Hashimoto Encephalopathy Following Iodine 131 (131I) Radiotherapy of Graves Disease

Hashimoto encephalopathy (HE) is defined by spontaneous subacute encephalopathy with raised thyroid autoantibodies and a remarkable responsiveness to steroids.1,2 Pathophysiologically, an association with Hashimoto thyroiditis is characterized by observations of elevated thyroid peroxidase antibody (TPO-Ab) levels or thyroglobulin antibody (TG-Ab) levels.3,4 We describe a patient who developed HE following iodine 131 (131I) radiotherapy of Graves disease.

Report of a Case. In February 2005, a 61-year-old man with a 6-year history of Graves disease was admitted to hospital for 131I radiotherapy. Thyroid function measures were as follow: thyroid-stimulating hormone (TSH) level, 0.29 µU/mL (reference, 0.35-4.5 µU/mL); free thyroxine (FT4) level, 17.1 pg/mL (reference, 8.0-18 pg/mL); free triiodothyronine (FT3) level, 3.6 ng/L (reference, 1.8-4.6 ng/L); and TSH-receptor antibody level, 1.6 mU/L (reference, <1 mU/L). Tests for TG-Ab were negative, and TPO-Ab levels were elevated (>1000 U/mL; reference, <35 U/mL). Apart from a slightly enlarged thyroid and exophthalmos, physical examination findings were normal. After 131I radiotherapy, the patient developed mild asymptomatic hypothyroidism, and therefore substitution therapy with levothyroxine 50 µg daily was initiated.

In March 2005, 4 weeks after 131I radiotherapy, the patient started to develop progressive dementia-like disorientation, tremor, and psychomotor deficits. A cerebral head magnetic resonance image (MRI) in October 2005 revealed only slight and putatively unspecific frontal and temporal white matter lesions (Figure). Neuropsychological symptoms further progressed with depression, decreased alertness, and cognitive function, including severe amnestic deficits and semantic paraphasia. In November 2005, neurological examination revealed an intention tremor, myoclonus, spasticity, and truncal ataxia. Thyroid function measures were as follow: TSH level, 17.71 µU/mL (reference, 0.35-4.5 µU/mL); FT4 level, 6.3 pg/mL (reference, 8.0-18 pg/mL); and FT3 level, 0.96 µg/dL.

Magnetic resonance imaging (MRI) scans in the course of Hashimoto encephalopathy. Corresponding coronal fluid-attenuated inversion recovery (FLAIR)–weighted images from October and November 2005 at a frontal and temporal plane demonstrated bilateral, symmetric, increasing signal intensity in frontal white matter regions and asymmetric abnormalities (right greater than left) in temporal white matter regions. An MRI scan from January 2007 showed the resolution of most of these abnormalities.

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mmol/L (reference, 0.7-2.9 mmol/L). Tests for TSH-receptor antibodies and TG-Ab were negative. Levels of TPO antibodies (>1000 U/mL, reference, <35 U/mL) were elevated. Routine hematological and biochemical analyses had normal findings. Antineuronal antibodies (Yo, Hu, Ri) were undetectable. Cerebrospinal fluid (CSF) analysis revealed an elevated protein level of 1630 mg/L (reference, <500 mg/L), 150 lymphocytes per microliter, an albumin quotient of 30.3 (reference, <8.9), normal glucose levels, weakly positive oligoclonal bands, and the presence of 14-3-3 protein. No intrathecal antibody synthesis or elevated viral titers were detected for human immunodeficiency virus 1/2, herpes simplex virus, varicella-zoster virus, Epstein-Barr virus, rubella, rubella, or coxsackie. Tests for Borrelia burgdorferi antibody titers were negative, and sterile CSF cultures ruled out a bacterial or fungal etiology. The amyloid β protein level was 637 pg/mL (reference, >797 pg/mL) and tau protein level was 321 pg/mL (reference, <318 pg/mL). The electroencephalogram showed a generalized diffuse slowing (6-7 per second). Interestingly, the cerebral head MRI now revealed symmetric, widespread, periventricular, and subcortical hypertensive signals on fluid-attenuated inversion recovery (FLAIR) and T2-weighted images (Figure). Corticosteroid therapy was started with initially 100-mg prednisolone per day. During the following weeks, the patient improved dramatically concerning neurological examination findings, alertness, psychomotor behavior, memory, speech, and mood. In accordance with this, an MRI scan in January 2007 documented an almost complete resolution of the frontal and temporal lesions (Figure).

The constellation of raised thyroid autoantibody levels; the typical diffuse, nonenhancing white matter lesions; and the raised lymphocyte count and protein level of the sterile CSF suggested the diagnosis of HE that might be accompanied by 14-3-3 protein and oligoclonal bands. In particular, the striking therapeutic response to steroids, including normalization of the electroencephalogram and the MRI abnormalities that had spared the basal ganglia, further supported the diagnosis of HE especially regarding the differential diagnosis of Creutzfeldt-Jakob disease.

Comment. To our knowledge, this is the first report of HE following 131I radiotherapy. In 4 reports, an encephalopathy was already observed in the course of Graves disease but without preceding 131I radiotherapy. In the present report, because of the clear temporal correlation between 131I radiotherapy and the onset of the encephalopathy 4 weeks later, the possibility of a causal relationship between thyroid tissue destruction and the development of HE is strengthened. The fact that TPO-Ab levels were elevated already before 131I radiotherapy weakened their etiological role in HE so that additional thyroid antigens released after 131I radiotherapy or during a spontaneous occurrence of Hashimoto thyroiditis might be responsible for the immune attack against the central nervous system. This case report suggests that next to Hashimoto thyroiditis, a second thyroid pathology going ahead with tissue destruction might now be identified to potentially cause a treatable encephalopathy like HE. Thus, the mechanisms that lead to HE might not strictly depend on the character of the initial thyroid damage.

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COMMENTS AND OPINIONS

Stroke Secondary to Meningococcal Meningitidis: A Potential Link Between Endothelial Dysfunction and Cytokines

The recent article by van de Beek et al described presentation of brainstem infarction secondary to Neisseria meningitidis. Unfortunately, the authors failed to explore a potential connection between brainstem infarction and cytokine network pathway. Meningococcal pathogenesis involves multiple links that interconnect in a highly intricate web of phenomena from neisserial attachment to meningitis or meningococcal sepsis. In fact, there are various pathways within the vascular compartment and in the subarachnoid space that are involved in the human-meningococcal interaction, such as the hemostatic system and cytokine network pathway. Cytokines are key mediators involved in mediating the systemic inflammatory response, and they have critical biological effects on coagulation cascade and many cell types such as endothelium. Meningococci can trigger an

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