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Lesions of the spinal cord in polyradiculoneuropathy of unknown aetiology and a possible relationship with the Guillain-Barré syndrome

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The following report describes two patients with polyradiculoneuropathy of unknown aetiology and displaying degeneration of the spinal cord secondary to severe and long-standing damage to the spinal nerve roots. With the possible exception of the tabetic form of syphilis, where the relationship of spinal cord lesions to spinal root pathology is still open to question (Blackwood, McMenemy, Meyer, Norman, and Russell, 1963), cord involvement is a rare consequence of radiculoneuropathies of known aetiology and is also rare in the polyradiculoneuropathies of unknown cause. Cases of root disease which fall into the latter category are often considered to bear the Guillain-Barré syndrome. Concepts concerning the nature or definition of this syndrome have undergone many changes over the past 50 years (Haymaker and Kernohan, 1949; Wiederholt, Mulder, and Lambert, 1964). Munsat and Barnes (1965) have recently pointed out that a controversy still exists concerning what is and what is not the syndrome. They reiterate the clinical aphorism that '. . . the Guillain-Barré syndrome is easy to diagnose but impossible to define . . .'. Because patients with the syndrome may in reality fall into several different and as yet unknown aetiological groups, some workers may prefer to abandon the eponymous designation, even when the clinical picture is clear-cut, and to refer instead only to polyradiculoneuropathies of unknown aetiology.

Classically, the Guillain-Barré syndrome is recognized by the presence of bilateral motor weakness which usually ascends in fatal cases. In addition, sensory deficits of the glove and stocking variety and of the segmental or radicular type are common, the latter being particularly frequent in ultimately fatal cases (Wiederholt *et al.*, 1964; Haymaker and Kernohan, 1949). The investigators mentioned above also established that albumino-cytological dissociation of the cerebrospinal fluid is not a constant finding although it is often present and may be considered a classical manifestation of the syndrome.

The pathological changes in cases considered to have the Guillain-Barré syndrome are characteristic even in the presence of wide variations in clinical symptoms (Haymaker and Kernohan, 1949). These changes consist of degeneration of the peripheral nerves with a concentration of the disease process on the spinal nerve roots. Alteration of myelin exceeds axonal damage and a negligible inflammatory cell infiltrate is present.

Both cases presented here had bilateral motor weakness and albumino-cytological dissociation of the spinal fluid, but the significance of these findings was overshadowed or obscured by other symptoms which reflected apparently unrelated disease processes as well as the intensity and duration of the changes in the nerve roots. The root pathology was qualitatively similar to that found in other fatal cases of the Guillain-Barré syndrome (Haymaker and Kernohan, 1949; van Bogaert, 1958) and to that found in six other cases examined by us, in which the clinical findings were characteristic. The two cases described here are distinguished from most other cases with the Guillain-Barré syndrome by the severe involvement of the spinal cord. Such involvement has rarely been reported in this syndrome and appears to be associated with disease of long standing (Haymaker and Kernohan, 1949; Lewey, 1945; Richter, 1962; van Bogaert, 1958).

CASE REPORTS

CASE 1 The patient was a 70-year-old white male in good health until two years before his death when he developed difficulty in walking and bilateral burning and tingling sensations in all four extremities. Examination revealed a broad-based gait and positive Romberg sign. Vibration, touch, and pain sensations were diminished in all extremities. Cerebrospinal fluid contained 200 mg.% protein and no cells. Tests for syphilis in both

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blood and cerebrospinal fluid were negative. During the next six months the paraesthesias disappeared, but the patient's ability to walk became increasingly impaired with staggering and falling.

One year before death he was readmitted to the hospital where marked muscle wasting was noted, more marked distally. The patient could no longer stand or sit without support. All deep tendon reflexes were absent. Position, vibration, light touch, and pain sensation was now absent in all extremities. Random slapping movements of the hands were noted as well as confusion, agitation, confabulation, and nocturnal hallucinations. His mental status improved greatly after phenothiazine therapy but the neurological deficits remained. Lumbar punctures yielded cerebrospinal fluids with 154 to 189 mg.% protein and 3 to 10 lymphocytes.

