UT Health Austin Pediatric Neurosciences
at Dell Children's
Austin, TX 78723

# Common Neurodiagnostic Testing

## Magnetic Resonance Imaging (MRI)

MRI uses magnetic fields (rather than radiation) to create detailed pictures of the structures inside the body, such as the brain. MRIs show better details of brain structure than CT scans. MRIs of the brain can look for general brain structure abnormalities, brain tumors, aneurysms, bleeding in the brain, nerve injury, infections or inflammation of the brain, and strokes. Sedation is often necessary, as the child must hold completely still for about one hour.

## Computed Tomography (CT) Scan

This test uses x-rays to make pictures of structures inside the body, such as the brain. CT scans show general structure abnormalities, aneurysms, brain tumors, bleeding in the brain, nerve injury, infections of the brain, and strokes. A CT scan is much faster than an MRI, typically taking 20 minutes. Sedation can be necessary, and radiation exposure is present with this technique.

## Electroencephalogram (EEG)

An EEG measures and records the electrical activity of the brain. Special sensors are attached to the patient's head with wires that are hooked to a computer. The computer is able to record the brain's electrical activity as wavy lines. These wavy lines are interpreted by a neurologist or epileptologist to identify seizures and diagnose epilepsy.

## Electromyogram (EMG) and Nerve Conduction Study (NCS)

EMG measures the electrical activity of the muscles in the body at rest and during contraction. NCS measures how well and how fast the nerves send electrical signals to one another. These tests are often helpful for diagnosing diseases in patients with numbness, weakness, paralysis, and muscle twitching.

## Sleep Study

This group of tests records what the body and brain do during sleep. This testing is done to find out what may be causing a patient's sleep problems. It can help diagnose problems such as sleep apnea, narcolepsy, insomnia, abnormal body movements during sleep, or problems with sleep stages. A sleep study may be performed with a multiple sleep latency test (MSLT). MSLT detects excessive daytime sleepiness by measuring how quickly you fall asleep. This is used to diagnose narcolepsy and hypersomnolence.

## Muscle Biopsy

For this test, your child's provider removes a small piece of muscle tissue using local numbing medication and sometimes sedation. The muscle sample is then studied to identify possible connective tissue disorders, infections that affect the muscles, metabolic defects of the muscle, and muscular disorders such as muscular dystrophy.

**Reviewed May 2022**
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## Positron Emission Tomography (PET)

A PET scan is an imaging test that looks at how tissues are functioning. A PET scan uses radioactive substances that collect in areas of your body where there are higher levels of chemical activity, which often corresponds to areas of disease. This test is used to evaluate cancers, heart disease, and brain disorders. The images are combined with CT or MRI scans.

## Lumbar Puncture (LP) with or without Opening Pressure (OP)

A LP is a procedure that looks at the cerebrospinal fluid (CSF) by carefully inserting a needle into the spinal canal low in the back. Cerebrospinal fluid is the fluid that surrounds the brain and the spinal cord. An LP is done to look for infections, cancer, bleeding and is often the best fluid sample to test for certain diseases. During an LP the **opening pressure (OP)** may be measured. The OP measures the pressure of the spinal fluid

## Single Photon Emission Computerized Tomography (SPECT)

This is a nuclear imaging test that allows doctors to analyze the function of internal organs, such as the brain. It uses a radioactive substance and a special camera to create 3D pictures that can show which areas of your brain are most active or least active. SPECT scans are particularly helpful for seizure patients who are considering surgery options. A SPECT scan included two separate pictures, an ictal SPECT scan which is completed with a seizure and an interictal SPECT scan which is done without a seizure. You may need a recent MRI for your doctor to evaluate at all the pictures together.

## Functional Magnetic Resonance Imaging (fMRI)

fMRI is a type of MRI that measures brain activity. It works by detecting the changes in blood oxygenation and flow that occur in response to brain activity. fMRI can detect patterns in blood flow and assist in mapping out areas of the brain that are used in certain brain functions including language and movement. It is a very useful technique prior to some brain surgeries.

## WADA (also known as Intracarotid Sodium Amobarbital Procedure)

A Wada test is performed prior to brain surgery, to help the care team know which side of the patient's brain controls language and memory. During a Wada test, each side of the brain is temporarily put to sleep while testing the patient's language and memory to figure out which side is responsible for language and which is better at controlling memory.

## Magnetoencephalography (MEG)

MEG is a noninvasive procedure that uses highly sensitive sensors to detect and record the magnetic fields associated with electrical activity inside the brain. A MEG can precisely locate areas of the brain that are functioning normally versus areas causing seizures. This is a highly detailed diagnostic study which can help surgeons create a map of areas to avoid during surgery to maintain normal language, and motor skills.

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## Transcranial Magnetic Stimulation (TMS)

TMS is a non-invasive brain mapping technology that can identify the exact location of essential brain functions such as those involved in controlling the hands and feet or speech production. It uses electricity to stimulate neural connections that provides information about brain functions.

## Neuropsychological Testing

This is a formal assessment of mood, personality and cognitive abilities (i.e., thinking, understanding, learning, attention and memory). It can aid in diagnosis, guide treatment options, and provide information on how injury or disease has affected brain function.

## Audiology Testing

An audiologist measures the child's ability to hear sounds. Evaluation of hearing is important in children with learning problems and developmental and speech delays.

## Ophthalmology Evaluation

A series of tests that assess vision and the overall health of your eyes. During the evaluation the ophthalmologist will examine vision and eye muscle function. They may use a medicine to dilate the eyes to look at structures in the back of the eye. Ophthalmology evaluations are particularly helpful for patients with chronic migraine headaches, or visual problems.

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