

## AXONAL AND DEMYELINATING MOTOR NEUROPATHIES. DIFFERENTIAL DIAGNOSIS

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### ABSTRACT

Diseases of the peripheral nervous system are quite common in clinical practice. Due to their extreme variability in clinical, etiopathogenic and therapeutic terms, they require a careful diagnostic, medical history, clinical and instrumental approach. The basic elements for proper differential diagnosis are described below.

**Key words:** Neuropathy, axonal neuropathy, demyelinating neuropathy, electroneurography, electromyography.

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Diseases of the peripheral nervous system are fairly frequent pathological occurrences in current practice. Because of their extreme clinical, etiopathogenic and therapeutic variability, they require an accurate investigation, clinical history, clinical and instrumental approach. Nonetheless a correct diagnostic definition is not always achieved and in some cases the pathophysiological diagnosis remains uncertain.

Their epidemiological incidence is difficult to assess due to a lack of specific publications, but reliable data in the literature estimate it at around 2 to 4 out of every 100,000 inhabitants, with a doubling of incidence after 55 years of age.

In Europe diabetes mellitus, alcoholism and HIV infection are among the most frequent causes of peripheral neuropathy. Among the other causes, a major role is attributed to genetic, toxic, metabolic, infectious, vascular, paraneoplastic, iatrogenic, traumatic and dysimmune factors<sup>(1)</sup>.

The clinical approach involves the assessment of a range of parameters such as: location of the deficit, mode of onset of symptoms (acute, subacute, chronic, relapsing), their duration, their evolution over time, anatomical localization (proximal, distal, diffuse) of the motor, sensory, autonomic and

mixed damage. The sensory, autonomic or motor signs and symptoms (deficiency of strength, muscle atrophy, spontaneous pathological activity, lack of reflexes, cramps, anatomical location of the damage in nerve, namely the cell body, axon and myelin)<sup>(2)</sup>.

In the context of motor neuropathies, a distinction is usually made between axonal and demyelinating varieties. Among the former, an important role is played by genetic diseases of motor neurons, which include different clinical conditions. These may have

- a contemporary involvement of the first and second motor neuron (sporadic or familial amyotrophic lateral sclerosis, with onset during youth or adult age)<sup>(3-4)</sup>.
- involvement of the first motor neuron alone (including primary lateral sclerosis or familial spastic paraplegia)
- lesions of the second motor neuron (including spinal muscular atrophy, Kennedy's disease, motor axonal neuropathy, post-polio syndrome).

An important diagnostic contribution is already given by clinical evaluation, which allows the detection of major differences between the two varieties of neuropathy. In fact, while it is true that both varieties can be hereditary or acquired, it is

also true that their phenotypic expression (sometimes as mononeuropathy)<sup>(5)</sup> is characterized, in the case of axonal varieties, by the presence of major atrophies, fasciculations, symmetric distribution of signs, possible toxic, metabolic, paraneoplastic or hereditary pathogenesis and absence of anomalies in cerebrospinal fluid.

An important role for diagnostic purposes is played by neurophysiological investigations, which can help identify and recognize the pathological conditions characterized by degeneration of the second motor neuron such as:

1. *Effects of axonal degeneration:*

- Reduced amplitude of compound muscle action potential (CMAP)
- Reduced recruitment (more or less poor transition)
- Reduced MUNE (motor unit number estimation)

2. *Effects of muscle denervation:*

- Presence of pathological spontaneous activity (fibrillations, positive waves, fasciculations)

3. *Effects of reinnervation*

- Increased breadth and muscle action potential
- Increased fiber density
- Increased width of motor unit potentials
- Increased width of motor units

4. *Possible reduction of motor conduction velocity, but by no more than 30% compared to the normal minimum value.*

L-acetyl-carnitine<sup>(6-8)</sup> seems to play a therapeutic role in reinnervation processes.

These are all electrophysiological characteristics typical that clearly characterize axonal and neuronal pathologies and that differ from those seen in demyelinating neuropathic diseases that feature other characteristics:

1. Sharp reduction in conduction velocity (usually 30% less than the minimum normal value)
2. Increased distal latency
3. Presence of conduction blocks
4. Increased F-wave latency
5. Rare pathological spontaneous activity.

However, it should be borne in mind that the two aforementioned varieties of neuropathy (axonal or demyelinating) are not always distinguished in the various clinical pictures of current practice, but may be mixed at times, as in the case of diabetes, kidney disease, hepatic diseases, iatrogenic forms

(drugs or toxins), lymphomas (Hodgkin's or non-Hodgkin's)<sup>(9,10)</sup>.

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