The final admission, three months before death, was occasioned by renewed confusion and disorientation. Occasional purposeless jerking or slapping movements of the hand were again noted, sometimes accompanied by inappropriate shouting at the immediate environment. Profound weakness and atrophy of the extremities were noted, distally more than proximally. All sensation was absent below the neck. Physical findings were otherwise the same as on previous occasions. Examination of the cerebrospinal fluid revealed 65 mg.% protein and no cells. The patient died approximately two years after his initial symptoms, terminally of pneumonia, urinary tract infection, and gangrene of the left foot due to peripheral vascular disease which necessitated a supracondylar amputation.

Pathological findings Necropsy revealed bronchopneumonia, several atherosclerotic aneurysms of the abdominal aorta and its branches, and undifferentiated carcinoma in the carinal lymph nodes (primary site undetermined).

Gross examination of the brain showed moderate atherosclerosis, and arteriovenous malformation and ventricular dilatation. The spinal cord displayed no gross lesions.

Microscopic examination was performed utilizing paraffin-embedded, formalin-fixed material stained with haematoxylin and eosin, luxol blue and periodic-acid Schiff for myelin, Mahon stain for myelin, Nissl, and Romanes (axon) stains. Additional stains are mentioned where used. Degeneration of dorsal nerve roots was present at cervical, thoracic, and lumbo-sacral levels. The lesions varied in age from recent to old and consisted of focal swellings of the myelin sheath, proliferation of cells in the nerve sheath, loss of myelin, and axonal swellings or loss. In certain areas of these roots myelin was virtually absent (Fig. 1). Axonal damage in general was not as marked as myelin degeneration; however, large numbers of axonal swellings were present and in areas where myelin was absent axons were often lost as well. The dorsal columns were extensively demyelinated (Fig. 2), had lost axons, and contained macrophages filled with myelin debris. Astrocytosis was present in the dorsal columns. The ventral roots displayed minimal changes in the material examined. Central chromatolysis was present in a few anterior horn cells. The trigeminal nerve and a portion of the lumbar plexus also displayed degeneration

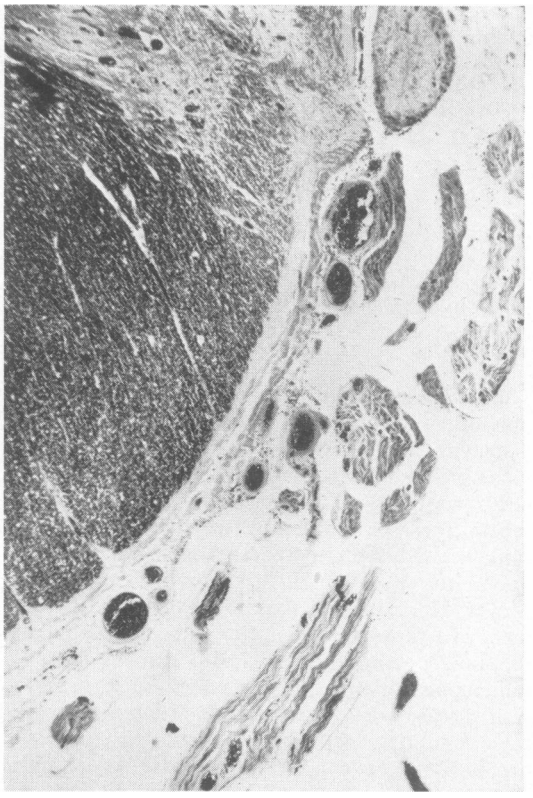

FIG. 1. *A section from case 1 to display dorsal roots adjacent to dorsal horn and lateral columns of the spinal cord. In this Mahon-stained section the pallor of the demyelinated dorsal roots contrasts with the dark staining of the well-myelinated lateral columns. Luxol blue stain for myelin revealed a similar picture.* × *40.*

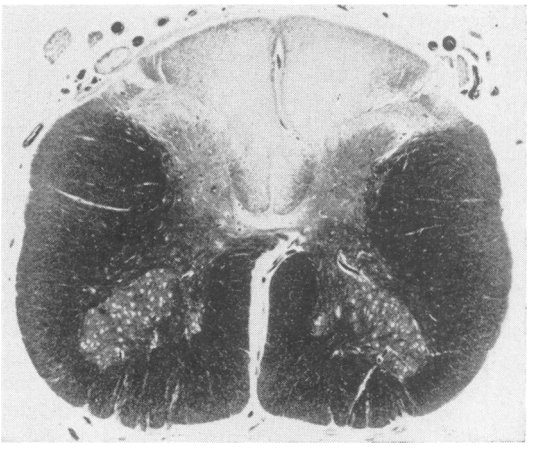

FIG. 2. *The spinal cord of case 1 displays marked pallor of the dorsal column indicating a severe degree of myelin loss. Mahon stain for myelin.* × *24.*

of myelin. Unfortunately, dorsal root ganglia were not available for examination.

