Guillain-Barré syndrome (GBS) because areflexia and CSF albuminocytological dissociation was detected in one of their three patients. Because prior infection is frequent in BBE, as in GBS, autoimmune mechanisms produced by microbial infections may function in its pathogenesis. A review of the literature in English turned up eight cases of BBE in which the pathogens of antecedent infection had been identified. The reported antecedent infections in BBE are herpes simplex virus, cytomegalovirus, Epstein-Barr virus, varicella zoster virus, measles virus, *Salmonella typhi*, and *Mycoplasma pneumoniae*. We here describe a case of BBE subsequent to *Campylobacter jejuni* enteritis.

A 17 year old youth had fever and diarrhoea that cleared up over a period of 5 days. Eight days after the resolution of this illness, he experienced unsteady gait (day 1), and the next day he required assistance to walk and experienced vertigo. On day 3, he could no longer walk and vomited several times. He was apyrexia but drowsy. The pupils were normal and responded promptly to light. There was no limitation of ocular movement. Bifacial palsy was present, and there was mild weakness in the four limbs. Tendon jerks were brisk. Babinski's sign was negative. Paraesthesia of the glove and stocking type were present. The white blood count, C reactive protein, and erythrocyte sedimentation rate were normal. Protein in CSF was 30 mg/dl with 7 cells/ μ l. The tentative diagnosis was brainstem encephalitis. Acyclovir was given intravenously for 5 days and methylprednisolone for 3 days. Brain MRI showed no brain abnormality on days 5 and 12. On day 7, the patient became confused. Upward gaze and lateral gaze to the left were impossible, and downward and lateral gaze were moderately impaired. Bell's phenomenon and oculocephalic reflexes were absent. He developed palatal and lingual weakness. Muscular weakness was severe in the distal part of the arms and moderate in the legs. On day 8, motor and sensory nerve conduction velocities were normal, but an EEG showed bilateral diffuse θ and δ activity at rest. He was given 0.2 g/kg human immunoglobulin (Venilon[®], Teijin, Tokyo, Japan) daily for 5 days starting on day 8. Consciousness disturbance lessened from day 9, and he became fully conscious on day 12. Facial and oropharyngeal weakness disappeared on day 13. On day 17, there was no paresis of the extraocular muscles, except for upward gaze limitation of the right eye. Limb power returned to normal on day 19. On day 22, he could walk, but his gait was markedly ataxic. An EEG was normal on day 29. Ataxic gait and gaze limitation disappeared respectively on days 30 and 39. Proprioceptive sensation was not impaired during the course of this illness. Thin layer chromatography with immunostaining showed that on day 3 his serum IgG reacted with GQ1b and GT1a, but not with GM1, GD1a, GD1b, or GT1b. The *C. jejuni* which grew from stool cultures taken on day 3 belonged to Penner's serogroup D (corresponding to PEN 4, 13, 16, 43, and 50) in the modified Penner's serotyping system,² and to LIO 1 in Lior's serotyping scheme. An enzyme linked immunosorbent assay showed strongly positive serum anti-*C. jejuni* antibody on day 3 (IgM, 4000; IgG, 64 000; IgA, 16 000). Viral screening (including herpes simplex virus) of the blood and CSF was unremarkable.

The gram negative bacterium *C. jejuni*, the most often identified trigger pathogen in

GBS, may also be a trigger for Miller Fisher syndrome and encephalopathy. Subsequent to *C. jejuni* enteritis, our patient showed consciousness disturbance (drowsiness and confusion), hyperreflexia, and tetraparesis as well as external ophthalmoplegia and ataxia of the cerebellar type. Serology and isolation of the bacterium from his faeces confirmed prior *C. jejuni* infection. BBE was diagnosed because five (cases 6, 7, 8, 13, and 18) of the 18 patients with BBE described by Al-Din *et al.*¹ (Bickerstaff being one of the authors) had limb weakness. This diagnosis was supported by the presence of anti-GQ1b IgG antibody, a serological marker of BBE and Miller Fisher syndrome.⁴ Overlapping BBE and GBS was another possible diagnosis, and this has been reviewed elsewhere.⁵ The presence of BBE (or overlapping BBE and GBS) after infection by *C. jejuni* supports the speculation that BBE and GBS are closely related and that BBE is an autoimmune disorder that occurs after microbial infection.

