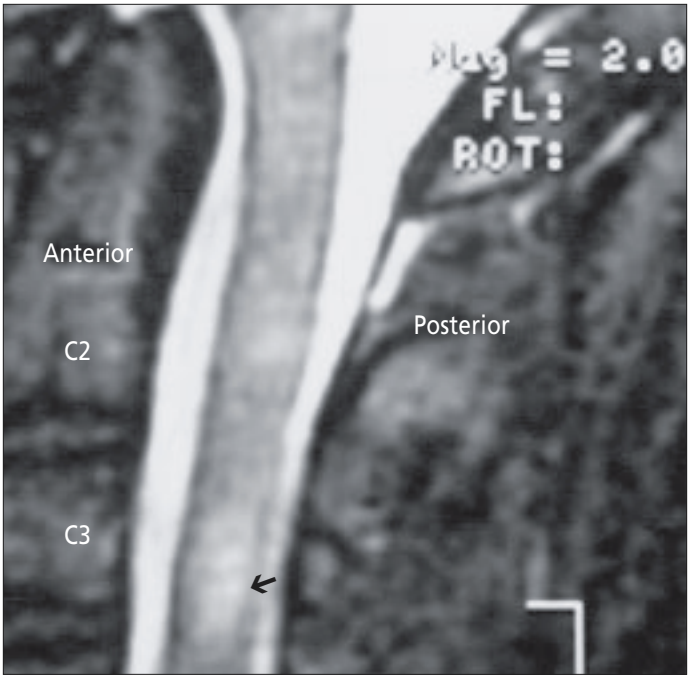

Figure 1. Sagittal fast spin-echo inversion recovery MR image of the cervical spine shows an area of abnormal signal intensity (arrow) in the cervical cord.

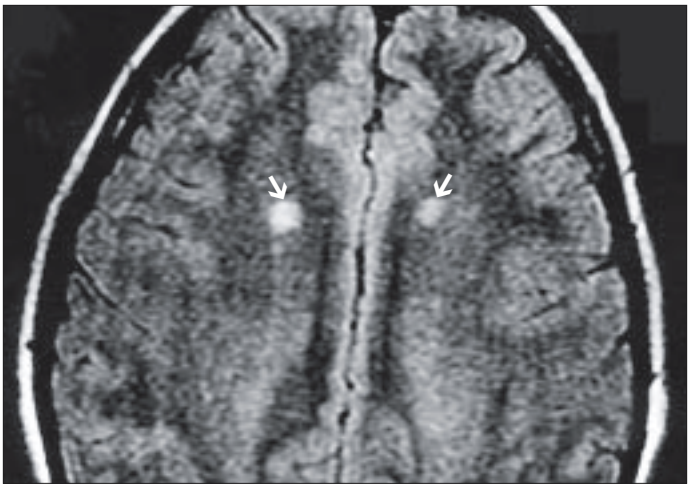

Figure 2. Axial fluid-attenuated inversion recovery (FLAIR) MR image demonstrates hyperintense foci (arrows) in the subcortical white matter of both frontal lobes.

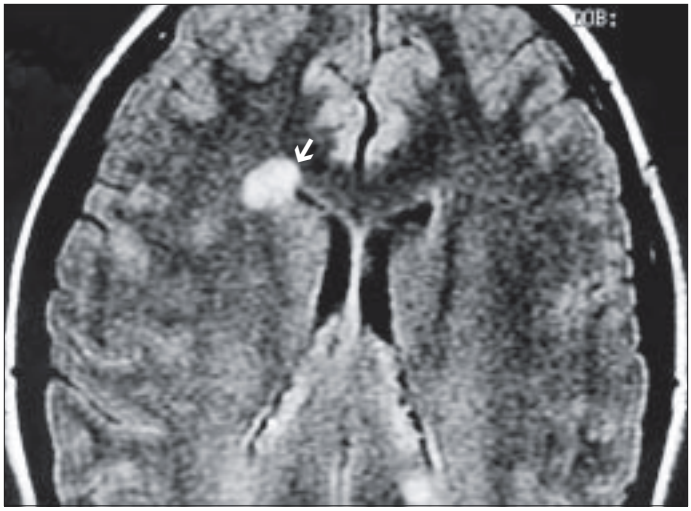

Figure 3. Axial FLAIR MR image shows a hyperintense focus (arrow) in the periventricular white matter of the right frontal lobe.

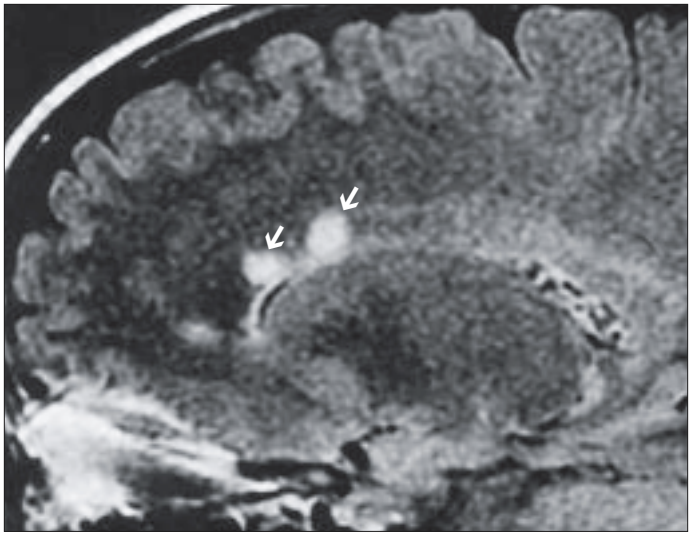

Figure 4. Sagittal FLAIR MR image demonstrates multiple ovoid periventricular lesions (arrows).