Histological examination of the brain confirmed the presence of an arteriovenous malformation and revealed a mild meningo-encephalitis thought to be of septic origin. In addition, astrocytosis of obscure aetiology was present in the left hippocampal gyrus, and neurofibrillary changes were seen in cortical neurones.

CASE 2 This 70-year-old Chinese woman was admitted to Bellevue Hospital with an organic mental syndrome. One year before admission she had been treated for pyelonephritis and no neurological symptoms were noted at that time. She was well until two months before admission when she suddenly became weak, ceased walking, and went to bed. On admission she was noted to have bilateral weakness of the legs, more marked on the right. A Babinski sign was said to be present on the left. Deep tendon reflexes were absent in the legs and diminished in the arms but sensation could not be adequately tested because of the language barrier. She was febrile. Gastrointestinal bleeding and transient jaundice were noted during her course. A diffusely abnormal E.E.G. was obtained. On two occasions lumbar puncture showed a cerebrospinal fluid protein level of 560 and 238 mg.%; 6 lymphocytes were found in the first specimen and 2 in the second. The serum bilirubin level was 2·1 and 6·9 mg%. The alkaline phosphatase level was raised, 25-39 Shinowara units. Serological tests for syphilis were negative. The patient died quietly without significant alteration in her symptoms.

Pathological findings Necropsy revealed a focal aspiration pneumonia, acute bronchitis, and chronic pyelonephritis. The liver appeared normal.

Gross examination of the brain showed an old, very thin subdural membrane and marked atherosclerosis. The spinal cord displayed a few adhesions between the arachnoid and dura. The brain was examined microscopically using stains listed in the preceding case. The brain displayed a few minute infarcts, senile plaques, and atherosclerosis, changes unrelated to the patient's primary disease process. Examination of the cord revealed marked loss of myelin in the dorsal and ventral roots, in the dorsal root ganglia, and in the portions of the spinal nerve in continuity with them. These changes were restricted to the lumbar and sacral segments and the cauda equina. Eleven sections of cervical and thoracic cord and roots were without lesions. The alterations in the lumbosacral segments were patchy and were more extensive in the ventral roots (Fig. 3). Axonal changes were less severe and less extensive than the myelin degeneration in the same areas, and consisted primarily of irregular swellings. Swellings of the myelin sheaths were also seen on rare occasions in the dorsal columns and spinal cerebellar tracts of the cord, together with infrequent macrophages containing P.A.S.-positive material. Occasionally a swollen or fragmented axon could be seen within these spinal tracts or within the pyramidal tract. Rare chromatolytic changes were present in the dorsal horns at the lumbar and sacral levels. The preceding cord changes were not thought to be significant. In contrast, severe loss of neurones was noted in the anterior horns at lumbar

