What Is PN?
Peripheral neuropathy (PN) is a serious disease that affects approximately 20 million people in the United States. PN usually affects the foot first and foremost. A list of common causes of peripheral neuropathy includes hereditary diseases, toxins, infections, cancer, side effects from medications, vitamin deficiencies, malnutrition, connective tissue disorders, and many other metabolic disorders, particularly diabetes mellitus.\(^1\)

The peripheral nervous system consists of two parts—a) the somatic system, which includes the motor and sensory neurons and b) the autonomic system, which is comprised of the parasympathetic and sympathetic nervous systems. The two main types of PN are a) De-myelinating neuropathy, in which the coverings of the nerves degenerate and b) Axonal neuropathy, in which the far ends of the axons deteriorate first followed by the decline of the rest of the axon and eventually the cell body. Axonal neuropathy is by far the most common form of PN and includes the diagnosis of diabetic neuropathy, and is the focus of this article.

One of the keys to the diagnosis of axonal PN is that the longest and the thinnest nerves tend to be affected first.

Diagnosis of PN
The diagnosis of PN is somewhat vague, historically. Patients are typically diagnosed with PN via a) complaints of numbness, tingling, burning or a loss of feeling and b) a physical examination which includes abnormal sensory testing of light touch, vibration, 2-point discrimination, hot versus cold, and the use of a monofilament wire against different surface points of the toes and sole. Motor testing of the reflexes, muscle strength, and joint range of motion can also be helpful in diagnosing PN. There is a lack of quantification in the clinical diagnosis of PN.

Early Detection of PN via Sudomotor Testing
An accurate, sensitive, and quantifiable measure of autonomic nerve disease would be very helpful in the early diagnosis of PN, especially since the best time to treat PN is early, before permanent somatic nerve damage has occurred. The next section will detail a method of the early detection of autonomic neuropathy (i.e., early PN) in the feet.

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New Concepts and Studies
“New Concepts” is a forum for the presentation of (1) new technologies and products and (2) new studies involving existing products. Readers should be aware that Podiatry Management does not specifically endorse any of the technologies, concepts, or products being discussed.
Early Detection (from page 121)

The “TM Flow” medical testing device measures the following: a) Blood pressure, b) Ankle brachial indices for the left and right side, c) Arterial stiffness, d) Autonomic fitness markers, and e) Sudomotor nerve function of the feet. Sudomotor nerve testing is a test of the long thin autonomic nerves to the eccrine glands of the soles of the feet. Sudomotor testing of the soles includes measurement of nitric oxide released as a marker of micro-circulation and a measurement of sweat response to stimuli as a marker of C Fiber nerve decreased density and/or function.

The technology described above has been approved by the FDA and provides data recommended to be collected by the American Diabetes Association. These tests are often indicated for people with a) diabetes or “pre-diabetes”, b) complaints of numbness, tingling, burning, coldness, leg cramps, leg fatigue, or a loss of feeling in the feet, and c) an age of over fifty who are overweight, have hypertension, and/or smoke cigarettes.

Treatment of PN

The treatment of PN includes the following:

1) Tough Love—Overweight, diabetic patients who drink and smoke and don’t keep their blood sugar under control should be told something like: “If you want the numbness in your feet to go away and you want to be able to successfully complete intimate physical relations, and you want to see your grandchildren graduate from high school … YOU NEED to quit drinking and quit smoking and lose 100 pounds and get your HgA1C to less than 6.0.” It’s in your job description to say something like that to them in a heartfelt manner.

2) Exercise—A prescribed Exercise Program a) gets the patient involved in their treatment, b) leads to the release of endorphins which is always a good thing, c) helps with weight loss and blood sugar control which are often indicated, and d) increases the blood flow to the lower extremities leading to improved nerve health.

3) Diet—You are what you eat. A diet featuring lots of vegetables, fruits, and lean proteins will optimize nerve health. Processed, salted, and “fast” foods tend to increase inflammation and should be avoided by people with PN.

4) Life Style Modifications—Proper sleep and abstinence from smoking and drinking alcohol are important factors in decreasing the symptoms and optimizing the health of individuals with PN.

5) Nutritional supplements may be useful as part of the wellness program for PN. More research is required to prove the effectiveness of the various vitamins and medical foods in relieving the symptoms of PN. Purity Standards and an awareness of potential side effects must be also considered.

6) Oral Medications—The anticonvulsant drug pregabalin (Lyrica) and the selective serotonin and norepinephrine re-uptake inhibitor duloxetine (Cymbalta) have been approved by the FDA as treatments for painful diabetic neuropathy. Other first-line medicines for PN include tricyclic antidepressants such as amitriptyline and nortriptyline and the anti-seizure drug gabapentin (Neurontin). Side-effects should be reduced by taking these at bedtime.

Sudomotor nerve testing is a test of the long thin autonomic nerves to the eccrine glands of the soles of the feet.
considered and watched for with these medicines, particularly with elderly patients.

7) Topical Medications—Topical anesthetics such as lidocaine may be used for painful peripheral neuropathy. The use of a chemical found in chili peppers (capsaicin) may be helpful for people with painful PN if applied at least three times per day. Compounding pharmacies often tout the benefit of using multiple medications such as phenytoin, baclofen, clonidine, and ketamine in a cream to be applied several times a day. Further study is needed to determine the most effective and cost-efficient combination and dosages of these medicines.

8) The use of light therapy (e.g., Laser Therapy, Anodyne) whereby devices are used to increase the circulation to the skin may be useful in the treatment of painful PN. However, further study is needed and sitting out in the sunshine might give a similar effect. Peripheral nerve stimulation is another avenue to explore if more traditional methods do not relieve the pain of neuropathy.

9) Massage and acupuncture are often viable options for people with PN if done with their doctor’s knowledge and consent and performed in a safe manner.

**Disclosure:** Kevin C. McDonald, DPM has no financial relationship with LD Technologies or any other conflict of interest.

**References**

2. LD Technology, www.LDTeck.com, Miami Florida

**Additional References**


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