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Research Article

HISTORICAL PERSPECTIVES OF PERIPHERAL NEUROPATHY

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ABSTRACT

Peripheral neuropathy is a general term of a disorder of the peripheral nerves that can impair sensory, motor or autonomic function individually or in a combination.
The understanding of peripheral nerves dates back to Hippocrates and their disorders were first described by Susruta and Galen during the ancient times. Schwann, Remak, Virchow and Ranvier played major roles in contributing to the understanding of the anatomy of peripheral nerves.
Acquired neuropathies due to diabetes, leprosy, lead poisoning, lathyrism and arsenic were first described in the Susrutasamhita but a detailed description of it was first given by de Calvi in the 19th century who went on to detail diabetic neuropathy. It was also during this period that various causes of peripheral neuropathy due to alcohol, leprosy, lead, arsenic, beri-beri and others were illustrated. While lethal diseases like Guillain Barre Syndrome and Chronic Inflammatory Demyelinating Polyradiculopathy were outlined much later.
Hereditary neuropathies were first reported by Charcot and Marie and correctly interpreted by Tooth. Various other entities were included in this group by other scientists and they were classified as Hereditary Neuropathies by Dyck.
It is important to recognize the various physicians and scientists who have made significant contributions in evolving our understanding of peripheral neuropathy.

INTRODUCTION

Peripheral nerves are composed of sensory, motor, and autonomic elements. Most peripheral nerves are mixed and contain sensory and motor as well as autonomic fibers. Peripheral neuropathies can impair sensory, motor or autonomic function, either singly or in combination. Peripheral neuropathy is a general term of a disorder of the peripheral nerves that primarily affects the cell body, myelin or the axon(1). The prevalence of peripheral neuropathy is approximately 2-8%(2).

Peripheral nerves have been described as early as the fourth century BC in the seminal works of Hippocrates(3). This article will describe the various historical perspectives of peripheral neuropathy and the gradual evolution of our knowledge.

METHODS

In this article, we reviewed various observational articles, books, clinical studies and review articles from electronic databases (PUBMED, COCHRANE, GOOGLE SCHOLAR, GOOGLE BOOKS) which were published in English. Keywords used for the search included: Peripheral Neuropathy, Historical Perspective, Peripheral Nervous System, Peripheral Nerves Regeneration.

History of Peripheral Neuropathyanatomy

It was during the era of Galen that it was discovered that nerves conveyed sensation and motility to the extremities(3,4). Anatomical details of the course of the nerves was shown in the illustrations of Vesalius(4). Anton van Leeuwenhoek (1632-1723), the pioneer microscorpist, was probably the first to detail single myelinated nerve fibers. Nonetheless, it wasn't until the 19th century that nerves, their function and the pathological states affecting them began to be understood(4).

In 1822, Magendie demonstrated that section of the anterior spinal roots resulted in limb paralysis and the section of posterior roots caused loss of sensation in the affected segments(5). Soon after, Remak observed that nerve fibers were in continuity with the neurons(6).

Remak's colleague, German scientist Theodore Schwann (1839) postulated that the long chains of nucleated cells (now named after him) coalesced to form a syncitium with a

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continuous band of protoplasm at the centre (7). The concept of Schwann cells was eventually refuted by Cajal's classical studies in 1913. (8). In 1854, Virchow posited the concept of nerve cells being held together by a 'Nervenkitte' which he called "glia" (for glue) and the concept of myelin sheath was born (9). Ranvier followed this up with his detailed histological study which found gaps in the myelin sheath and thus, they were named 'nodes of ranvier'(10). Waller demonstrated degeneration and regeneration of nerves through his experiments on frogs where he severed their glossopharyngeal and hypoglossal nerves(11).

The Acquired Neuropathies

The Indian physician, Susruta deserves credit for the very first record of symptoms attributed to diabetic neuropathy(12). Centuries after Susruta, Marchal de Calvi, in 1864, identified that relationship between diabetes and the nervous system(13). Davies Pryce, a British surgeon, deserves credit for providing the first report on macro- and microscopic changes in peripheral nerves of diabetic patients and suggesting a connection between 'diabetic neuritis and perforating foot ulcers'(14).

