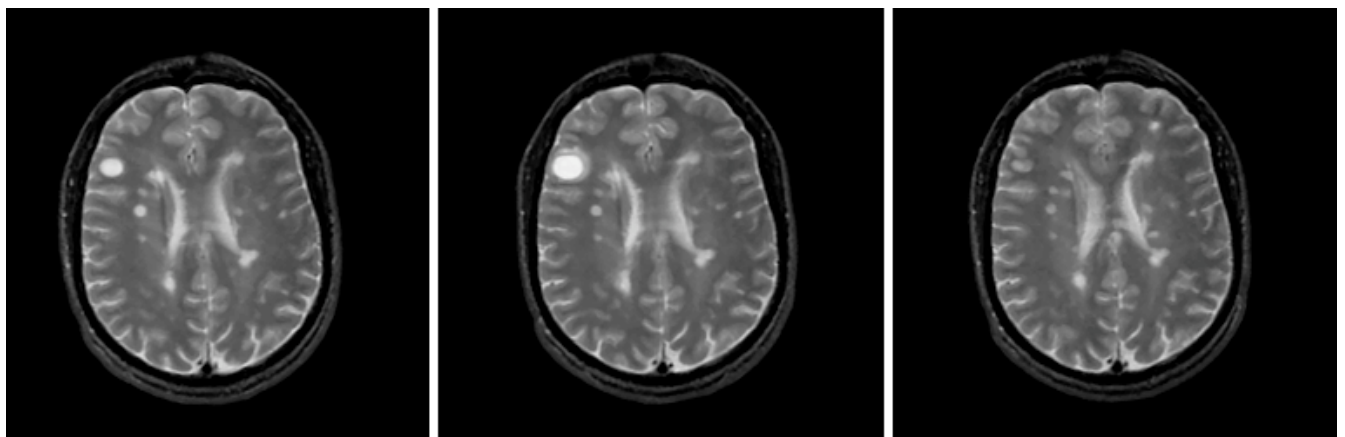


**Case 22**

U.W. is a 32-year-old woman who presented to the emergency room complaining of unsteady gait and dizziness. Her review of systems was notable for an episode of blurry vision in her right eye associated with a dull ache behind the eye, which resolved over 2-4 weeks. Three years ago she presented to the emergency room complaining of numbness on the entire left side of her body as well as the face and was told she was anxious and was sent home on Motrin. This numbness improved after one week but she says it never completely resolved. Last year she noticed that she was forgetting things at work that she attributed to working long hours and not sleeping enough. She was otherwise healthy until three weeks ago when she developed a cold with sore throat, nasal congestion, and a mild cough. This resolved after 5 days. Three days ago, she felt mildly unsteady when she was going up the stairs in her house and felt very tired. On the morning of presentation to the emergency room she woke up with severe dizziness and difficulty walking.

Neurologic exam revealed an ataxic (wide, unsteady) gait and nystagmus (abnormal eye movements seen in a variety of neurological diseases, particularly involving the cerebellum). Routine chemistries and CBC, ECG, and CXR were all normal. She had a lumbar puncture; her cerebrospinal fluid was clear with 22 WBC/mm<sup>3</sup>, all of which were lymphocytes. Levels of total CSF protein and glucose were normal. Further evaluation demonstrated an oligoclonal banding pattern in her CSF that was absent in the serum and an elevated IgG in the CSF. An MRI of the head showed multiple areas of inflammation scattered throughout the white matter (Fig. 1) and electrical studies showed slowing of conduction in central white matter pathways. A serological test for Lyme disease was negative. She was diagnosed with multiple sclerosis and was started on IV corticosteroids.



**Fig. 1.** Serial T2-weighted MRI images of the brain of U.W. were taken at three month intervals. Note changing appearance of predominant right hemisphere lesion. Gray area surrounding lesion in middle image probably reflects edema. Intravenous administration of gadolinium, which leaks from blood vessels in recently inflamed tissue, can often enhance acute/active lesions.

She gradually improved and was begun on weekly intramuscular injections of IFN- $\beta$  and a trial of simvastatin.

**Questions for Case 22**

(1) What are oligoclonal bands? What do they tell us about the immunobiology of this patient's illness?

(2) Many healthy individuals that are DR2-positive have T-cells in their peripheral blood that can respond to myelin basic protein peptide 81-103. Why are these T-cells not negatively selected in the thymus? Why are these individuals not sick if they have potentially autoreactive T-cells in their blood? How might a viral infection precipitate MS in a susceptible individual?

(3) What is epitope spreading and how does it help explain the clinical course of MS?

(4) IFN- $\beta$  is a disease-modifying agent that has been approved for the treatment of relapsing-remitting MS. Speculate as to how it might halt the inflammation in lesions of MS

(5) Glatiramer acetate (GA) is another disease-modifying agent that has been approved for the treatment of relapsing-remitting MS. This compound, which is a random amino acid copolymer of tyrosine, glutamic acid, alanine and lysine, binds to HLA-DR2 (Class II) molecules and triggers a broad T cell response. GA-reactive CD4+ T cell clones often have a Th2 phenotype. Explain what effect this might have on the course of MS. Another observation is that GA can induce the expression of TGF- $\beta$  from T cell clones. How might this prove beneficial in MS?

(6) In a prospective clinical trial of 40 patients with relapsing-remitting MS, simvastatin, an HMG CoA reductase inhibitor, has been shown to reduce the number and volume of Gadolinium-enhancing lesions on MRI by 44%. Although the mechanisms underlying this effect are unknown, simvastatin has been shown to inhibit IFN- $\gamma$ , TNF- $\alpha$ , and IL-2 secretion and decrease LFA-1 and MMP expression in mononuclear cells, and reduce migration of mononuclear cells across human brain microvascular endothelial cells *in vitro*. Provide a mechanistic link between these experimental observations and the possible clinical efficacy of this drug.