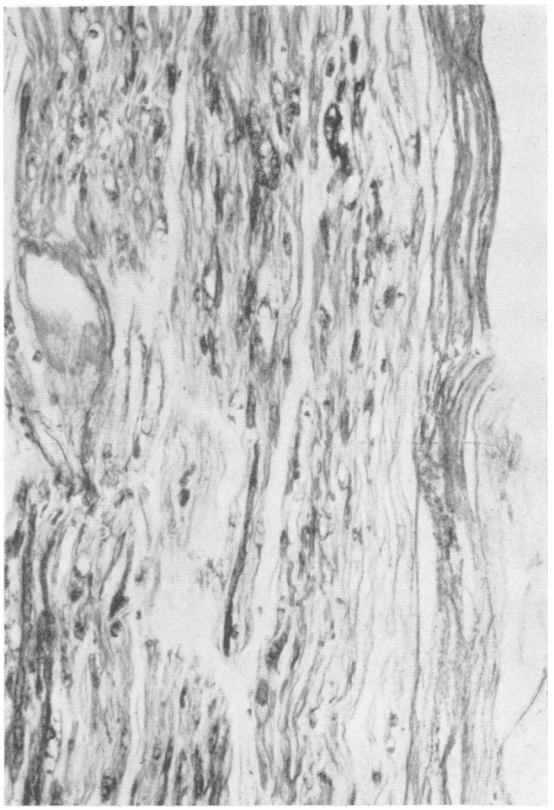

FIG. 3. *A section from a ventral root, lumbar segment of the spinal cord, in case 2. Degeneration and loss of myelin are indicated by the pallor of the section. Remnants of myelin sheaths appear black in the figure. They are sparse, interrupted, and display focal swellings. Luxol blue-P.A.S.* × *200.*

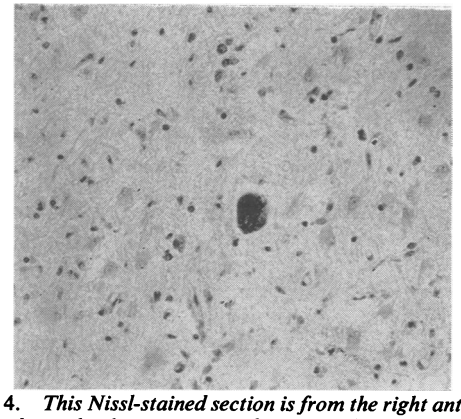

FIG. 4. *This Nissl-stained section is from the right anterior horn, lower lumbar segment, of case 2. The single, poorly preserved neurone in the centre of the figure was the only neurone in this region of the section. Many reactive astrocytes are present.* × *165.*

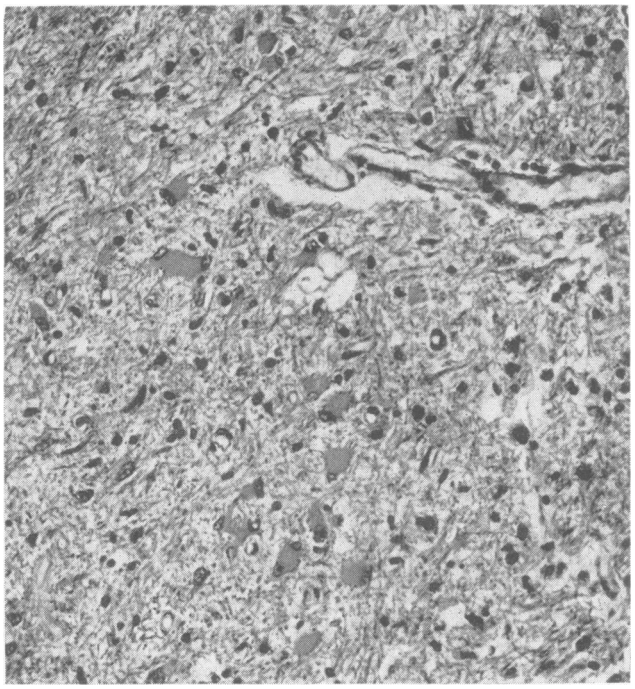

FIG. 5. *A portion of the right anterior horn of the spinal cord in case 2. The section is the same as that shown in Fig. 4 and reveals marked reactive astrocytosis. Phosphotungstic-acid-haematoxylin.* × *240.*

and sacral levels, especially marked on the right. In some sections, in the right anterior horn there were virtually no neurones (Fig. 4). Neuronophagia was present and large numbers of swollen astrocytes were seen at these sites (Fig. 5). Silver carbonate stain (paraffin) revealed microglial proliferation as well. The astrocytosis also involved white matter adjacent to the ventral horns. Axons running from the anterior horn cells to the ventral roots were markedly diminished in number on the right side of the cord in sections displaying neuronal loss.

