KAWASAKI MED. J. VOL. 10 : NO. 2, 151-154 (1984)

Brief Note
Peripheral Type Remyelination in the Spinal Cord of a Patient with Multiple Sclerosis

Accepted for Publication on April 17, 1984

Key words : Multiple sclerosis — Spinal cord — Remyelination — Peripheral myelin — Schwann cell

Prominent peripheral type remyelination by Schwann cells was observed within the severely atrophic spinal cord of a patient with chronic relapsing multiple sclerosis.

The patient was a 31-year-old man who had several remissions and exacerbations of transverse myelopathy with double vision, dysarthria and visual disturbance during the six-year and three-month course of the illness. Pathologically, the spinal cord was severely atrophic and demyelinated across most of its diameter from the mid-cervix to the lower thorax. In addition, small demyelinated lesions were scattered in the cerebral and cerebellar white matter, corpus callosum, optic chiasm, midbrain, pons and medulla oblongata, showing characteristic features of multiple sclerosis in Japan.[1] Other detailed clinicopathological observations have been described elsewhere.[2]

Staining of paraffin sections of the spinal cord by the luxol fast blue (LFB) and periodic acid-Schiff (PAS) methods revealed clusters of deep blue stained peripheral type myelin in the demyelinated lesions, especially at the entry zone of the posterior roots (Fig. 1). Nerve fibers with peripheral type myelin in the spinal cord were generally smaller in diameter than those with surrounding blue green stained central type myelin (Fig. 2). The areas of peripheral type myelin were rich in cellular elements. Electron microscopic examination of these lesions showed many proliferated Schwann cells coated with a basement membrane and containing one myelinated nerve fiber each (Fig. 3).

Feigin *et al.*[3,4] demonstrated a difference in the stainability of LFB and PAS to stain peripheral and central type myelin in paraffin sections. Peripheral type myelin is stained deep blue by LFB and PAS, whereas central type myelin is stained blue green because cerebroside is extracted during processing, resulting in the failure of PAS to stain the myelin. In our case also, the peripheral and central type myelin was distinctively stained in two separate colors. Also, electron microscopic examination revealed many Schwann cells containing one myelinated nerve fiber each. Peripheral type myelin in the spinal cord of our case was considered to be peripheral type remyelinated fiber ensheathed by Schwann cells around preserved central axons.

Ogata and Feigin[5] found peripheral type myelin associated with Schwann cells in the multiple sclerosis plaque in the pons, and suspected these Schwann cells had arisen by selective maturation of the multipotential primitive reticular cells, a phenomenon consistent with the view that Schwann cells are mesenchymal in character. Ghatak *et al.*[6] and Hosokawa[7] also observed remyelination of peripheral type myelin in the spinal cord probably derived from

調 輝男

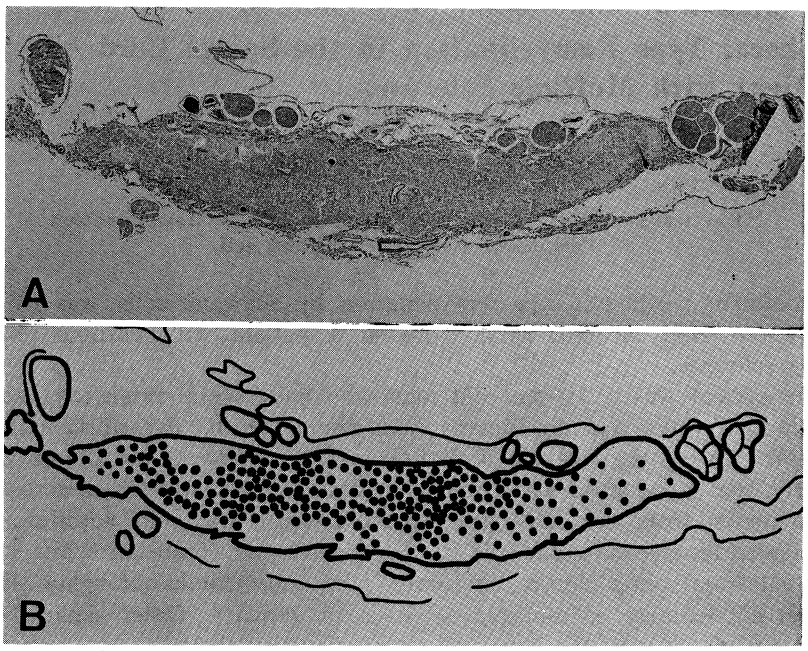

Fig. 1. Spinal cord is severely atrophic and is scattered with clusters of peripheral type myelin, as illustrated in B (dots indicate clusters of peripheral type myelin). LFB/PAS, ×9.8.

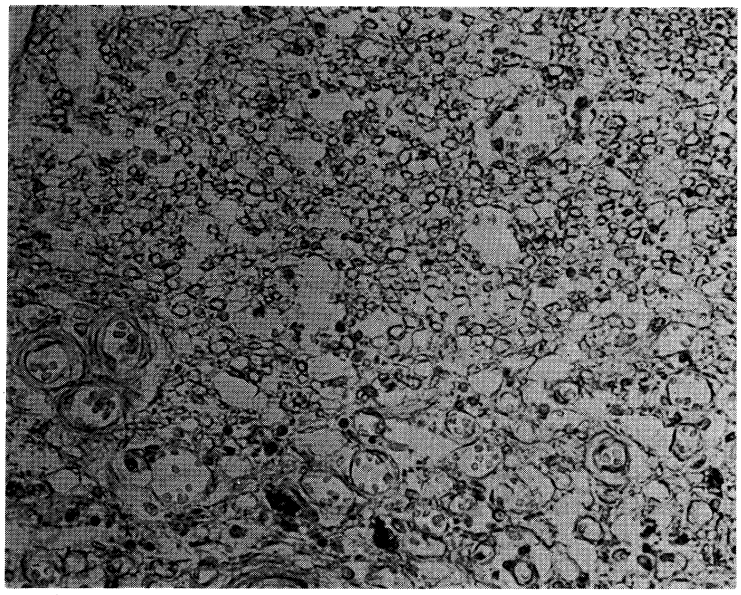

Fig. 2. Photomicrograph of the spinal cord showing a cluster of peripheral type myelin. LFB/PAS, ×315.

