TEST

Electromyography

Electromyography records electrical activity in selected muscles to assess muscle and nerve function.

WHAT IT MEASURES
Electrical activity in selected muscles at rest and during movement

SAMPLE
None; signals recorded through a fine needle electrode

FASTING NEEDED?
No, unless your clinic gives special instructions

HOW LONG IT TAKES
Usually 30 to 60 minutes

RESULTS IN
Often days; timing varies by clinic or laboratory

USED FOR
Diagnosing and monitoring muscle, nerve, and nerve-root disorders

MAIN LIMITATION
Sampling and timing can miss patchy or early abnormalities

Overview

Electromyography, usually shortened to EMG, records electrical activity inside selected muscles. It can show whether a muscle and the nerves controlling it are working as expected.

A clinician places a fine needle electrode through the skin into a muscle. The needle records signals while the muscle is relaxed and while you tighten it. It does not inject medicine or deliver an electrical shock.

EMG is often performed with nerve conduction studies, which use small electrical pulses on the skin to measure how quickly and strongly nerves carry signals. The tests are related but assess different parts of the nerve-and-muscle system.

Why the test is ordered

EMG can investigate symptoms that may come from a muscle, nerve, nerve root, or the connection between a nerve and muscle. Reasons for testing include:

EMG is not usually a general screening test. The clinician selects muscles according to your symptoms, examination, and the question being investigated.

- Muscle weakness, wasting, twitching, or persistent cramps
- Numbness, tingling, or certain patterns of limb pain
- A suspected trapped or injured nerve
- Possible nerve-root irritation from the neck or lower back
- A suspected muscle or neuromuscular junction disorder
- Monitoring a known nerve or muscle condition

Who should have the test

You may be offered EMG when your symptoms and examination suggest a problem involving muscles or their nerves. A neurologist, rehabilitation specialist, or another clinician assessing nerve and muscle symptoms usually arranges it.

EMG is not useful for every type of pain, weakness, or numbness. Conditions affecting the brain, spinal cord, joints, or very small sensory nerve fibres may require other tests.

Tell the testing team beforehand if you:

These factors do not always prevent testing, but they may affect which muscles are examined or what precautions are needed.

- Take blood-thinning or antiplatelet medicine
- Have a bleeding disorder
- Have a pacemaker, defibrillator, or other implanted electrical device
- Have significant swelling, infection, or broken skin near the testing area
- Are pregnant or could be pregnant

How to prepare

You can usually eat and drink normally; fasting is not generally required.

Bathe or shower before the appointment. Do not apply lotion, oil, or cream to the limbs being tested because these can interfere with skin electrodes used for nerve conduction studies.

Wear loose clothing that allows access to the affected area. You may need to change into a gown.

Bring an up-to-date medicine list. Do not stop blood thinners like warfarin or apixaban , muscle medicines, or other prescribed treatments unless the clinician responsible for your care specifically tells you to.

Tell the team about previous surgery, significant injuries, or botulinum toxin injections in the area. Mention if you are worried about needles or tend to faint during procedures.

What happens during the test

The clinician reviews your symptoms and examines the relevant limbs before deciding which nerves and muscles to test. The plan may change according to the findings.

For nerve conduction studies, recording pads are placed on the skin and brief electrical pulses are applied over a nerve. You may feel quick tapping or tingling, and a nearby muscle may twitch.

For needle EMG, the skin is cleaned and a thin, sterile needle electrode is inserted into one muscle at a time. You will be asked to relax and then gently tighten the muscle. The needle may be repositioned or moved to other muscles. Crackling sounds from the equipment represent electrical activity and do not mean tissue is being damaged.

The appointment usually takes 30 to 60 minutes, although complex testing may take longer.

Understanding your results

EMG results are based on signal patterns rather than one number. The clinician assesses electrical activity at rest and the size, shape, and recruitment of signals during muscle contraction. Recruitment describes how additional muscle fibres are brought into use as effort increases.

An abnormal pattern may suggest a problem involving:

EMG usually cannot identify the cause by itself. Results are interpreted with your symptoms, examination, nerve conduction findings, imaging, and blood tests.

