Electromyography (EMG) and Nerve Conduction Studies (NCS)

EMG and Nerve Conduction Studies
Electromyography, or EMG, involves testing the electrical activity of muscles. This is a very sensitive test and can be used to identify general disorders of nerves and muscles and, when multiple muscles are studied, allows the physician to localize a problem to a specific anatomic point. EMG testing is often performed with another test, a nerve conduction study (NCS) which measures how well signals travel along a nerve.

Why are these tests performed?
EMG and NCS, also called electrodiagnostic testing, might be considered if a patient has any of the following symptoms: numbness or tingling, weakness, muscle pain, muscle twitching, double vision, droopy eyelids, among other concerns.

How to prepare for the test?
No special preparation is usually necessary for the EMG/NCS. To ensure accurate readings, the patient should avoid using any creams or lotions the day of the test and make sure his or her skin is clean. Testing usually takes one to two hours. There are no restrictions on activity before or after the testing. Although the testing can be uncomfortable, there are no lasting effects.

Nerve Conduction Study (NCS)
Nerve conduction studies look at the size and speed of electrical signals as they travel through a nerve and are performed to help find the cause of abnormal nerve function.

How is the test performed?
A hand-held device delivers electric pulses to the nerve at different sites along its path. The resulting electrical activity is recorded by surface electrodes (similar to that used for EEG or EKG) placed on the skin at different places along the nerve path. The distance between the electrodes and the time the pulses take to travel between them are used to calculate the nerve conduction velocity. Each nerve tested will require multiple pulses to provide reliable results. This test is then repeated on other nerves with the final number dependent on the type of problem being evaluated.

How will the test feel?
The small electrical pulses cause a short, mild tingling feeling similar to a static charge. This can sometimes be uncomfortable but lasts less than a second apiece.

What are the risks?
There are essentially no risks for NCS.

Electromyography (EMG)
How is the test performed?
Unlike nerve conduction studies, this test requires that a needle electrode be inserted through the skin into each muscle to be tested as it detects much smaller changes in electrical activity. The electrical activity detected by this electrode is relayed to a
recording instrument and displayed on a screen. It may also be heard through a speaker or with headphones.

How will the test feel?
The needle insertion into the muscle is similar in principle to an intramuscular injection or vaccination, but nothing is injected. The needle electrode does not have a hollow core and is therefore smaller, but there is usually some mild discomfort when the electrode is inserted into the relaxed muscle under the skin. Unfortunately, topical or local anesthetics do not reach the muscle and cannot alleviate this discomfort.

After the electrode is placed, the activity of the muscle at rest and when contracted is recorded. This can be uncomfortable and the patient may feel muscle soreness at the site of the needle electrode during the test. After the test, the muscles studied may feel tender for a short time afterwards. Cold compresses during the first 4-6 hours and acetaminophen (ie Tylenol) may be useful in reducing musculoskeletal soreness.

What are the risks?
Risks with an EMG are minimal. There may be some bleeding at the insertion sites. Without proper care, the electrode sites may become infected.

Special precautions
Patients who have a cardiac pacemaker, implantable defibrillator device, transcutaneous nerve stimulator (TENS), a bleeding disorder, a skin infection, or are on blood thinners (anticoagulation) such as warfarin should alert their examiner prior to the study. Patients who are taking mestinon (pyridostigmine) should also inform the examiner before taking the test, as they may need to discontinue this medication temporarily. On the testing day, patients should avoid using skin lotions or creams and ensure that their skin is clean.

Results
When the examination is complete, the examiner will analyze the results and report them to the referring physician. Some findings require extensive analysis and cannot be immediately reported to the patient on the day of the procedure.