

KAISER PERMANENTE SAN FRANCISCO

DEPARTMENT OF NEUROLOGY

Office Procedures included:

- Botulinum Toxin Injections
- Electroencephalogram (EEG)
- Electromyography (EMG) and Nerve Condition Studies (NCS)
- Lumbar Puncture (“Spinal Tap”)

Botulinum Toxin Injections

TREATMENT WITH BOTULINUM TOXINS TYPES A AND B

Patient Information

Botulinum toxin is a poison produced by certain kinds of bacteria. Food containing botulinum toxin can cause food poisoning (botulism). Since the 1980s, a purified botulinum toxin has been used as a treatment for various medical conditions that cause muscle spasticity (tightness). The toxin is injected into muscles that are too tight in order to relax the muscles. Botulinum toxin that is used to treat people is made a special way so that very tiny amounts of the toxin are injected into the target muscles. The amount of toxin that is injected is much less than is needed to cause botulism.

How does the botulinum A toxin work?

The way that botulinum toxin works is to interrupt the relay of signals from the nerve to the muscle. Nerve endings produce a chemical message (acetylcholine) that travels from the end of the nerve (end terminal) to the muscle. The chemical message causes the muscle to contract. However when botulinum toxin is injected near the nerves, the chemical message usually sent from the nerves to the muscles to contract cannot be delivered, and the muscle relaxes. In this way, injections of the toxin can be used to reduce muscle contractions (spasms). For example, in the forehead, muscles contracting can cause forehead lines (wrinkles). When these tight muscles are injected with toxin, these muscles relax and the forehead lines disappear. Similarly, patients who have severe muscle spasms and tightness of their neck and limb muscles receive toxin injections to relax the tight muscles, resulting in improved function and reduced discomfort.

How long do the effects of the medicine injections last?

Usually, the muscle weakening or relaxation produced by the toxin lasts from 3 to 6 months. The effects of the drug eventually "wear off" because the nerves that are affected by the toxin injections eventually develop new end terminals. When this happens, the new terminals are once again able to send messages to the muscles to contract. For this reason, the effects of the toxin are not permanent.

How is the medicine delivered to the muscles?

The toxin comes in a powdered form. Before use, it is dissolved in salt water (saline) before it is injected. The medicine is injected directly into the muscle(s) that are tight

using a needle and a syringe. It would be difficult to inject enough of the toxin into any one patient to cause botulism due to the way that the drug is supplied. Some patients receive the injections as part of a clinic visit.

What are the side effects of the botulinum toxin injection?

The most common side effects include soreness of the injected muscle and/or weakness of the injected muscle. A degree of muscle weakness that is greater than that which was intended. No patients ever reported whole body problems (side effects) after receiving an injection of toxin. This is due to the fact that the amounts of toxin that are injected are low compared to the amount of toxin needed to cause botulism. In this way, the use of toxin injections avoids the side effects that affect the entire body.

What type of individuals should not be given injections of botulinum toxin?

Patients who are pregnant or breastfeeding should not receive toxin injections. In addition, patients who have certain neurological diseases that interfere with the transmission of signals from nerve endings to muscles should not receive toxin injections.

Electroencephalogram (EEG)

Overview

An electroencephalogram, or EEG, records the electrical activity generated by your brain cells. The procedure is not painful. Most of the time, we order EEGs to look for seizures, which create electrical abnormalities in the brain. We also use EEGs to assess other issues, including head injuries and changes in the brain that may be causing problems with cognitive function.

Ideally, we conduct an EEG during 3 different stages of consciousness: when you are awake, drowsy, and asleep.

How It Is Performed

Preparing for the test

Deprive yourself of sleep the night before the test. If possible, sleep for only 4 or 5 hours. Lack of sleep increases the chance that seizure activity will show up during the test. You may fall asleep during the test, and some seizure patterns are much more visible during sleep. Don't consume anything containing caffeine within 6 hours of the test.

Before the test

We perform EEGs in our medical offices. Most tests take around 45 minutes.

We record the electrical activity of the brain with the help of small metallic discs called electrodes that we attach to your scalp.

Before the test, we measure your scalp to determine where to place the electrodes to ensure an accurate reading. We then ask you to lie down on an exam table. We will prepare you for the procedure in the following way:

- We apply gel or paste to your scalp where we will place the electrodes. This helps the electrodes stay in place.
- We attach the electrodes to your scalp.
- Wires from a recording machine are connected to the electrodes.
- We test the machine and make adjustments to ensure that all of the wires are operating properly.

Waking EEG

When we perform the EEG while you are awake, we will turn on the recording machine and check on you to make sure that your eyes are open and that you are fully awake. We will ask you to breathe rapidly for a minimum of 3 minutes. Hyperventilation causes predictable changes in the brain wave activity that we want to study as part of the test.