DISCUSSION

Our first patient had bilateral motor weakness which was slowly progressive and ascending, and the cerebrospinal fluid contained a high concentration of protein in the presence of few cells, findings which are characteristic of the Guillain-Barré syndrome. Also present were marked sensory deficits, including anaesthesia in a segmental distribution and loss of proprioceptive sense. The severity of these sensory changes may reflect the widespread and marked degeneration of the dorsal roots in this case. Anaesthesia in a segmental distribution was reported by Haymaker and Kernohan (1949) in many of their 49 fatal cases, sometimes so extensive that they suspected a direct involvement of the spinal cord by the pathological process although they also considered it possible that widespread radicular involvement might account for the findings. These investigators also noted markedly impaired proprioceptive sense in most of their cases. A similar deficit was found by Wiederholt *et al.* (1964) in many of their 97 patients, most of whom survived. Our patient was ataxic. The presence of ataxia in cases of the Guillain-Barré syndrome has been noted by others and the pertinent literature is reviewed by Richter (1962) and by Munsat and Barnes (1965). The dementia in the first case occurred in an aged person subjected to an extremely stressful and physically debilitating situation. Severe peripheral atherosclerosis was present and neurofibrillary changes were found. The latter findings are frequently seen in elderly people unaccompanied by dementia, and their relationship to the mental deterioration in this case remains questionable. It should be noted that mental changes were described by Guillain (1938) as part of the syndrome, and that hallucinations were observed in several of the fatal cases observed by Haymaker and Kernohan (1949). The slapping hand movements seen in our patient were often accompanied by overt evidence of hallucinations and might have had a psychiatric basis. The prolonged course of our patient's disease is unusual, but has been noted in other patients considered to have the Guillain-Barré syndrome. Wiederholt *et al.* (1964) report that one of their patients had a progressive course culminating in death four years after

the onset of illness, that 10 patients had recurrences or relapses, and four patients remained ill, without improvement, for three years or more. The latter were distinguished from those who had residual symptoms after a period of improvement. Peterman, Daly, Dion, and Keith (1959) reported that 11 out of 17 patients under 15 years of age had illnesses lasting six months or more and that relapses occurred in two patients, three months and nine months after apparent recovery. The aetiology of the radiculoneuropathy in our first patient remains unknown.

Our second case had bilateral motor weakness in the lower extremities, which can be explained on the basis of the alterations found in the ventral roots at lumbosacral levels. The asymmetrical nature of the weakness has been observed before in cases with the Guillain-Barré syndrome (Wiederholt *et al.*, 1964), and in our case the root lesions were greater on the weaker side. The Babinski sign reported in this case cannot be explained on the basis of the demonstrated neuropathological changes, but similar findings have occasionally been reported in large series of the Guillain-Barré syndrome (Haymaker and Kernohan, 1949; Wiederholt *et al.*, 1964). As in the first case, the history, clinical data, and general pathological findings fail to provide an aetiological basis for the patient's neuropathological disease.

The essential pathological changes in these two cases, and in six additional cases examined by us, were characteristic of the Guillain-Barré syndrome as described by Haymaker and Kernohan (1949), consisting of degeneration of the spinal nerve roots and the most proximal portion of the peripheral nerves. Haymaker and Kernohan have shown that the most pronounced alteration at these sites is destruction of myelin, and in our cases there were irregular swellings of the myelin sheath, proliferation of cells comprising the nerve sheath, loss of myelin, and the presence of myelin debris in macrophages, patchy in distribution with less involved areas interspersed among those more severely damaged. In general, axon damage is manifest by scattered focal swellings of the axis cylinder but interruption of the axon and axon loss was minimal except in the two cases presented here. In the first case there was marked loss of axons as well as myelin in the dorsal roots in the most severely involved nerve bundles. In the bundles that were moderately involved by the degenerative process, axon loss and damage was less severe than myelin degeneration. In the second case, damage to the axis cylinder was less marked than myelin degeneration in almost all areas examined but axons were lost in the anterior roots at those lumbosacral levels at which anterior horn cells were absent or markedly decreased in number. Myelin degeneration was most severe in these roots. Thus, in the two cases presented here, as in other cases of the Guillain-Barré syndrome, the initial and essential pathological change appeared to be degeneration of myelin with equally severe axonal damage occurring only in the most severely involved areas. Degeneration of cranial and the distal portions of peripheral nerves, like that seen in the spinal roots, was observed in several of our cases, including case 1 reported here. The exact incidence of distal peripheral nerve involvement in this syndrome has not yet been determined, but several reports have described such changes (Haymaker and Kernohan, 1949; van Bogaert, 1958; Gilpin, Moersch, and Kernohan, 1936; Debré and Thieffry, 1951; Merrill and Fredrickson, 1959; Lowenberg and Foster, 1945). Lymphocytic infiltration of the nerves or nerve roots was minimal.

