Tests for muscle hypotension/paralysis or hyperactivity

Paralysis is the complete loss of voluntary of moment muscle function for one or more muscle groups. Paralysis may results in **loss of sensation or mobility** in the affected area.

Paralysis mostly occurs due to damage to the nervous system, mainly the spinal cord. Partial paralysis can also occur in the Rapid Eye Movement stage of sleep. There are a number of factors that contribute to paralysis and some of them are as follows; stroke, trauma, poliomyelitis, amyotrophic lateral sclerosis (ALS), botulism, spina bifida, multiple sclerosis as well as Gillian-Barre syndrome. There are some poisons that interfere with nerve function, like curare which can also cause paralysis. Many causes of this are varied, and could also be unknown.

Variations of paralysis

- Paralysis may be localized, generalized, or follow a certain pattern.
- For instance, a localized paralysis may occur in Bell‘s palsy where by one side of the face may be paralyzed as a result of facial nerve inflammation on that side. In case of Patients with stroke, weakness may occur throughout the body (**global paralysis**) or have weakness on only one side of the body which is termed **hemiplegia** or other patterns of paralysis depending on the area of damage in the brain. Different forms of paralysis are due to different lesions and their sequelae.
- For example, lower motor neurons are due to damage of the **anterior horn** of the spinal cord and may result in **paraplegia** while upper motor neurons include injuries that are higher up the spinal cord and they cause **quadriplegia**.
- Normally patients with paraplegia or quadriplegia need support when they stand from a sitting position, hence their use for standing frame or the use of wheel chairs for mobility and to regain some independence.

Most paralyses caused by nervous system damage are constant in nature. These include periodic paralysis which involves sleep paralysis which is caused by many other factors. Hyperactivity can be described as a physical state in which a person is abnormally and easily excitable or exuberant.

- **The tests for neuromuscular diseases** can be divided into 3 categories:
  - **Electrophysiology**
  - **Muscle biopsy**
  - **Nerve biopsy**

Electrophysiology

A) Motor

In large myelinated fibres the motor conduction velocity can be calculated by recording the time it takes for a standard current to produce a twitch when the distance magnitude between the point of current application and the the reacting muscle is known. This method can be suitable for upper and lower extremity nerves as well as the facial nerve. It is important to note that nerve conduction velocity can remain normal up to 7 days after section of a nerve and denervation changes may not appear 10 - 21 days following section. Neuropathies that affect myelin early (and show segmental demyelination pathologically) reduce nerve conduction velocities. Acute inflammatory demyelinating polyneuropathy (AIDP), diphtheria, Charcot-Marie-Tooth disease, metachromatic leukodystrophy, and entrapments often show definite slowing. There is no way to measure nerve conduction velocity if a nerve is completely degenerated.

B) Sensory

The time it takes for an evoked potential to be recorded at a distal site along a nerve is known as sensory conduction. Radial, medial and ulnar nerves can be easily tested in the upper extremity whereas in the lower extremity it’s possible to access sural, lateral fermoral cutaneus, deep peroneal and saphenous nerves. In addition, neural action potentials can be recorded by stimulating a mixed nerve. Changes in amplitude and conduction time of the neural action potential (whether from a sensory or mixed nerve) are useful in the evaluation of nerve entrapment syndromes, axonal neuropathies, or demyelinating neuropathies.

C) Electromyography

An electromyography is a technique for recording and evaluating the activation signal of muscles. Fibrillations, positive sharp waves, reduced interference pattern, and polyphasic units are included amongst the signs of denervation and such signs can support the suspicion of a neurogenic disease. Primary muscle disorders have nonspecific and variable EMG patterns, usually with reduced amplitude.

Muscle biopsy

Whenever there is a clinical sign that indicates abnormality of a muscle, a muscle biopsy can be performed and analyzed. It is a relatively safe method and may resolve a diagnostic problem allowing specific diagnosis and treatment of the myopathy. Disorders with a specific appearance on muscle biopsy include:

- Progressive muscular atrophy and dystrophy
- Localized or diffuse inflammatory disease of muscle
- Systemic disease that is suspected to be vasculitis or collagen-vascular in nature
- The state of denervation in the muscle after injury to nerves and vessels of a limb
- To diagnose congenital and metabolic myopathies

Nerve biopsy

When a specific etiology is suspected, a nerve biopsy is performed. A nerve biopsy may be pathognomonic in:

- Sarcoidosis
- Metachromatic leukodystrophy
- Amyloidosis
- Polyarteritis nodosa
- Leprosy
- Hereditary neuropathies

References

Martin and Samuels, 1998, Manual of neurologic therapeutics, 6th edition