We previously reported the occurrence of GBS in two family members after *C. jejuni* infection.⁶ The clinical features of that second case are very similar to those of the case reported here; the patient was comatose and showed external ophthalmoplegia. Overlapping GBS and BBE, therefore, could also be diagnosed for that patient. Anti-ganglioside serology testing was not possible because no serum was kept. Aspinall *et al.*⁷ proposed that the lipopolysaccharide of the strain OH 4384 isolated from that patient with GBS has a GT1a-like structure. We partially confirmed this using anti-GT1a monoclonal antibody but in addition showed that OH 4384 has lipopolysaccharides that bear GM1, GM2, GD1a, GD2, GD3, GT1b, or GQ1b epitopes.⁸ Goodyear *et al.*⁹ immunised mice with the lipopolysaccharide from OH 4384 and cloned three monoclonal antibodies with GQ1b reactivity. Anti-GQ1b IgG usually cross reacts with GT1a, and GQ1b is abundantly expressed in human ocular motor nerves.¹⁰ Infection by *C. jejuni* bearing a GT1a-like or GQ1b-like lipopolysaccharide may induce the production of anti-GQ1b IgG antibody, which then may bind to ocular motor nerves causing paresis of the extraocular muscles in patients with overlapping BBE and GBS.

Effective therapy for BBE has yet to be established. As stated above, BBE and GBS are closely related; therefore, steroids should not be used to treat BBE. Instead, the established treatments for GBS, plasmapheresis and intravenous immunoglobulins (IVIg), should be used. Some patients with BBE have responded favourably to plasmapheresis,¹ and the patient in our case responded favourably to IVIg. We recommend not giving steroids, but using IVIg (or plasmapheresis) to treat BBE. Controlled clinical trials are required to establish the efficacy of these procedures as therapeutic for BBE.

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Myelopathy associated with Hashimoto's disease

Encephalopathy associated with Hashimoto's disease was first reported by Brain *et al* in 1966.¹ Hashimoto's encephalopathy is a steroid responsive relapsing disorder associated with Hashimoto's disease that often presents with stroke-like episodes, myoclonus, and cognitive impairment. Diagnostic testing usually shows a euthyroid state with increased thyroid autoantibodies, increased CSF protein, and EEG abnormalities.^{2,3} We present the first case of myelopathy associated with Hashimoto's disease, followed 2 months later by encephalopathy.

A 70 year old housewife was admitted to our hospital on 28 July 1997. Her leg had felt heavy for a month, and she was unable to walk for several days before admission due to weakness in the left leg. She had been diagnosed with Hashimoto's disease at the age of 57 and treated with thyroxine. On January 11 1988, she had developed dysaesthesia and weakness in the left arm and leg. Brain CT, radiography of the cervical spine, and CSF findings were normal at this time. She gradually recovered after this. On 31 January 1997, she was experiencing weakness in her left leg, which gradually disappeared over 2 months.

On physical examination, the blood pressure was 114/62 mm Hg. She had marked scoliosis. Neurological examination indicated a decrease of pain and temperature sensations on the right side and decrease of position and vibration sensations on the left side of the body below the Th7 level. Her muscle

strength was evaluated as 2/5 (grade) in the left lower limb and 3/5 in the right lower limb by manual muscle test. Extensor plantar response was present on the left. Routine haematological and blood chemistry findings were within the normal range except for a mild increase of glutamic oxaloacetic transaminase (46 U/l, normal range 10 to 27), glutamic pyruvic transaminase (45 U/l, normal range 5 to 33) and r-globulin (34%, normal range 9.0 to 18.3). The serum free triiodothyronine, 3.1 pg/ml (normal range 2.4 to 4.5), free thyroxine, 1.2 ng/dl (normal range 0.8 to 1.7), and thyroid stimulating hormone (TSH) concentrations, 4.84 μ U/l (normal range 0.3 to 5.0), were normal. The antithyroglobulin antibody titre was 1/409600 and the antithyroid microsomal antibody titre was 1/102400. Serological tests for syphilis and HTLV-I were negative. Vitamin B₁₂, folate, angiotensin converting enzyme, ANA, anti-ds-DNA, ENA complex, and antiphospholipid antibody were normal or negative. Concentrations of circulating immune complexes were raised in blood (3.9 μ g/ml, 0 to 2.9). The CSF was under normal pressure and contained 3 lymphocytes/ μ l, glucose 59 mg/dl, and mildly raised protein concentration at 50 mg/dl. Oligoclonal bands and myelin basic protein were absent. IgG index was normal. Further immunological results showed the titre of antithyroid microsomal antibodies in the CSF to be 1/128 and the titre of antithyroglobulin antibodies in the CSF to be 1/1600. A thoracic spinal MRI examination and myelography showed normal findings. She was given 500 mg intravenous methylprednisolone for 3 days. A few days later she made a marked improvement in muscle strength in her feet.