The consistent involvement of nerve roots and the most proximal portion of peripheral nerve is probably an important factor, as others have suggested (Berlacher and Abington, 1958; Scheinker, 1949), in accounting for the elevation in the cerebrospinal fluid protein level so often seen with this syndrome and found in the two cases reported here. Gross swelling or oedema at these sites has been described by some investigators (Gilpin *et al.*, 1936; Haymaker and Kernohan, 1949; Krücke, 1955), and is used to explain the characteristic cerebrospinal fluid findings (Berlacher and Abington, 1958; Scheinker, 1949). We were not able to recognize in any of our eight cases, including the two described here, either gross swelling of the nerve bundles or microscopically identifiable oedema in the form of stainable fluid or greatly widened, unstained spaces between nerve fibres or bundles.

The cases reported here had marked alterations within the spinal cord in addition to the neuropathological findings characteristic of the Guillain-Barré syndrome. The severe cord involvement distinguishes them from most cases of this syndrome reported to date. The spinal cord pathology in each of our cases is a consequence of the primary pathological process in the nerve roots. In the first case, there was marked degeneration of the dorsal columns with loss of both axons and myelin to an equal degree. There were alterations in both the dorsal and ventral roots without significant changes in the ventral cord, supporting the view that the pathological process started in the roots rather than in the cord. The changes in the dorsal roots were extremely severe and the changes in the dorsal columns are thought to represent Wallerian degeneration secondary to axon loss in these roots.

Cases of the Guillain-Barré syndrome with dorsal column degeneration have been reported on rare

occasions and with one possible exception are instances in which the duration of illness was two months or longer (Haymaker and Kernohan, 1949; Richter, 1962; van Bogaert, 1958). Richter, in particular, called attention to the long duration of such cases, finding four in the literature and adding one of his own. One might anticipate that degeneration of axons in the dorsal columns would be evident earlier in this syndrome since in Wallerian degeneration the entire distal segments of interrupted axons degenerate simultaneously, and in most instances in less than two months (Ranson, 1912; Weddell and Glees, 1941; Ramon y Cajal, 1959). It is probable that only if the disease remains active for a considerable time will axons in the dorsal roots be damaged severely enough and in sufficient numbers to produce dorsal column degeneration recognizable by conventional methods for staining myelin.

In our second case there was a bilateral loss of anterior horn cells at lumbosacral cord levels, slight to moderate on one side and almost complete on the other, and accompanied by an astrocytic and microglial reaction. The root lesions were also asymmetrical. There was severe damage to the ventral roots together with loss of axons in their intramedullary course. It is probable that the loss of neurones in the anterior horn was the result of a retrograde injury due to ventral root lesions, and we know of only one other case (Lewey, 1945) in which marked neuronal loss was present in the anterior horns. Milder alterations in anterior horn cells are not infrequent. These generally consist of chromatolytic changes and have also been interpreted as being retrograde in nature (Haymaker and Kernohan, 1949). Again two factors, intensity and duration of disease, probably combine to determine the severity of the cord lesion.

The aetiology of the Guillain-Barré syndrome is unknown, though viral mechanisms have been repeatedly considered (Haymaker and Kernohan, 1949; Wiederholt *et al.*, 1964). It is of interest that one of six additional cases of this condition in our files was found to have interstitial myocarditis, and intranuclear eosinophilic inclusion bodies of the Cowdry type A (1940) within the nuclei of cells comprising the nerve sheaths (Fig. 6). These findings have been associated with viral disease but do not prove such origin. No such inclusions were found in our other cases, including the two reported here, though these were studied with equal thoroughness.

