Axonal particles with electron-dense cores from arterial biopsy in polymyalgia arteritis

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**Summary**

Electron microscopic examination of nerve tissue from a patient with polymyalgia arteritis has shown the presence of electron-dense particles within the axons. These particles have a viral-like structure but lie within the size range of small neurosecretory vesicles and may represent alterations in these organelles. Myelin-like bodies have also been identified within non-myelinated axons and are suggestive of lysosomal end-products. These findings seem to bear out the proposition that the primary lesion in polymyalgia arteritis may be neurogenic in origin and offer some explanation of the pain experienced in the course of the disease.


The history of temporal or giant-cell arteritis dates back to 1890, when Hutchinson\(^1\) gave the first description of the gross findings in this disease.

The microscopic features were defined by Horton *et al.*\(^2\) in 1932, while the related polymyalgia rheumatica was described by Barber\(^3\) in 1957. Both are now grouped as the syndrome polymyalgia arteritis or giant-cell arteritis.\(^4\) Histologically the giant multinucleate macrophages are found in association with the elastic lamina in the junctional region of the arterial intima and media. Disruption of the elastic layer is evident and may be due to changes in the elastin itself or more probably to deposition of immunoglobulin complexes\(^5\) within the matrix. These complexes are apparently phagocytosed by the histiocytes, resulting in the formation of the foreign-body-type macrophage.\(^6\) It has been shown that the fast-twitch type 2 muscle fibres (those poor in mitochondria and lipid but rich in glycogen and myophosphorylase) are atrophied in polymyalgia rheumatica.\(^7\) Ultrastructural studies have been confined to the description of the giant cells,\(^8\) observations on the degeneration of muscle fibres,\(^9\) and changes in the elastic lamina,\(^10\) but there appears to be no report of changes in the nervous tissue.

**REFERENCES**

Material and methods

A temporal artery specimen from a 57-year-old White woman was obtained at biopsy and fixed immediately in 4% glutaraldehyde in cacodylate buffer followed by further fixation in 1% osmium tetroxide. After dehydration and embedding in Araldite the material was sectioned, post-stained with uranyl acetate and lead citrate and then examined in an Hitachi HU 11B electron microscope.

Results

The micrograph (Fig. 1) shows non-myelinated axons containing neurosecretory granules of 40-55 nm and approximately 100 nm in diameter, the latter containing moderately electron-dense material. Also present are particles approximately 50 nm in diameter with markedly electron-dense cores and a myelin-like body. Elastic fibres traverse the lower section of the micrograph and portions of mitochondria are at the upper centre.

Discussion

The particles with electron-dense cores are not normal axonal components and may represent altered neurosecretory granules or be virus-like particles. In the latter case it would be a novel virus, as on the grounds of structure and size it cannot be categorized into any known viral group. Paramyxovirus-like inclusions have been found within arterial endothelial cells from a patient with temporal arteritis, but this appears to be the only report of a possible viral association. Furthermore, viral antibody studies conducted by Mowat and Hazelman have yielded negative results. If, however, as seems more likely, these structures are neurosecretory granules, it may be supposed that they are altered as a result of the underlying disease or possibly are peculiar to this case. The presence of laminated myelin-like bodies within non-myelinated axons further suggests that changes of a necrotic nature have taken place and that these represent the end-results of lysosomal digestion. The possibility that the myelin figure is a result of trauma sustained during collection of the specimen is dismissed on the basis of lack of injury to adjacent tissues and in consecutive sections. Myelin-like structures were also found to be present in other axons, some of which did not contain electron-dense particles.

These changes in axonal content are consistent with the findings of Isaacs and Frere that in 4 of 5 cases of polymyalgia rheumatica the muscle biopsy was diagnostic of a neurogenic disorder; in the 5th case the findings were due to traumatic neurogenic dysfunction. Although available evidence suggests that arterial elastin is acting as an antigen and is inducing an auto-immune reaction it offers no rational explanation of the myalgic and arthralgic pains, and it is therefore hoped that these electron microscopic findings of abnormal bodies in the axon will stimulate further research into a field which until now has been totally neglected.

This work was supported by funds from the Poliomyelitis Research Foundation and the Department of Health and Welfare.

REFERENCES