

Neuropathic Pain



Neuropathic pain arises from injury to nerves in either the central nervous system (spine or brain) or other parts of the body (peripheral nervous system). The injury may be from a specific incident (an accident, stroke, or amputation, for example), or a disease such as diabetes, a viral infection, or neurodegenerative condition. (1)

Unlike short-term pain that warns of potential harm, neuropathic pain does not serve a protective purpose. In fact, symptoms may not seem related to any reasonable or obvious cause. The area of pain may be diffuse, or limited to a single nerve or several nerves.

Neuropathic Pain Symptoms

The pain is described variously as feeling like a stabbing, burning, electric shock, or a freezing sensation. It may worsen at night.

Other types of nerves may also have sustained damage, producing other symptoms. If there has also been damage to nerves that convey the sense of touch, vibration, and temperature, patients may experience tingling, numbness, or the sense of wearing an invisible glove or sock.

If there is damage to motor nerves, patients may have a lack of coordination, weakness, or cramping. Finally, if the autonomic nerves that regulate internal organ function have also been damaged, patients may experience a reduction in saliva, tears, perspiration, or other organ or gland dysfunction.

Neuropathy Kinds and Causes

More than 100 types of neuropathy have been identified. Approximately 30% of neuropathies are of unknown origin, according to the U.S.-based Neuropathy Association. Roughly another 30% of neuropathies are diabetic neuropathies that develop as a result of high blood sugar levels; up to 30% of diabetics are estimated to have some degree of neuropathic pain. (2)

Other causes of painful neuropathy include:

- Viral infections such as HIV or herpes zoster (the virus that causes shingles); bacterial infections such as leprosy, Lyme disease or botulism
- Trauma or compression of the spine or nerves (including sciatica, radiculopathy, pudendal neuralgia, and carpal tunnel syndrome from repetitive stress injury - RSI)
- Complex regional pain syndrome types I and II (formerly known as reflex sympathetic dystrophy syndrome or RSD)
- Post-surgical conditions such as failed back surgery syndrome
- Amputation leading to phantom limb pain (estimated by the National Institute for Health and Clinical Excellence [NICE] to appear after 30-50% of amputations) (3)
- Tumors

- Stroke
- Neurological disorders such as epilepsy, multiple sclerosis, fibromyalgia or Parkinson's disease
- Autoimmune responses
- Heredity
- Vascular and metabolic disorders
- Nutritional imbalances
- Alcoholism
- Kidney failure
- Cancer treatment
- Toxin exposure

Central Pain Syndromes

While some neuropathies occur because of damage to peripheral nerves and nerve endings, other types of neuropathic pain happen after an injury in the central nervous system. These neuropathic pain conditions that arise in the brain or spine are called central pain syndromes. One example of a central pain syndrome is post-stroke shoulder pain, which is estimated to occur in up to one-third of stroke survivors. (4) Diagnosis of painful peripheral neuropathy may require several steps. An exam will involve taking a complete patient history; checking tendon reflexes, muscle tone, motor function and the sense of touch; collecting urine and blood specimens to screen for metabolic or autoimmune disorders; and tests to determine the nature and extent of nerve damage.

Follow-up tests may include an electroencephalogram (EEG) that records electrical activity of the nervous system; a spinal tap to test for breakdown of myelin; brain scans using computed tomography (CT) and/or magnetic resonance imaging (MRI); nerve conduction velocity testing to see how fast electrical signals move; and electromyography, which measures the electrical impulses of muscles at rest and during contraction. A biopsy may also be ordered to inspect the extent of nerve damage.

Extent of Painful Neuropathies

A study in the Netherlands found that almost 1% of the population has neuropathic pain, which was particularly evident in the middle-aged and elderly population, and 63% more common in women. (5) Meanwhile, a 2006 study in the United Kingdom found that chronic pain of predominantly neuropathic origin was more common than previously thought, and more severe than other types of chronic pain. This study found that a neuropathic cause accounted for some 8% of chronic pain cases. The patients with neuropathic pain were more likely to be slightly older, single, female smokers who were unable to work. (6)

Neuromodulation May Be an Option

In cases in which drugs are ineffective or side effects intolerable, an option for some patients may be use of an implanted electrical stimulator to interrupt pain signals by producing a mild tingling sensation (paresthesia) in the painful area. Neuromodulation for intractable peripheral neuropathic pain may be carried out through spinal cord stimulation or through peripheral nerve stimulation.

