

An Introduction to Electrodiagnostic Studies

Electrodiagnostic Studies are helpful in evaluating common symptoms such as pain, numbness, tingling or weakness, often in the neck, lower back or extremities. In contrast to imaging studies such as MRIs, CT scans and x-rays which produce “pictures” in search of abnormal anatomy, Electrodiagnostic Studies are physiological tests of nerve and muscle function which can assist in identification of nerve compression, injury or disease. In the Worker’s Compensation arena these studies are commonly used in cases of suspected peripheral nerve compression (such as carpal tunnel syndrome) or in compression of nerve roots in the neck or lower back resulting in pain and extremity symptoms.

Electrodiagnostic Studies are commonly called EMGs, but usually consists of two different types of testing procedures; nerve conduction studies (NCS) and electromyography (EMG). A typical Electrodiagnostic Study (EDS) will usually consist of several nerve conduction studies, both motor and sensory, and a needle EMG study of several muscles.

- **Nerve Conduction Studies (NCS)** are performed by a physician or technician by stimulating a nerve with an electrical stimulus through the skin (usually in an extremity) and recording electrical responses either from a muscle (testing motor function) or from the same nerve at a different site (testing sensory function). These wave forms can be recorded. By analyzing the size and appearance of the various wave forms and comparing recordings from different stimulation locations a physician can determine the speed of electrical transmission along various segments of the nerve being tested and determine if there is a specific location of nerve injury and the severity of that injury.
- **Electromyography (EMG)** consists of inserting a small sterile needle electrode through the skin into various muscles and observing wave forms on a screen while listening to sounds generated by these wave forms. If the motor nerve fibers supplying the muscle being tested have been seriously injured, the muscle will produce abnormal electrical signals which can be detected. By determining which muscles contain abnormal activity and applying anatomical knowledge of nerve supply to those muscles, the location and severity of nerve injury can be determined. This portion of the study should only be performed by a specially trained physician (usually a neurologist or physiatrist) because the interpretation of the electrical activity is performed in real time and is dependent on slight movements of the needle electrode by the physician. Distinguishing between abnormal and normal muscle electrical activity requires extensive training and is very much both art and science.

If enough nerve compression or other type of nerve injury is present, the combination of these two types of procedures has a high probability of determining both the location and the severity of nerve pathology. This information is valuable in assisting with treatment planning and is often is very important in determining whether surgical treatment is advisable. In some cases, such as neck or back injuries, it is helpful to correlate imaging studies such as MRI with EDS and physical examination findings in order to determine if abnormalities seen of the imaging studies are really the cause of symptoms or incidental findings.

In the next newsletter I will discuss some of the pitfalls in performing and interpreting these important studies and discuss who should be (and should not be) performing these types of studies.

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