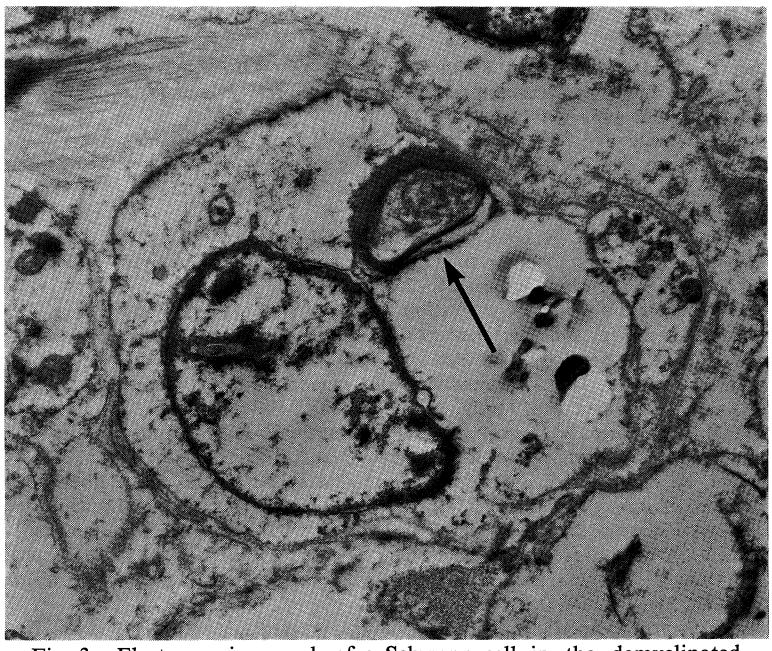

Fig. 3. Electron micrograph of a Schwann cell in the demyelinated lesion of the spinal cord. The Schwann cell is coated with a basement membrane and contains one myelinated nerve fiber (arrow). ×7,500.

the spinal nerve roots. Itoyama *et al.*[8] demonstrated Schwann cell remyelination by immunostaining with antiserum to P_0 protein, a major constituent of peripheral nervous system myelin. Such peripheral type remyelination appears to occur in cases with a relatively protracted course as in ours, although the mechanism of such remyelination remains obscure.

It is said that central type remyelination by oligodendroglia may also occur at the margins of multiple sclerosis plaques,[9] or even whole plaques, occasionally developing shadow plaques.[10] It is questionable, however, whether clinical remissions of multiple sclerosis are attributable to these remyelination. Anyway, the fact that there is marked regeneration of the demyelinated lesions as observed in our case of multiple sclerosis is worthy of note as a bright prospect for the development of an effective treatment of this disorder.

Teruo SHIRABE

Division of Human Pathology (Neuropathology),
Department of Pathology,
Kawasaki Medical School,
Kurashiki 701-01, Japan

REFERENCES

1) Shirabe, T., Shida, K., Murai, Y. and Kuroiwa, Y. : Three autopsy cases of multiple sclerosis group and characteristic features of multiple sclerosis in Japan. Psychiatr. Neurol. Jpn. **73** : 397-412, 1971 (in Japanese)
2) Shirabe, T., Inoue, N., Wakisaka, S., Yoshida, H. and Hoshiko, M. : An autopsy case of demyelinating disease involving severely the spinal cord, with several exacerbations of the transverse myelopathy at the same level. Brain Nerve **23** : 1575-1581, 1971 (in Japanese)
3) Feigin, I. and Cravioto, H. : A histochemical study of myelin. A difference in the solubility of the glycolipid components in the central and peripheral nervous systems. J. Neuropathol. Exp. Neurol. **20** : 245-254, 1961
4) Feigin, I. and Popoff, N. : Regeneration of myelin in multiple sclerosis. The role of mesenchymal cells in such regeneration and in myelin formation in the peripheral nervous system. Neurology **16** : 364-372, 1966
5) Ogata, J. and Feigin, I. : Schwann cells and regenerated peripheral myelin in multiple sclerosis. An ultrastructural study. Neurology **25** : 713-716, 1975
6) Ghatak, N.R., Hirano, A., Doron, Y. and Zimmerman, H.M. : Remyelination in multiple sclerosis with peripheral type myelin. Arch. Neurol. **29** : 262-267, 1973
7) Hosokawa, K. : On the regeneration phenomena of peripheral nerve fibers in the spinal cord lesions of multiple sclerosis. A study of five autopsy cases of multiple sclerosis in the Hokuriku district. Psychiatr. Neurol. Jpn. **83** : 547-571, 1981 (in Japanese)
8) Itoyama, Y., Webster, H. de F., Richardson, E.P., Jr. and Trapp, B.D. : Schwann cell remyelination of demyelinated axons in spinal cord multiple sclerosis lesions. Ann. Neurol. **14** : 339-346, 1983
9) Prineas, J.W. and Connell, F. : Remyelination in multiple sclerosis. Ann. Neurol. **5** : 22-31, 1979
10) Lassmann, H. : Comparative neuropathology of chronic experimental allergic encephalomyelitis and multiple sclerosis. Berlin, Heidelberg, New York, Tokyo, Springer-Verlag. 1983, p. 60