Various case reports of neuropathies were published in the mid 19th century due to epidemic polyneuritis (Chomel 1828), diphtheria (Maingault 1860) and lead intoxication (Remak 1875) but it was not known with certitude where their pathology lied (4). Dumenil (1864) described a case of ascending paralysis due to the inflammation of the peripheral nerves in the same volume in which Landry reported his own – better known clinical observations(15).

In 1880, Gombault reproduced experimental demyelination in the peripheral nerves while simultaneously demonstrating nerve lesions to be responsible for paralysis of lead and arsenic poisoning, diabetes, leprosy, alcoholism, beri beri(17). Meyer wrote his classical account of the pathology of diptheretic neuritis in 1881(18).

Fifty seven years after Landry published his significant findings, Guillain, Barré and Strohl described an identical condition, with two unique characteristics: I) better prognosis, II) cyto-albuminar dissociation in the cerebrospinal fluid study(19). Eichhorst was the first to describe recurrent polyneuritis in 1890. This was followed by sporadic case resports which included a case series by Hoestermann in 1914 that closely resembled CIDP (Chronic Inflammatory Demyelinating Polyradiculopathy). During the late 1950s under the guidance of Edward Lambert, Henriksen studied nerve conduction velocities in individuals various neuromuscular diseases and discovered many cases of CIDP (20).

Toxic neuropathies due to heavy metals, drugs, solvents were investigated by Schaumberg, Spencer and Thomas 1980(21), but were well first metioned in ancient texts such as the Susrutasamhita and the Charaksamhita (22).

Neuropathy secondary to malignancy was infrequently reported, but came to be clearly described by Denny-Brown in 1948(23). Peripheral neuropathies due to paraneoplastic causes was meticulously studied at the London hospital by Brain, Henson and Urich(24).

Hereditary Neuropathies

The first description of familial neuropathic plantar ulcers can be traced back to a report by Nelaton in 1852(4). In the year 1886, Charcot and Marie published their original case series of patients who they clinically diagnosed to have progressive muscular atrophy(26). They reckoned that the lesion could be a myelopathy. It was Tooth who localized the lesion to the peripheral nerves in his seminal thesis titled 'Peroneal Type of Progressive Muscular Atrophy', three months after Charcot and Marie's report(27). Dejerine and Sottas (1893) subsequently identified two siblings with peripheral neuropathy, calling it hypertrophic interstitial neuritis which later came to be known as CMT 3 (28). In 1926, Roussy and Levy described an identical disorder that included resting tremors (29). Dawidenkow (1927) initially endeavored to classify the neural muscle atrophies but this was unsuccessful (30). Dyck and Lambert (1968) consequently classified several Charcot-Marie-Tooth Disease (CMT) kinships (31). In 1975, Otha and Dyck proposed a newer and updated classification of inherited peripheral neuropathies based on clinical profile, hereditary transmission, nerve conduction studies and nerve biopsy introducing the term HMSN (Hereditary Motor Sensory Neuropathies)(32).

CONCLUSION

Peripheral neuropathy is a disorder that has been recognized since the time of Galen and Susruta. Various discoveries by scientists like Schwann and Ranvier helped establish the understanding of the anatomy of peripheral nerves. It wasn't until the 19th century that peripheral neuropathies, both acquired and hereditary were recognized.

De Calvi was the first physician to comprehend diabetic neuropathy while other acquired neuropathies caused by diphtheria, alcohol, arsenic, beri-beri were demonstrated by Gombault. Both GBS and CIDP were recognized much later and the likes of Guillain, Barre, Strohl and Henriksen played a major role in demonstrating them.

The inherited neuropathies were also acknowledged during the same time period and the contributions of Charcot, Marie and Tooth cannot be overstated. They were eventually properly classified in the 20th century and Dyck helped devise the system currently in use.

It is important to realize how far we've come in our understanding of peripheral neuropathies and recognize the important contributions by distinguished scientists and physicians who helped us get where we are.

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