On 10 August 1997 she developed an abrupt onset of somnolence and disorientation. She was afebrile. Subsequently her respiration became irregular with short apnoeic spells. Funduscopic examination was normal. She had spontaneous myoclonus in her right arm. Repeated CSF investigations showed a predominantly mononuclear pleocytosis (9 cells/ μ l) and raised protein concentration (74 mg/dl). An EEG showed diffuse slowing of background rhythm with sharp waves in anterotemporal regions. Assuming a meningoencephalitis of possible viral origin, acyclovir was administered intravenously for 10 days. Polymerase chain reaction (PCR) studies for herpes simplex virus and herpes zoster virus were negative. She was given 500 mg intravenous methylprednisolone for 3 days, then oral prednisolone. Her level of consciousness improved rapidly over the next several days. She was fully alert 7 days after initiation of steroid therapy. Steroid dosage was slowly tapered and maintained at 10 mg daily. She remained well for 18 months on steroid therapy. Cerebral MRI disclosed bilateral high signal areas in frontal deep white matter on T2 weighted images. These findings were similar to those seen before her encephalopathy. Repeat spine MRI on 5 September 1997 showed previously unrecognised high intensity area by the T2 weighted image, on the left side of the cord at the level of the fifth and sixth thoracic vertebrae (figure).

Our patient had Hashimoto's disease with a marked increase in antithyroid antibodies. Her thyroid function tests were normal on thyroxine replacement therapy. Diffusely abnormal EEG and high CSF protein were found at her confusional state. Her encephalopathy markedly responded to steroid therapy. Other aetiologies

Axial T2 weighted MRI of the thoracic spine at T5-T6 showing a high intensity area on the left side of the cord.

such as infectious, metabolic, toxic, neoplastic, vascular, and paraneoplastic causes had been excluded. These findings are consistent with previously described cases of Hashimoto's encephalopathy.

What is notable in our case is that the myelopathy developed 2 months before encephalopathy. Some diseases, including multiple sclerosis, scoliosis, and vascular accident, are known to cause myelopathy. The lack of typical findings of brain MRI and oligoclonal bands as well as myelin basic protein in CSF, and normal IgG index were not compatible with multiple sclerosis. Findings of myelography and spinal MRI suggested that myelopathy was not associated with scoliosis. Slow progression over a month and the distribution of sensorimotor disturbance were not compatible with vascular accident. We think that her myelopathy was also associated with Hashimoto's disease because she subsequently had encephalopathy and other conditions which could cause myelopathy were excluded. This is the first case of myelopathy associated with Hashimoto's disease.

The aetiology and the pathological basis of Hashimoto's encephalopathy are not known. Brain *et al*¹ described localised cerebral oedema as a possible cause of Hashimoto's encephalopathy. This hypothesis may be supported by reversible MRI abnormalities⁴ and excellent response to steroid therapy.^{2,3} Ishii *et al*⁵ postulated that a toxic effect of TRH on the CNS had an important role in Hashimoto's encephalopathy.

In our patient, antithyroid antibodies were detectable not only in serum but also in CSF. Shaw *et al*⁶ reported that antithyroid antibodies were detectable in CSF from one of four patients with Hashimoto's encephalopathy. Marked higher titres of antithyroid antibodies in serum compared with those in CSF in our patient might suggest that antithyroid antibodies in CSF were mainly derived from serum.

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BOOK REVIEWS

Mild Head Injury. A Guide to Management. By PHILIP WRIGHTSON and DOROTHY GRONWALL. (Pp 182). Published By Oxford University Press, Oxford, 1999. ISBN 0-19-262939-5.

Mild head injury presents the neurosurgeon with several dilemmas. Those of us who see head injury cases for the purposes of medico-legal reports have even greater problems with the topic. In particular, any statistics relating to the frequency of the condition or its possible complications are likely to be unreliable as many patients who sustain mild head injuries may never be referred to neurosurgeons or even to hospital. Of those who do get admitted, in many cases the primary injury is to another body system and the coexistence of mild head injury is consequently ignored. Similarly, those patients who have continuing neurological symptoms after mild head injury may not readily come to the notice of the neurosurgeon. At best, therefore, all scientific papers and other reports which purport to give the incidence of this condition or of its complications should carry a health warning "to be treated with great caution". However, this guide to the management of mild head injury begins in an admirable way by establishing carefully both the basis on which its statistics are derived and its authors' own definition of what they mean by "mild head injury". Thus the statistics which these authors provide are likely to prove more reliable than most. Their careful studies indicate a probable incidence of 3% of persisting symptoms 28 days or more after mild head injury.

Although the view that the "post-traumatic" or "postconcussion" syndrome is a "litigation induced neurosis" still has some currency, particularly in legal circles, there are now sufficient pathological and imaging studies to agree a probable pathological basis for the syndrome. This volume sets out the evidence for such a case in a clear and lucid manner including some mention of the more recent MRI and SPECT evidence. Similarly, the more recent work undertaken by clinical psychologists carrying out detailed psychometric assessments of these patients has provided good supportive evidence for the reality of the continuing cognitive and performance problems that such patients have, often for prolonged periods after an apparently mild injury. The authors present a wealth of clinical and psychological data in a clear and lucid manner and the layout progresses naturally to