There is no single universal normal range. Interpretation can vary with the laboratory, equipment, age, body size, limb temperature, medicines, pregnancy status, and clinical context.

- The muscle
- A peripheral nerve
- A spinal nerve root

- The connection between a nerve and muscle
- An older injury rather than an active process

What affects the results

Timing matters. Some EMG changes take time to appear after a nerve injury, so early testing may miss an abnormality. Older injuries can leave electrical changes after symptoms improve.

Only selected muscles are sampled. A patchy condition may be missed if the affected muscle or part of a muscle is not examined.

Other influences include:

Age and height affect some nerve conduction measurements. Pregnancy-related swelling can also affect nerves and interpretation. A recent blood transfusion does not usually alter EMG signals.

- Cold limbs, which can slow nerve conduction
- Swelling or tissue between a nerve and skin electrode
- Difficulty fully relaxing or activating a muscle
- Previous surgery, trauma, or scarring
- Recent botulinum toxin injections
- Medicines that alter nerve-to-muscle signalling
- Strenuous exercise causing pain or fatigue
- Electrical interference or differences in electrode placement

Accuracy and limitations

Accuracy varies by condition, timing, severity, and the muscles tested. There is no single percentage describing how often EMG is correct.

A normal result does not exclude every nerve or muscle condition. EMG may miss an early, mild, intermittent, or patchy problem. It may also be normal in disorders limited to the brain or spinal cord and in some small sensory nerve fibre conditions.

Old injuries, age-related changes, or minor findings may appear abnormal without explaining current symptoms. The report must therefore be matched to the location and pattern of symptoms.

Other tests may answer different questions. MRI can show structural pressure on nerves or spinal roots. Blood or genetic tests may identify a cause. Skin biopsy or autonomic testing may assess small-fibre nerve problems. Repetitive nerve stimulation or single-fibre EMG may help assess nerve-to-muscle transmission disorders.

Risks and complications

Electrical pulses used for nerve conduction studies can be uncomfortable, but the sensation is brief.

Needle EMG may cause temporary soreness, a small bruise, or minor bleeding, especially if you take blood-thinning medicine. Infection is rare because sterile, single-use needles are used.

Testing deep muscles near the chest carries a very small risk of air entering the space around a lung. The clinician considers this risk when selecting muscles.

What happens next

The clinician may discuss preliminary findings during the appointment. A full report is often sent to the referring clinician within several days, although timing varies.

Follow-up may include reviewing the report, comparing it with imaging or blood tests, or arranging another test. Repeat EMG may be considered if the first test occurred soon after an injury or if symptoms change.

Mild soreness or bruising usually settles without treatment. Seek prompt medical advice for worsening redness, warmth, swelling, drainage, fever, or bleeding that does not stop.

Call emergency services for severe breathing difficulty or sudden chest pain, especially if muscles near the chest were tested. These complications are very uncommon.

Common questions

Can I drink coffee before an EMG?

Usually, yes. Follow any different instructions from your clinic.

Does the time of day matter?

Not for most tests. Tell the clinic if your weakness changes noticeably during the day.

Can I exercise beforehand?

Normal activity is usually fine. Avoid unusually strenuous exercise immediately beforehand if it makes your muscles sore or exhausted.

Does an EMG hurt?

Electrical pulses feel like brief taps or shocks. The needle can feel sharp, and tightening the muscle may be uncomfortable. You can ask for a pause.

Can I drive home afterwards?

Most people can drive and resume normal activities. Arrange help if pain, weakness, anxiety, or another medical issue could make driving difficult.

Can I take my usual medicines?

Usually, yes. Bring a medicine list and mention blood thinners, botulinum toxin injections, and medicines affecting muscle function. Do not stop prescribed medicine unless instructed.

Sources

- MedlinePlus: Electromyography and nerve conduction studies , U.S. National Library of Medicine
- NHS: Electromyography , National Health Service
- Mayo Clinic: Electromyography , overview of preparation, procedure, risks, and results
- London ZN. Safety and pain in electrodiagnostic studies , Muscle & Nerve , 2017;55(2):149-159