

Optic neuritis in the Landry–Guillain–Barré–Strohl syndrome

PETER O. BEHAN, SIMMONS LESSELL, AND MARTIN ROCHE

From the Department of Neurology and Ophthalmology, Boston University, School of Medicine and the Institute of Neurological Sciences, Glasgow

The Landry–Guillain–Barré–Strohl (LG–BS) syndrome is presumed to be due to cell-mediated autohypersensitivity to peripheral nerve myelin (Asbury, Arnason, and Adams, 1969; Behan, Behan, Feldman, and Kies, 1972). Optic neuritis, which is a rare complication, would indicate involvement of central nervous system myelin. This is a report of a patient with the LG–BS syndrome and bilateral optic neuritis whose immunological status we investigated.

Case report

A 17-year-old girl was admitted to hospital because of arm and leg weakness. She had had a cough, malaise, and fever 2 weeks earlier. Five days before her illness she had experienced a 'pins and needles' sensation in her hands and feet, and had felt generally weak. Within a few days she neither could walk nor use her hands, and her face felt tired. Her history included congenital scoliosis and the illicit use of a variety of drugs (both intravenously and by mouth); her past neurological history was negative. On admission to hospital she was alert, co-operative, and intelligent and her vital signs were normal. Her best correctable visual acuity was 20/25 in each eye and the fundi were normal. There was bilateral weakness of the facial musculature and of the flexor muscles of the neck. She was quadriparetic and areflexic but the sensation was not impaired. The only laboratory finding on admission that was abnormal was a cerebrospinal fluid protein of 267 mg/100 ml. The fluid was clear, contained no cells, and was under normal pressure.

Within 10 days she became quadriplegic and developed impairment of respiration, but no artificial assistance of respiration became necessary. Two weeks after admission she complained of blurring of vision of both eyes. Three weeks after admission she complained that her vision had become worse and that there was pain in her eyes on movement. Her visual acuity was then found to be 20/70 in each eye with dyschromatopsia. The pupils responded subnormally to light stimulation but normally to attempts at near vision. She had a central scotoma to the 1 mm white object on the 2 m

tangent screen in each eye. Both optic discs were swollen and there were papillary and peripapillary haemorrhages. Fluorescein angiography showed leakage of dye from the tissues of the optic nerve heads in both eyes. The cerebrospinal fluid at that time had a normal pressure and contained no cells, but the protein content was 300 mg/100 ml. She was treated with prednisone which gave immediate relief of pain but did not improve the visual acuity. After 9 days the prednisone was discontinued and the visual acuity gradually improved during the next 3 months. Ultimately a visual acuity of 20/25 was recorded in both eyes with normal colour vision, visual fields, and fundi. She made an excellent recovery from her polyneuritis.

Immunological studies

No abnormalities were found in the levels of any of the major immunoglobulins determined on three occasions throughout the patient's stay in hospital.

Complement-fixing antibodies were determined (Melnick, 1963) using saline extracts of human whole brain tissue, finely ground human sciatic nerve, and purified human myelin encephalitogenic protein as antigens. A weak titre of 1:8 was found during the second week of her illness to all three antigens. Similarly, precipitating antibody to the same antigens (seen as faint lines) were detected during this time by Ochterlony diffusion technique.

Evidence for cell-mediated immunity to these antigens was obtained by the *in vitro* technique of macrophage migration (Rocklin, Meyers, and David, 1970). In this test mumps and streptokinase/streptodornase antigens were used as controls. The patient had exhibited cutaneous sensitivity to these proteins. Additional control antigens were purified protein derivative (PPD) (the patient was PPD negative) and calf thymus histone. Positive inhibition was found to peripheral nerve tissue extract (35 per cent), central nervous tissue extract (29 per cent), myelin basic protein (27 per cent), streptokinase/streptodornase (40 per cent), and mumps (49 per cent). No inhibition was found with PPD, calf histone, or from cultures without antigen. Delayed hypersensitivity measured *in vivo* thus showed good correlation with that measured *in vitro*.