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DIAGNOSIS: Multiple sclerosis.

DISCUSSION

Multiple sclerosis (MS) is a chronic inflammatory demyelinating disease of the central nervous system that is characterized by disseminated lesions and a relapsing and remitting course. It has a prevalence of 6 cases per 10,000 individuals and occurs more frequently in cooler climates (1). An increased incidence is also seen in patients with a positive family history. MS is second only to trauma as the most frequent cause of neurologic disability in early to middle adulthood (2).

The etiology of MS is unknown. Indirect evidence supports an autoimmune mechanism, possibly triggered by a viral infection in a genetically susceptible host. MS is twofold more common in women than in men, and the incidence steadily increases from adolescence to age 35, then begins to decline (2). The clinical manifestations are variable, and several clinical forms have been described, including the relapsing-remitting, relapsing progressive, and chronic progressive forms (1). The most common initial symptoms include weakness in one or more limbs, ataxia, diplopia, visual blurring due to optic neuritis, and sensory disturbances. A definite clinical diagnosis of MS requires documentation of 2 or more episodes of symptoms and 2 or more signs that reflect pathology in anatomically noncontiguous white matter tracts of the central nervous system (2).

The pathologic lesions of MS are termed "plaques." Macroscopically, plaques are well-demarcated gray or pink areas located in the white matter, with only occasional lesions being found in gray matter. Plaques of MS show histologic features that may vary according to the age of the individual lesion. Acute MS lesions are characterized by perivenular cuffing and tissue infiltration by mononuclear cells (2), which appear to mediate the destruction of oligodendrocytes and consequent loss of the myelin sheath. With time, gliosis (proliferation of astrocytes) occurs (1).

Eighty-five percent of patients with MS have ovoid periventricular lesions that are oriented perpendicularly to the long axis of the brain and lateral ventricles; these are termed "Dawson's fingers" (3). Plaques are usually between 5 and 10 mm in size and are associated with mass effect and edema only in the acute phase. Ninety percent of MS plaques are supratentorial in adults, whereas the majority of plaques in children and adolescents are located in the posterior fossa. MS may also involve the spinal cord. Twelve percent of patients with spinal cord involvement lack coexistent intracranial plaques (1).

MR imaging is the modality of choice for the diagnosis of MS. MR imaging of MS is 95% specific and 85% sensitive and exceeds the sensitivity of all other tests, including evoked potentials, computed tomography (CT) scans, and identification of oligoclonal bands on electrophoresis of cerebrospinal fluid (3). CT scans are usually normal or show nonspecific brain atrophy. On noncontrast CT scans, lesions can be iso- to hypodense. Following the administration of contrast, enhancement of plaques is variable, with transient enhancement during the acute phase (3). Cerebrospinal fluid abnormalities seen with MS include a mononuclear pleocytosis, an elevated level of total immunoglobulin, and the presence of oligoclonal bands (2).

More than 80% of patients with positive MR scans and clinical symptoms that indicate a diagnosis of "probable" MS progress to clinically definite MS. Plaques are typically iso- to hypointense on T1-weighted MR scans and hyperintense on T2- and proton-weighted images. MS lesions often have a "beveled" or "lesion within a lesion" appearance on T1- and proton-weighted images. To establish the diagnosis of MS by MR imaging, the presence of 3 or more discrete lesions that are ≥5 mm in size and in a characteristic location is required. A compatible clinical history is also required because there are many causes of white matter hyperintensities on T2- and proton-weighted images (3). Enhancement is highly variable and typically transient and usually occurs only in the active demyelinating phase due to blood-brain barrier disruption (3). In the spinal cord, MS may appear as focal or generalized cord atrophy on T1-weighted images. Elongated, poorly marginated, hyperintense intramedullary lesions may be visualized on T2-weighted images (3).

The prognosis of MS is variable. Favorable prognostic factors include early onset (<40 years of age), a relapsing-remitting course, complete recovery from first attack, presentation with isolated optic neuritis or sensory symptoms, female sex, and fewer than 2 relapses in the first year of illness (2). Pregnancy may affect the course of MS, with fewer attacks during gestation but more attacks in the first 3 months postpartum. Pregnancy does not appear to affect the overall disease course or degree of disability.

The goals of treatment for MS are to delay progression of the disease, decrease the relapse rate, and relieve symptoms. Immunosuppressive drugs such as azathioprine, cyclophosphamide, and cyclosporine may have potential to slow progression of MS, but potentially serious adverse effects limit their use. During the past decade, new therapies have been shown to significantly improve the disease course of MS. These include recombinant interferon beta, glatiramer acetate, intravenous immune globulin, and mitoxantrone (4). Symptomatic treatment remains a crucial part of the management of MS. Spasticity, depression, and fatigue as well as urinary, paroxysmal, and sensory symptoms can be alleviated to some extent with drug therapy.

1. Dahnert W. *Radiology Review Manual*, 4th ed. Baltimore: Williams & Wilkins, 1999:254–255.
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