We will also place flashing lights in front of your face. The rate at which the lights flash varies from 3 to 34 times per second. We can record your brain's responses to these flashes, which helps us better understand its functioning.

Drowsy and sleeping EEG

We will ask you to get comfortable and try to fall asleep. Ideally, we will continue to record electrical activity as you become drowsy and fall asleep. We continue recording until you are in a deep phase of sleep.

After the test

When the EEG is finished, the technician will gently wake you up and remove all electrodes from the scalp. There will be some residual paste in the scalp afterwards, so you'll need to shampoo your hair when you get home.

Results

It takes about a week to analyze and review the electrical activity recorded during the test. Once I have the results, I will contact you to discuss them and consider the next steps.

Electromyography (EMG) and Nerve Condition Studies (NCS)

Overview

These tests measure electrical activity in your nerves (NCS) and muscles (EMG). The results can tell us if you have a disorder of the peripheral nervous system involving the arms, legs, and head/neck region.

The doctor performing the test will be looking for abnormal electrical activity that can help us find diseases that damage nerves, muscles, or the connections between nerve and muscle. The results of these tests may be useful in identifying causes of weakness and/or loss of sensation.

You may have an NCS or EMG or both, depending on the condition of concern. Your appointment will take between 30 and 60 minutes. These tests will not show brain or

spinal cord diseases.

How It Is Performed

Preparing for the EMG and/or NCS:

- You may shower or bathe normally on the day of the test.
- Please do not use cream or lotion on your skin.
- Wear loose fitting or easily removed clothes. We may ask you to change into a hospital gown, depending on the area of the body to be tested.
- You may take all your regular medications, including pain medications.
- Please tell us if you are taking any blood thinning medications, such as warfarin.
- Please tell us if you have been advised not to have needle sticks in a particular arm or leg for medical reasons.
- Try to relax. We know that calm, relaxed people tend to feel less discomfort during the procedure.

During the NCS portion of the test:

- You will lie on an exam table, and we will attach electrodes to your hands or feet.
- We will apply small electrical shocks along the course of the nerve being tested. We usually test several nerves.
- The results are recorded on a machine attached to the electrodes.
- The electrical shocks are felt only locally. Most people tolerate them well. The shocks have no lasting effects.
- You can have the test even if you have a cardiac pacemaker or defibrillator.

During the EMG portion of the test:

- You will lie on an exam table.
- We insert a small thin needle electrode into several of your muscles. The needle electrode is much smaller in diameter than the needles we use to draw blood or give injections.
- The electrode is attached to a machine that records the muscle's electrical waveforms.
- We will ask you to briefly contract the muscle while the needle is held still. You will not receive any electrical shocks through the needle electrode.

After Your Procedure

- You may have some local discomfort at the needle insertion sites for up to 1-2 days.
- If this occurs, you may apply ice to the affected areas for a few minutes 2-3 times a day. Rarely, some mild pain medication is necessary.

Results

The doctor performing the test(s) will analyze and summarize the test results and send the report to me. I will contact you with the results. This can take several days.

Lumbar Puncture (“Spinal Tap”)

Patient Information

A lumbar puncture involves the removal of a small amount of cerebrospinal fluid (CSF) — the fluid that bathes your brain and spinal cord in nutrients and provides protection — for laboratory analysis. The test also measures the pressure in CSF fluid. A lumbar puncture is used to help diagnose:

- Infections, such as meningitis and encephalitis
- Bleeding around the brain (subarachnoid hemorrhage)
- Certain cancers involving the brain and spinal cord
- Certain inflammatory conditions of the nervous system, such as Multiple Sclerosis and Guillain-Barre Syndrome

The procedure may be performed with patients lying on their side or sitting up, depending on the doctor’s preference. A local anesthetic is injected in an area over your lower spine to reduce discomfort from the procedure. Then a needle is placed into your spinal canal allowing for measurement of the opening pressure and the collection of fluid for analysis. The entire procedure usually takes about 45 minutes. Once the procedure is complete, you'll need to lie flat for 20 minutes to one hour.

Lab technicians check for a number of things when examining spinal fluid, including:

- General appearance: Spinal fluid is normally clear and colorless. If it is cloudy, it may indicate infection or inflammation.
- Protein (total protein and the presence of certain proteins): Elevated levels of protein may indicate infection or another condition.
- White blood cells: Increased numbers of white cells in spinal fluid may indicate infection or inflammation
- Glucose (sugar content)
- Culture: virus, bacteria, fungi
- Polymerase chain reaction: helps identify certain viruses.

The results of these laboratory studies are generally available within 1-2 weeks.