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Address for reprints: Dr P. O. Behan, Institute of Neurological Sciences, Southern General Hospital, Glasgow, Scotland

Discussion

There can be little doubt that the patient had LG-BS polyneuritis. Her polyneuritis followed a febrile, upper respiratory tract illness and began with lower limb paraesthesia and weakness. There was progression of the weakness with sensory sparing and the total cerebrospinal fluid protein was markedly raised without an increase in the number of cells. The ocular symptoms and signs point to a diagnosis of optic neuritis; blurred vision, pain on eye movement, central scotomas, and dyschromatopsia are characteristic of optic neuritis. Disc swelling (and the abnormalities demonstrated on fluorescein angiography) is compatible with both optic neuritis and papilloedema. Optic neuritis has been described previously in the LG-BS syndrome (Brock and Davidson, 1947; Martin, 1961; Kyrieleis, 1931) but considering the prevalence of the LG-BS syndrome, it must be a rare complication. Papilloedema, however, has frequently been observed. It is generally not accompanied by any visual symptoms, and the visual acuity is usually normal. In the past, instances of optic neuritis have possibly been confused with papilloedema because of the similarities in the fundus. The mechanism of papilloedema in the LG-BS syndrome is uncertain (Morley and Reynolds, 1966). It may reflect brain swelling (Joynt, 1958) or a rise in the cerebrospinal fluid pressure due to blockage of the arachnoid villi by protein (Denny-Brown, 1952). Hypercapnia and acidosis caused by respiratory insufficiency may also be factors. The mechanism responsible for the optic neuritis is uncertain, but it could represent autoimmune inflammation of the white matter of the optic nerve. The immunological studies in our patient suggest hypersensitivity to

both central and peripheral myelin, and humoral antibody in both central and peripheral nervous tissue antigens has previously been demonstrated in over 50 per cent of cases of the LG-BS syndrome (Melnick, 1963).

It is known that the antigen which causes experimental allergic encephalomyelitis (EAE) is present in peripheral nerve (Abramsky, Teitelbaum, Webb, and Arnon, 1975). Animals immunized with whole peripheral nerve tissue develop lesions of the central nervous system (Waksman, 1963). The possible causative antigens in experimental allergic neuritis (EAN)—an animal model for LG-BS polyneuritis—produced both EAE and EAN when injected into animals (Abramsky and others, 1975). The reason advanced for this finding is that the antigen responsible for EAN contains active sites for both EAN and EAE induction, but that the site for EAE is normally blocked by the conformation of the protein in the normal myelin substructure (Brostoff, Burnett, Lampert, and Eylar, 1972). Sensitivity to central myelin in our patient may thus have resulted from the liberation of sequestered central nervous system myelin from the initial lesions in the peripheral nerve.

Summary

A patient with typical Landry-Guillain-Barré-Strohl syndrome (LG-BS) developed bilateral optic neuritis. Laboratory studies showed hypersensitivity to both central and peripheral nervous tissue myelin. The occurrence of optic neuritis is presumably due to autohypersensitivity to central nervous tissue myelin. The initial lesions of the LG-BS syndrome in the peripheral nerves might have liberated sequestered antigens that cross-reacted with central nervous system myelin.

References

- ABRAMSKY, O., TEITELBAUM, D., WEBB, C., and ARNON, R. (1975) *J. Neuropath. exp. Neurol.*, **34**, 36
- ASBURY, A. K., ARNASON, B. G., and ADAMS, R. D. (1969) *Medicine*, **48**, 173
- BEHAN, P. O., BEHAN, W. M. H., FELDMAN, R. G., and KIES, M. W. (1972) *Arch. Neurol. (Chic.)*, **27**, 145
- BROCK, S., and DAVIDSON, C. (1947) *Arch. Neurol. Psychiat. (Chic.)*, **58**, 550
- BROSTOFF, S., BURNETT, P., LAMPERT, P., and EYLAR, E. H. (1972) *Nature (Lond.) (New Biology)*, **235**, 210
- DENNY-BROWN, D. E. (1952) *New Engl. J. Med.*, **246**, 839
- JOYNT, R. J. (1958) *Neurology (Minneap.)*, **8**, 8
- KYRIELEIS, W. (1931) Augenveränderungen bei entzündlichen Erkrankungen des Zentral Systems. D. Die Landry'sche Paralyse (akut aufsteigende Spinalparalyse), in 'Kurzes Handbuch der Ophthalmologie', ed. F. Schieck and A. Bruckner, vol 6, pp. 742-743. Springer, Berlin
- MARTIN, J. J. (1961) *Psychiat. et Neurol. (Basel)*, **142**, 265
- MELNICK, S. C. (1963) *Brit. med. J.*, **1**, 368
- MORLEY, J. B., and REYNOLDS, E. H. (1966) *Brain*, **89**, 205
- ROCKLIN, R. E., MEYERS, O. L., and DAVID, J. R. (1970) *J. Immunol.*, **104**, 95
- WAKSMAN, B. H. (1963) Experimental Immunologic Disease of the Peripheral Nervous System, ed. A. Rose, and C. Pearson, in 'Mechanism of Demyelination', pp. 170-198. McGraw-Hill, New York