In our first case, a carcinoma of undetermined primary site was noted in thoracic lymph nodes. Carcinoma has been associated by some workers with a variety of neurological signs and neuropathological findings (Denny-Brown, 1948; Lennox, and Prichard, 1950; Henson, Russell, and Wilkinson, 1954; Heathfield and Williams, 1954). Henson

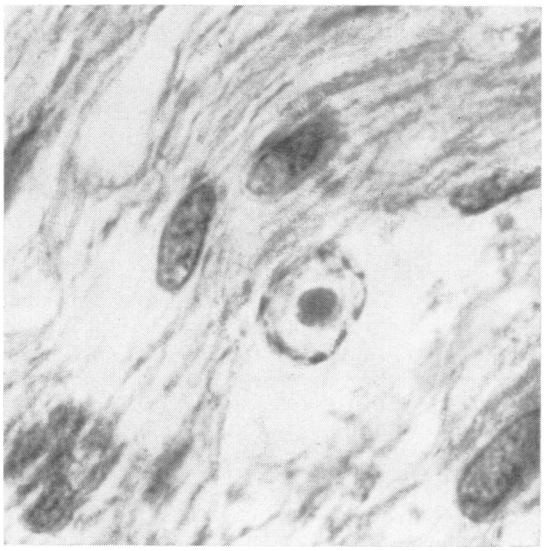

FIG. 6. *An eosinophilic, intranuclear inclusion is present in a nerve sheath cell adjacent to the dorsal root ganglion and it is surrounded by a clear halo. Chromatin material is clumped around the nuclear membrane. These inclusions were found in one out of eight cases of Guillain-Barré disease. Haematoxylin and ecsin.* × *1,200.*

et al. (1954) group these into the general category of 'carcinomatous neuropathy' which in turn may be subdivided into cerebellar degeneration, polyneuritis (or mixed motor and sensory neuropathy), neuromuscular disorders (motor neuropathy and myopathy), and sensory neuropathy. Only sensory neuropathy concerns us here. Two cases in the latter category were first described by Denny-Brown (1948), and a few additional cases with necropsy reports have been added to the literature by other workers, particularly by Henson *et al.* (1954) and by Heathfield and Williams (1954). Our first case resembles these cases of sensory neuropathy in several respects. Ataxia and severe sensory deficits were present from the onset of the illness. Muscle wasting and weakness, absent in Denny-Brown's case, was present in our case as it was in one case of Henson *et al.* (1954) and in both cases of Heathfield and Williams (1954). At necropsy, degeneration of the dorsal columns and dorsal roots was pronounced, as it was in Denny-Brown's original cases, and in subsequent reports, while changes in ventral roots were negligible.

In evaluating the role of carcinoma in the cases in the literature and in our case, several factors must be considered. The clinical features in these cases are not specific as previous workers have themselves recognized (Denny-Brown, 1948; Henson *et al.*,

1954), and indeed have been reported in cases of the Guillain-Barré syndrome in the absence of carcinoma. Several of the latter were reviewed by Richter (1962) whose own case and that of Gilpin *et al.* (1936) had carcinoma of the breast and Hodgkin's disease respectively. A definite statistically significant relationship between malignancy and the sensory type of carcinomatous neuropathy or polyneuritis has only been suggested for carcinoma of the lung (Lennox and Prichard, 1950; Henson *et al.*, 1954; Heathfield and Williams, 1954). Denny-Brown (1948) emphasized the presence of severe alterations in the dorsal root ganglia in his cases, and believed these could be used to distinguish carcinomatous neuropathy from forms of the Guillain-Barré syndrome. However, the degree of ganglion cell involvement as reported by Denny-Brown and others appears to vary considerably among cases with the sensory form of carcinomatous neuropathy. In one case almost all ganglion cells had dropped out while, in another, 50% of the cells at most were involved (Denny-Brown, 1948). In one subsequent case (case 7 of Henson *et al.*, 1948) the loss of neurones in dorsal root ganglia is called 'pronounced' while in another (case 8) degeneration of the neurones is stated to be uneven and 'considerably less' in four ganglia as compared to a fifth. In one case of Heathfield and Williams (1964) it is stated that some ganglion cells appeared normal, and, while most apparently showed evidence of degeneration, complete absence was noted only 'in places'. It is of interest to compare these reports with descriptions of dorsal root ganglia in Guillain-Barré disease. Gilpin *et al.* (1936) described a case with dorsal column degneration in which most of the ganglion cells showed degenerative changes such as fraying, vacuolization, shrinkage, and chromatolysis. Capsular cells were extensively proliferated. Similar changes were described by Denny-Brown in one case of carcinomatous neuropathy. Russell and Moore (1943) reported a case of the Guillain-Barré syndrome with dorsal column degeneration, with 'moderate' decrease in the number of ganglion cells. No malignancy was present. Haymaker and Kernohan (1949), in their extensive series of cases of the Guillain-Barré syndrome, state that 'degeneration in dorsal root ganglia varied greatly from case to case and even from one ganglion to another. . . . In several cases a focal proliferation of the endocapsular cells was noted. Occasionally this was well marked, but usually it was mild. It seemed to us that this proliferation was secondary to degeneration of the nerve cells. . . . Mild to marked chromatolysis was present in most ganglia.' It is apparent that cases of the Guillain-Barré syndrome can display alterations in individual dorsal root ganglia resembling those reported in cases of sensory carcinomatous neuropathy, and that in each instance these changes vary widely in severity and distribution. Although dorsal ganglia were not examined in our first case it is apparent that pathological findings in scattered ganglia cannot distinguish with certainty between the Guillain-Barré syndrome and other conditions.

