



EMG: WHAT, WHY, AND WHY NOT

PAUL E. PEACH, MD, PALMYRA POST-POLIO CLINIC, ALBANY, GEORGIA

WHAT IS AN EMG STUDY?

An electromyogram (EMG) is a diagnostic instrument that detects the presence of motor units. (A motor unit consists of the nerve and all the muscle fibers it stimulates.) In the diagnostic EMG, a very small diameter needle is inserted into a muscle.

In an EMG study, a number of observations are made. First, any spontaneous resting activity is noted while the individual is completely relaxed. Normally, no resting activity should be present. If abnormal activity is observed with the muscle at rest, a neuropathy (a disease of the nerves) or myopathy (a disease of the muscles) may be the cause of the problem.

Next, the polio survivor is asked to contract the muscle up to full effort. During this phase of the examination, the readings of the individual being tested are compared to the readings of normal motor units, which fall within a given size range and with a maximum number of phases. Motor units which have too many phases (polyphasic) and are larger than normal could indicate a neuropathy. On the other hand, if smaller than normal motor units are observed which are also polyphasic, a myopathy may be indicated.

Additionally, the EMG can document the rate of recruitment (the rate at which the number of motor units are activated) and degree of interference at full effort. Incomplete interference at full effort can indicate the severity of the neuropathic or myopathic process.

The second part of what is commonly referred to as an EMG study is the nerve conduction study (NCS) in which surface electrodes are used. In the NCS, a controlled electrical shock at a certain threshold stimulates the nerve. At the end of the arms and legs,

the time delay from onset of stimulus to the response is termed the distal latency. In some neuropathies, for example, carpal tunnel syndrome, this time delay is extended.

Also, the nerve conduction speed can be calculated by stimulating a nerve at two points. A lower speed may be found in a systemic disease, such as diabetes mellitus. A slower nerve speed in one section may be

found when a nerve is compressed, for example, across the elbow.

Data from the EMG and NCS is combined and the determination can be made whether a neuropathy or myopathy is present and whether it is acute (is presently active) or chronic (occurred in the past but is no longer active). Further, it can be determined whether the problem is localized or generalized throughout the body. Finally, the severity of the problem can be estimated. The EMG of polio survivors will typically show evidence of chronic neuropathy which reflects

the paralysis of many years ago.

"Well-founded research studies have established that EMG findings of polio survivors who have been appropriately diagnosed with post-polio syndrome, and those of survivors who are not experiencing symptoms, are not significantly different."

WHAT IS THE VALUE OF AN EMG STUDY?

For those who have had paralytic polio, an EMG study will detect evidence of the prior effects of polio. This will also be true of those who had initial paralysis or weakness and experienced complete clinical recovery. The apparently complete recovery that occurs in those instances, and partial recovery that occurred in those with greater involvement, resulted primarily from a process that has been termed collateral reinnervation or "sprouting." After the acute episode of poliomyelitis, various areas of muscle are "orphaned" of nerve supply as a result of the motor nerve cells that did not survive the viral attack.

Depending on the relative number of motor nerves surviving, these surviving motor units (in the areas of their terminal sprouts) send out sprouts to the orphaned muscle tissue. As a result, much larger than normal motor units are formed.

This process which occurs months after recovery from acute polio results in functional improvement for the polio survivor. Therefore, an EMG study of an individual who had paralytic polio will show much larger than normal motor units. Characteristically, these motor units also will be polyphasic. This finding in polio survivors is termed chronic polyneuropathy. These findings reflect only a past pathology and do not indicate that anything is currently active.

A question that has been asked by many polio survivors is whether an EMG can detect the presence of post-polio syndrome. A straightforward answer to this question simply is that an EMG is of no value whatsoever in detecting post-polio syndrome. Well-founded research studies have established that EMG findings of polio survivors who have been appropriately diagnosed with post-polio syndrome, and those of survivors who are not experiencing symptoms, are not significantly different. It is well established among medical practitioners experienced in managing post-polio patients that the diagnosis of post-polio syndrome is a clinical diagnosis. No objective test is available that can reliably and specifically denote the presence of post-polio syndrome. The diagnosis is made only after well-established clinical criteria have been met, and other possible medical conditions that could also cause symptoms of progressive fatigue, weakness, and pain have been excluded.

PAUL E. PEACH, MD, has written numerous articles relating to post-polio issues including a chapter entitled "Late Effects of Poliomyelitis in Clinical Aspects of Rehabilitation Medicine," has published original research, and has presented at many post-polio conferences.

Dr. Peach has recently established the Palmyra Post-Polio Clinic in Albany, Georgia, which provides comprehensive services to polio survivors, and previously served as medical director at Warm Springs. He may be reached at Rehab Associates of South Georgia, Inc., 810 Thirteenth Avenue, Suite 105, Albany, Georgia 31701 (912/434-2551).

If an EMG is of no value in diagnosing post-polio syndrome, then under what circumstances would performing an EMG be justified on an individual who is being evaluated for post-polio syndrome? In the post-polio clinics I have developed, I have never used EMG studies as a screening test, but rather, utilize them with a specific purpose in mind, and only to the specific limbs which may yield maximum diagnostic benefit. The reasons for this are twofold: the EMG-NCS is not an inexpensive test, and the majority of polio survivors will endure some degree of discomfort from these procedures.

I will recommend an EMG in two situations.

Generally, it is preferable to have medical records available to confirm a history of paralytic poliomyelitis. However, this frequently is not feasible. If a person gives a history compatible with acute poliomyelitis, and he or she presents with obvious atrophic paralysis with complete sensory preservation, a history of poliomyelitis is supported, and an EMG is unnecessary. If no residual paralysis is clinically apparent, however, then an EMG is useful to confirm the presence of chronic polyneuropathy (or earlier acute poliomyelitis as evidenced by large motor units).

Occasionally, someone is seen who had been misdiagnosed with poliomyelitis. If, for example, someone has spastic paralysis rather than flaccid paralysis (as seen in polio), or if sensory impairment is present, this is not consistent with a history of poliomyelitis and an EMG is helpful in determining the existence of another disorder.

Another situation where an EMG is appropriate is when, during the clinical evaluation, there is reason to suspect the coexistence of another disorder other than post-polio syndrome or chronic poliomyelitis. For example, carpal tunnel syndrome is much more common among crutch walkers than the general population. In persons with diabetes mellitus, for example, fatigue, and often sensory impairment, may also be present. An EMG-NCS is very useful in confirming the presence of these as well as other non-polio related disorders. Sometimes follow-up EMGs at a reasonable interval can be useful in monitoring response to clinical interventions, or, in some cases, confirming the progress of a disease process such as neuropathy of diabetes, carpal tunnel syndrome, or radiculopathy (a "pinched" nerve).

In summary, the EMG-NCS is a diagnostic study that can be very useful during the evaluation and clinical management of post-polio survivors. It does, however, as with any other diagnostic test, have its limitations. When utilized appropriately, it can be of very material assistance to the clinician in the evaluation and management of polio survivors. ❧