Spinal cord stimulation starts with a trial phase. A permanent implant is generally offered to candidates if the temporary implant reduces pain from 50-70% percent. For appropriately screened patients, meanwhile, peripheral nerve stimulators can have an 80% to 90% near-term success rate. (3-5)

In patients who eventually develop a tolerance to neurostimulation, a potential future option is delivery of a pain-relief agent to targeted sites in the body using an intrathecal drug delivery system. For instance, ziconotide, a non-opiate drug now often employed to treat complex regional pain syndrome, has been suggested by specialists as a possibly viable alternative pain-relief agent. (6)

Nerve Damage and Pain

Neuralgia, such as the facial pain syndrome trigeminal neuralgia, falls under the broad category of a pain of neuropathic origin. Neuritis, meanwhile, is a nerve pain that may exhibit similar symptoms to neuropathy and neuralgia, although its cause is inflammation of a nerve or group of nerves, which may also be accompanied by fever and swelling.

Some of the processes active in neuropathic pain involve, to some degree, changes in parts of the nerve pathway that process pain sensations. Release of the body's own pain-killing substances may be dampened, and some nerve cells along the pathway may become excitable and overly active in signaling pain messages. Therefore, regardless of where the original damage occurred, in many instances, the central nervous system can play a role in the continued experience of chronic pain symptoms. (1)

Some of the specific types of disordered pain that may be experienced in neuropathy include:

Allodynia – pain from what is normally a non-painful touch, such as being stroked by a feather

Dysesthesia – abnormal feeling not related to any ordinary cause

Hyperpathia or hyperalgesia – prolonged or severe pain from a lightly painful incident, such as a pinprick

Paresthesia – unusual sensations, such as pins and needles or a burning sensation (a limb “falling asleep” due to a pinched nerve will tingle from paresthesia)

Neuropathy Treatment

The prognosis and treatment of painful neuropathy depend on the cause and symptoms. The underlying cause should be addressed to stop or limit damage, and then ongoing treatment can help to manage remaining symptoms.

Remaining nerve cells can regenerate over a period of weeks to years, creating new nerve fibers to transmit signals between nerves.

To manage pain that cannot be relieved by over-the-counter drugs, standard medical treatment includes anticonvulsants or antidepressants that help regulate some transmission of nerve messages. In addition, creams, patches or local injections may relieve some pain.

In cases in which drugs are ineffective or side effects intolerable, neurostimulation using spinal cord stimulation or peripheral nerve stimulation may be an option for some patients to reduce pain.

Meanwhile, in central pain, deafferentation syndromes, or trigeminal neuralgia that resist medical treatment, motor cortex and deep brain stimulation (DBS), used for movement disorders such as Parkinson's disease, have been reported to provide some symptom relief. (7)

Transcutaneous electrical nerve stimulation (TENS), applied externally through the skin, has also been reported to improve symptoms of diabetic peripheral neuropathy. (8)

References:

1. Zhuo M, Wu G, Wu LJ. Neuronal and microglial mechanisms of neuropathic pain. *Mol Brain*. 2011 Jul 30;4:31. Review. <http://www.molecularbrain.com/content/4/1/31> (accessed Oct 1, 2012).
2. Abbott CA, Malik RA, van Ross ER, Kulkarni J, Boulton AJ. Prevalence and characteristics of painful diabetic neuropathy in a large community-based diabetic population in the U.K. *Diabetes Care*. 2011 Oct;34(10):2220-4.
3. Patient.co.uk. Neuropathic Pain and Its Management. <http://www.patient.co.uk/doctor/Neuropathic-Pain-and-its-Management.htm> (accessed Oct 1, 2012).
4. Zorowitz RD, Smout RJ, Gassaway JA, Horn SD. Usage of pain medications during stroke rehabilitation: the Post-Stroke Rehabilitation Outcomes Project (PSROP). *Top Stroke Rehabil*. 2005 Fall;12(4):37-49.
5. Dieleman JP, Kerklaan J, Huygen FJ, Bouma PA, Sturkenboom MC. Incidence rates and treatment of neuropathic pain conditions in the general population. *Pain*. 2008 Jul 31;137(3):681-8.
6. Torrance N, Smith BH, Bennett MI, Lee AJ. The epidemiology of chronic pain of predominantly neuropathic origin. Results from a general population survey. *J Pain*. 2006 Apr;7(4):281-9.
7. Nguyen, JP, Nizard, J, Keravel, Y, Lefaucheur, JP. Invasive brain stimulation for the treatment of neuropathic pain. *Nat Rev Neurol*. 7, 699–709 (2011); published online 20 September 2011.
8. Jin DM, Xu Y, Geng DF, Yan TB (July 2010). Effect of transcutaneous electrical nerve stimulation on symptomatic diabetic peripheral neuropathy: a meta-analysis of randomized controlled trials. *Diabetes Res. Clin. Pract.* 89 (1): 10–5.

Reviewed October 28, 2012

Kenneth M. Alo, MD

Member, International Neuromodulation Society

Pain Management, The Methodist Hospital Research Institute

Houston, TX, USA

Please note: *This information should not be used as a substitute for medical treatment and advice. Always consult a medical professional about any health-related questions or concerns.*
