

Examinations Performed in the Neurophysiology Laboratory

1) Full Field Visual Evoked Potentials

This test is used to examine the function of the optic nerve, which carries messages from the eye to the brain. It is a painless procedure. Electrodes are placed on the scalp. The patient is then asked to look at a screen, which has black and white squares that move. The patient is asked to focus on the center of the screen. Each eye is tested separately, with the eye not being examined covered with a square piece of gauze. Each eye is examined at least twice. The examination takes about 30 minutes to complete. With young children, cartoon characters are placed in front of the monitor to draw their attention.

2) Half-field Visual Evoked Potentials

This test is similar to test (1) above. However, it specifically examines the part of the optic pathway that is called the optic tract that exists towards the back of the head, and is responsible for looking at specific parts of the visual field, such as the left or right side. Recording is similar, but the screen has black and squares on one half of the screen. This examination takes a little longer than (1) above as it is more detailed, about one hour.

3) Flash Visual Evoked Potentials

This test is used to rule out blindness. It is a painless procedure. It is used in infants and young children that cannot cooperate for test (1) above. A flashing light is presented to each eye separately using special goggles. Depending on the results, the examiner can decide whether the patient can receive light signals. The examination takes about 30 minutes to complete.

4) Pattern Electroretinography

This test is used to examine the function of the retina of the eye, the part of the eye that converts light into electrical signals that the brain can understand, and leads to the sensation of vision. Electrodes are placed on the scalp and corneal fiber electrodes are used. The patient is then asked to look at a screen, which has black and white squares that move. The patient is asked to focus on the center of the screen. Both eyes are tested together. The examination takes about 30 minutes to complete.

Flash Electroretinography

This test is used to examine the function of the retina of the eye, the part of the eye that converts light into electrical signals that the brain can understand, and leads to the sensation of vision. Specifically the cells of the retina responsible for vision in the dark and light respectively are tested. This test involves looking into a specialized dome with a flashing white light. Mydriatic drops (for pupil dilation) and corneal fiber electrodes are used. The test will be carried out in two parts: the first part will take place with the lights on, and the second part with the lights off. Before the second part, you will be asked to sit in a dark room for 20 minutes in order for your eyes to adapt to the dark. Due to the use of mydriatic drops, you will need to have someone accompany you home. The examination takes about one and a half hours to complete.

5) Brainstem Auditory Evoked Potentials

This test is used to examine the function of the cochlear nerve of the ear, the nerve responsible for the sensation of hearing. Because this examination is able to record the path of the signals relating to hearing up to a specific part of the brain, this examination is also used to monitor function in a part of the brain called the brainstem, located at the base of the brain. It is a painless procedure. Electrodes are placed on the scalp and ears. Earphones are placed over the ears, and the patient listens to certain sounds. The examination takes about 30 minutes to complete.

6) Threshold Latency Series

This test is similar to (6) above in its technique, but specifically is used to determine hearing threshold, the intensity level where the patient can barely hear the clicks. It is a painless procedure. Electrodes are placed on the scalp and ears. Earphones are placed over the ears, and the patient listens to certain sounds. The intensity of the sound is decreased gradually. This examination is useful for young children that cannot cooperate for standard audiometry examinations. The examination takes about 45 minutes to complete.

7) Myogenic Vestibular Evoked Potentials

This test is used to examine the vestibular nerve of the ear, the nerve that is responsible for the sensation of balance. It is a painless procedure. Electrodes are placed on the neck. Earphones are placed over the ears, and the patient listens to certain sounds. While the patient is lying down s/he is asked to lift her/his head slightly from the pillow. The examination takes about 30 minutes to complete.

8) Somatosensory Evoked Potentials

This test is used to test the part of the spinal cord and brain that is related to the sensation of touch, pressure and vibration sense, more specifically the back region of the spinal cord and somatosensory cortex (the part of the brain that receives and gives messages for sense and movement). Electrodes are placed on the scalp, shoulder area, and back. Using a low intensity electrical stimulus, specific nerves are stimulated either at the wrist or ankle. The test takes about 30 minutes to perform.

9) Dermatomal Somatosensory Evoked Potentials

Dermatomes are related to SSEPs, where electrical stimulus is measured at the surface of the scalp. The main difference between SSEPs and dermatomal recordings is that a skin surface is stimulated at a lower electrical current than what would be used to stimulate a nerve. The skin surface that is stimulated is innervated by a particular nerve root from the spine. Dermatomes are useful because they are specific for a particular nerve root whereas SSEPs are used for measuring general upper and lower body nerve activity and velocity. The test takes about 30 minutes to perform.

10) Motor Evoked Potentials

This test is used to examine the motor pathways of the central nervous system, the part that is involved in ordering and controlling muscle movements. Electrodes are placed over the muscle we wish to examine. A magnet is then used as the stimulator which is placed over the scalp and over the neck or back. The test takes 30 minutes to perform, depending on the number limbs to be examined.

11) Routine Electroencephalography

This test is used to record the general function of the brain in real time. The test is not painful. Electrodes are placed on the scalp at about 25 specific places. The patient then lies down and 20 minutes of recording is obtained. The patient may be asked during the recording to perform three minutes of heavy breathing, and the patient may also be asked to look at some flashing white light at different frequencies. The total test time is approximately 45 minutes - 1hour.

12) Long-Term Monitoring (VEEG)

This test is a modification of test (10) above, with simultaneous video recording. Recording is performed long-term in the neurology ward, from several days to a few weeks depending on the information that is needed.

13) Polysomnography

This test is used to examine sleep. Surface electrodes are used to record electroencephalography (brain function), muscle activity, airflow through the nose and mouth, movements of the chest and belly during breathing, electrocardiography, blood oxygen levels and body position. The study is performed overnight in the neurology ward. Before the exam, the patient fills in a sleep questionnaire, which documents the patient's sleep habits and symptoms, such as snoring and waking up in the middle of the night.

14) Multiple Sleep Latency Test

This test is similar to (12) above, but is performed during the day, and the patient is allowed to take 5 naps lasting 20 minutes each, with about 1.5 hours in-between. It is used to investigate excessive daytime sleepiness.

15) Vagus Nerve Stimulation

Vagus Nerve Stimulation (VNS) is used as an adjunctive therapy in reducing the frequency of seizures that are refractory to anti-epileptic medications. The patient is implanted with the VNS device, which delivers electrical signals to the brain via the vagus nerve. Programming of the device and monitoring of the patient takes place at CING.

16) Intra-Operative Monitoring (IOM)

Intra-operative monitoring is a service that is provided by the Neurophysiology department. Intra-operative monitoring has been done in brain surgeries for epilepsy. Intra-operative monitoring is done for vagal nerve stimulator surgery routinely.