

HKSH Neurology Centre

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Consultation by Appointment



Neurophysiology Service



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Nerve Conduction Study (NCS) and Electromyography (EMG)

Nerves control the muscles in the body by electrical signals and also to answer sensation from the peripheral sensory organs. A nerve conduction study (NCS) measures the velocity of electrical impulses travelling along a nerve and the amplitude of the motor and sensory responses. The test can help the doctor to locate and characterise any damage to the nerves that lead away from the brain and spinal cord, the smaller nerves that branch out from those nerves as well as the neuromuscular junctions. If any nerve is trapped, damaged or diseased, then these signals will become slow or small.

An electromyography (EMG) measures the electrical activity of muscles at rest and during contraction. The doctor will decide after a NCS whether or not an EMG is also required to obtain additional diagnostic information. During this part of the testing, no electrical stimulation is delivered through the needle and nothing is injected through the needle tip. You can think of the needle as being similar to a microphone. It is only a recording device. The needle is attached via a cable to a computer which allows the doctor to both hear and see what your muscle is doing both at rest and with movement.

The tests are performed:

- To assess nerve damage following an injury
- To check for “trapped” nerves, e.g. carpal tunnel syndrome
- To check for peripheral neuropathy
- To check for damage to nerves caused by medical conditions such as diabetic neuropathy
- To check for inflammatory conditions affecting the nerves, e.g. Guillain-Barré syndrome

Procedure

NCS is performed by placing electrodes on your face, upper or lower limb. The stimulating electrode will deliver a small amount of current to the nerves and the response will be measured. You may feel repeated, sharp tapping sensation over the examined part during the procedure as stimulation is performed on a number of different nerves by your doctor. The stimulating electrical impulse would not do harm to the body, as it is at a low level acceptable for testing.

During EMG, a fine needle electrode is put into several muscles to record the electrical activity. You may feel a mild pinprick sensation when the needle is being placed into the muscle. After insertion of an electrode, you may be asked to contract the muscle, such as lifting or bending the limb. Mild pinprick sensation may be felt during the procedure.

After the test

While one may feel uncomfortable during the test or experience a slight increase in the usual symptoms for a few minutes afterwards, NCS and EMG cause no harm to patients.

EMG is a safe diagnostic test. A small number of patients may experience light bleeding at puncture sites. The bleeding would be stopped by applying light pressure on the site for several minutes.

Test results are not immediately available after test completion. The results must be analysed and interpreted before being sent to the ordering doctor.



Somatosensory Evoked Potential (SSEP)

Somatosensory evoked potential (SSEP) is an evoked potential induced by a physical stimulus (usually a small electric pulse). A SSEP commonly involves electrical stimulation of the median nerve at the wrist, or the posterior tibial nerve at the ankle to test the pathway of the sensory nerves to the sensory areas of the brain. Based on the SSEP, doctors can determine the time it takes for nerve fibres to relay a stimulus from the point of stimulation, i.e. wrist or ankle, to a detection site on the scalp, neck or back and get an idea of how well the sensory nerves are working. A SSEP test can provide information about the presence and extent of a particular disease or injury affecting the somatosensory nerve system. It can be used to monitor one's neurological condition and thus track disease progression.

The test is performed:

- To diagnose multiple sclerosis (MS) – damage to nerve fibres in the body is a common feature of MS. SSEP analysis can help confirm and localise the affected areas
- To check for trauma – any physical injuries affecting the nerves and nerve pathways of the somatosensory system
- To detect tumours – they can affect the nerves involved in relaying signals of the somatosensory system

Procedure

The skin is first cleaned with scrubbing cream and an alcohol-based cleansing cloth before the test. Some detection electrodes will be glued to particular spots on your scalp, neck, back and limbs. A small generator is used to create tiny electrical impulses to stimulate the nerves in the wrist or the ankle. Only small electrical impulses are used as the stimulus. While the impulses are usually not painful, they may cause your thumb or toe to twitch a little, which is normal.

While the SSEP test is a safe and non-invasive procedure with no side effects, minor skin irritation may occur during skin preparation.

Visual Evoked Potential (VEP)

A visual evoked potential (VEP) is an evoked potential caused by a visual stimulus, such as an alternating checkerboard pattern on a computer screen. Responses are recorded from electrodes that are placed on the back of your head. These responses usually originate from the occipital cortex, the area of the brain involved in receiving and interpreting visual signals.

The test is performed:

- To detect optic nerve problems. As the optic nerve helps transfer signals enabling us to see, doctors can study the way your visual system responds to light by testing the nerve

Your doctor may order a VEP test if you experience any change in vision attributable to problems along the pathways of certain nerves. Some of these symptoms may include:

- Loss of vision
- Eye pain
- Double vision
- Blurred vision
- Flashing lights
- Alterations in colour vision

Procedure

First you need to undergo a visual acuity test. In preparation for a VEP test, nurses will clean your skin with scrubbing cream and an alcohol-based cleansing cloth. With small electrodes (sticky patches with wires attached) placed on your scalp and back of the head, you will be asked to look at various visual patterns on a monitor screen and focus on the centre spot. Readings will be recorded through the wires at the back of your head.

While the VEP test is a safe and non-invasive procedure with no side effects, minor skin irritation may occur during skin preparation.

Preparation

- If you have a cardiac pacemaker/implanted defibrillator/deep brain stimulator, are currently taking blood thinners or have a history of bleeding problems, please inform us when making appointment
- Certain medicines such as anticholinesterase inhibitors (i.e. Mestinon) can alter the test results. Please discuss with your doctor before scheduling the test. Some medications may be withheld on the day of examination
- Please allow at least 1.5 hours for NCS +/- EMG or VEP test and 2 to 3 hours for SSEP test. Test duration may vary with the patient's condition
- No fasting is required before neurophysiology test
- Wear loose, comfortable clothes
- Do not wear jewellery
- Do not apply any lotion or makeup on the day of examination for they can interfere with the test

For VEP test:

- Wash hair thoroughly to remove oil on scalp before attending the appointment. Do not apply any hair product or spray
- Get plenty of sleep the night before VEP test
- Bring with you your glasses for VEP test

Please feel free to contact us for any enquiry.

References:

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<https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/electromyography-emg>

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<https://www.myvmc.com/investigations/visual-evoked-potential-vep/>