How does chemotherapy cause damage to nerves?
Chemotherapy kills cancer cells, but as a side effect, it damages and kills normal nerve cells. Peripheral nerves are located outside the brain and serve as a communication relay between the brain and the rest of the body. Chemotherapy may affect these peripheral nerves in the hands and feet first. Most often the nerve damage causes a sharp, searing pain similar to “hitting your funny bone”. In rare cases it can even make the hand and feet paralyzed. In some instances, you will need to make a decision with your doctor about the risks of continuing a chemotherapy that is working but causing ongoing damage to your nerves.

The risk of nerve damage is related to the dose of the chemotherapy, the schedule of the chemotherapy, and the total amount of chemotherapy that the patient received.

Certain chemotherapy drugs are more likely to cause nerve damage, including:

- Cisplatin
- Carboplatin
- Oxaliplatin
- Paclitaxel
- Docetaxel
- Vincristine
- Vinorelbine
- Vinblastine
- Ado-trastuzumab emtansine
- Brentuximab vedotin
- Eribulin
- Ixabepilone
- Cabazitaxel
- Bortezomib
- Thalidomide
What are other causes for nerve damage in people with cancer?
In addition to chemotherapy, the tumor and other cancer therapies may cause nerve damage. The tumor can cause nerve damage by growing into a nerve, stretching a nerve, or by secreting proteins that damage nerves. Surgery to diagnose or treat cancer can cause nerve damage by cutting or pulling on a nerve, or if pressure is applied on a nerve during the anesthesia. Radiation therapy can cause damage to the nerves as a long term side effect. Cancer patients have a higher risk of developing infections such as shingles which can also damage a nerve.

What are some common symptoms of nerve damage?
Peripheral neuropathy may cause any of the following problems:
- Tingling, numbness, burning, or weak feeling in your hands or feet
- Searing type pain in the fingers and toes
- Inability to sense hot or cold
- Pain while walking
- Loss of balance or feeling dizzy
- Falls from loss of balance, or falls from weakness

What is the typical course of peripheral neuropathy once it develops?
Chemotherapy circulates throughout the body, but tends to damage those nerves in the hands and feet, because they are the longest nerves. You may develop symptoms at any time after your treatment begins. They tend to start in the fingers and toes and progress to hands and feet, then arms and legs. The symptoms are generally mild at the beginning and slowly progress if treatment is continued.
Peripheral neuropathy is very common as people age, so you may have some before any chemotherapy treatments. Peripheral neuropathy is also common in patients with diabetes. Peripheral neuropathy can get severe enough to affect the ability to use your fingers to perform tasks like picking up a small object from the table, or using your cell phone. It can interfere with balance, and make you prone to falls.

Your doctor can order some tests to tell how severe the neuropathy is, but they will also rely on your reporting of the symptoms of the neuropathy. This is important because each patient has a slightly different reaction to the nerve damage. After stopping the chemotherapy, the nerve damage may get a little worse and then stabilize, or the nerves may heal themselves slowly over months to years. Younger people tend to have more reserve to heal damaged nerves, and their nerves tend to heal quicker and more completely. Tell your doctor or nurse as soon as you notice these symptoms. Discuss your goals with your doctor. For example, how much nerve damage can you tolerate for an increased cure rate from your cancer? How much nerve damage can you tolerate for increase cancer shrinkage?

**What treatments are possible for the symptoms of nerve damage?**

Available treatments for peripheral neuropathy can help to relieve the symptoms of the nerve damage. There are no treatments that prevent nerve damage from chemotherapy or speed healing of damaged nerves over what the body normally does. Usually, once the chemotherapy is stopped, the nerves will slowly heal, but the nerve damage can be permanent for some people. In many cases, the brain adapts to the damaged nerves.
These are the medications that are most commonly used to treat the pain from chemotherapy caused nerve damage:

- **Gabapentin (Neurontin®)** is approved by the FDA to treat seizures and pain caused by nerve damage from shingles. It is often used to treat nerve pain from chemotherapy. It can help with a burning type of pain, but it does not heal the nerves. It generally does not help relieve numbness, nor does it increase coordination or decrease falls. It is usually started on a low dose, 100-300 mg three time per day, and increased as tolerated. If you are taking more than 900 mg of gabapentin per day, you will need to taper off the medication to avoid a withdraw seizure.

- **Pregabalin (Lyrica®)** is approved by the FDA to treat pain caused by nerve damage from diabetes, pain from nerve damage from shingles, and pain from spinal cord injury. Pregabalin may lead to addiction. It is a controlled substance so you need to be supervised closely during the treatment.

- **Duloxetine (Cymbalta®)** is approved by the FDA to treat depression, anxiety, pain from nerve damage from diabetes, fibromyalgia, and chronic musculoskeletal pain.

- **Amitriptyline (Elavil®)** is an antidepressant that can be used to treat pain from damaged nerves.

- **Lidocaine patch** has been approved to treat nerve damage pain from shingles, but it is difficult to use on the hands and feet.

- **Capsaicin** is the active ingredient in chili peppers, and can be bought over the counter, or as a prescription patch. It can relieve some of the burning pain from nerve damage.
Other therapies that may help nerve damage symptoms include:

- Massage
- Stretching and yoga
- Exercise, in particular walking
- Guided imagery, meditation, relaxation
- Acupuncture

**What can I do if I have peripheral neuropathy?**

If you develop nerve damage, follow these steps to prevent falls and other injuries:

- Do not climb on ladders, step stools and chairs. Have others do those jobs.
- Make a clear and lighted path in your house, especially from your bed to the bathroom.
- Move rugs and other small items out of your way, so you won’t trip.
- Put up rails on the walls and in the bathroom.
- Put bathmats in the shower and bathtub.
- If you have trouble with balance, use a cane when you walk.
- Wear supportive shoes that fasten to your feet with laces, Velcro or buckled straps.
- Wear shoes inside and outside your home so you won’t injure your feet. This will also help with balance.
- Wear gloves when you are working outside or in the kitchen.
- Check your feet every day for cuts and blisters. Get treatment for any cuts/blisters that do not heal in a week, or that seem to be getting worse.