Denny-Brown (1948) noted that the changes he described in dorsal root ganglia were like those reported in some experimental nutritional deficiencies. He stated that his cases presented 'the first clear clinical picture closely resembling experimental pantothenic acid deficiency'. He also suggested that the carcinoma in his cases might produce a substance interfering with the action of this vitamin. Subsequent reports on carcinomatous neuropathy have specifically denied a direct causal relationship between the carcinoma and the neuropathy. Henson *et al.* (1954) stated that '. . . it is certain that more than one factor must be concerned in the production of these neuropathies'. They also say 'in view of our observations on the relative causes of carcinoma and neuropathy we find it difficult to believe that there can be any direct causal relationship between the one and the other; we would rather suggest that they are linked by a common cause'. Viral and nutritional causes were among those considered by these authors. It is apparent that the mechanism underlying neuropathy in the presence of carcinoma is as unknown as that underlying the Guillain-Barré syndrome, and that similar mechanisms, such as a viral, have been proposed in both situations.

The juxtaposition of neuropathy and carcinoma is rare, making further analysis of the relationship difficult. The incidence of neuropathy in general has been reported as 1·3% of 1,063 cases of bronchial carcinoma and only a portion of these had the sensory type (Henson *et al.*, 1954). In our extensive experience with carcinoma we have never encountered another case similar to that reported here. Where moderate alterations in dorsal ganglia and peripheral nerves have been noted we have ascribed them to nutritional deficits and general debilitation, usually readily demonstrated in these individuals. The possible relationship of sensory carcinomatous neuropathy to nutritional factors has already been pointed out. Since the findings in sensory carcinomatous neuropathy appear to lack clinical, pathological, and aetiological specificity it is conceivable, and even predictable, that they can occur in the absence of carcinoma. In an individual case with radiculoneuropathy and carcinoma it does not seem possible or proper to rule out a coincidental concurrence of the two findings. The clinical and pathological findings in sensory carcinomatous neuropathy have been reported in cases of the

Guillain-Barré syndrome without carcinoma of the lung. The same aetiological agents have been proposed for both the Guillain-Barré syndrome and for carcinomatous neuropathy. The information currently available does not appear to warrant removing the case reported here from the category of polyradiculoneuropathies of unknown aetiology and placing it, instead, in a category relating the findings specifically to the presence of carcinoma.

Our two cases remain as examples of polyradiculoneuropathy of unknown aetiology. The pathological findings in the nerve roots are characteristic of those seen in cases with the Guillain-Barré syndrome. The severe spinal cord changes were a consequence of marked damage to the dorsal and ventral roots respectively and of the prolonged course of the disease. These cord lesions are rare in reported cases of the Guillain-Barré syndrome but were considered by several workers to be part of the spectrum of pathological change that can occur in the syndrome, particularly if the course is prolonged. The clinical findings included signs and symptoms found in many cases with the syndrome. In addition, there were other signs less frequently associated with the syndrome. However, several of these have been reported previously as part of the complex of symptoms that can be seen. Several clinical findings represented disease processes that were unrelated to the primary neuropathological condition. In view of the underlying similarity between the essential pathological findings in these cases and in others considered to have the Guillain-Barré syndrome, it appears reasonable to suggest that these are examples of the syndrome, with secondary involvement of the spinal cord through Wallerian degeneration or retrograde degeneration, respectively.

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