

Diabetic Peripheral Neuropathy
Symptoms Relieved
By Magnetic Neural Entrainment

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Overview

Peripheral neuropathy is a result of damage to the nerves outside of the brain and spinal cord, specifically peripheral nerves. This issue often causes weakness, numbness, pain, and a burning sensation affecting the hands and feet. When in the advanced stage, it can ascend the arms and leg. It can also affect other areas of the body functions including the digestive, urinary and circulation. The peripheral nervous system sends information from your brain and spinal cord (central nervous system) to the rest of your body. The peripheral nerves also send sensory information to the central nervous system. Peripheral neuropathy can result from traumatic injuries, infections, metabolic problems, inherited causes, and exposure to toxins. One of the most common causes is diabetes mellitus.

Individuals with peripheral neuropathy generally describe the abnormal sensations or pain as a burning, sharp, shooting, stabbing or a numbness and tingling sensation. In many cases, symptoms improve, especially if the underlying condition is treated. Medications can also reduce the pain of peripheral neuropathy. Over the past decade, compounding medications that are applied topically have shown to help mitigate the abnormal sensations of peripheral neuropathy.

Symptoms

Every nerve in our peripheral nervous system has a specific function, so symptoms depend on the type of nerve affected. Nerves are classified into sensory, motor, and autonomic. Sensory nerves receive sensations such as temperature, pain, vibration, or touch from the skin. Motor nerves control muscle function and movement. Autonomic nerves control functions such as blood pressure, perspiration, heart rate, digestion, bladder, and bowel function.

Signs and symptoms of peripheral neuropathy might include a gradual onset of numbness, tingling in your feet or hands and again, can spread to your arms and legs. It is not uncommon to experience sharp, jabbing, shooting, throbbing, and burning type of discomfort. There can be sensitivity to touch and discomfort with air flow touching the skin. It is not uncommon for patients to describe the feeling that they are wearing gloves, or a sock is bunched up in their shoe. In more advanced progression of peripheral neuropathy, patients can develop lack of coordination, balance issues that can affect stability and lead to falls. Additionally, muscle weakness and paralysis can eventually take place if the motor nerves are affected. The autonomic nerves are affected, signs and symptoms might include heat intolerance, excessive sweating, or the inability to sweat, bladder, bowel, and digestive problems. From a cardiovascular standpoint, there can be drops in blood pressure causing dizziness and lightheadedness. This is evident in individuals that develop Postural Orthostatic Tachycardia Syndrome (POTS). This autonomic dysfunction affects blood pressure and the Vagus nerve (10th cranial nerve), affecting the parasympathetic nervous system of the cardiovascular and digestive systems.

Causes

Peripheral neuropathy is nerve damage caused by a number of different conditions. Health conditions that can cause peripheral neuropathy include autoimmune disease, diabetes mellitus, infections, inherited disorders, tumors, bone marrow disorders and other disease. Some of these include, kidney, liver, connective tissue disorders and underactive thyroid disease (hypothyroidism). Other causes of peripheral neuropathy include alcoholism, exposure to toxins or poisons (heavy metals, lead, and mercury), medications (chemotherapy), Vitamin deficiencies (B-1, B-6, B-12, vitamin E and niacin) and injury or pressure on a nerve. Carpal tunnel in the wrist or tarsal tunnel in the foot can cause peripheral neuropathy from pressure that is typically relieved when the nerve is surgically decompressed.

Risk Factors

Peripheral neuropathy has many risk factors and can be associated with medical conditions, exposures, and lifestyle habits. Patients with uncontrolled diabetes have higher blood sugar levels that adversely affect peripheral nerves and lead to neuropathy. Alcohol abuse, exposure to toxins and poisons can certainly add unnecessary risk in the development of peripheral neuropathy. An example would be exposure to lead and mercury in the environment and one's diet. Prior to antibiotics in farm animal food, arsenic in low amounts were present. Farmers would expose themselves to the food containing arsenic and would develop skin issues along with the peripheral neuropathy. Autoimmune diseases such as rheumatoid arthritis and lupus has the immune system attack your own tissue. Infectious diseases such as Lyme disease, shingles, Epstein-Barr virus, hepatitis B and C and HIV all can lead to the annoyance of peripheral neuropathy. Family history certainly is important risk factor as are jobs and hobbies that perform repetitive motions, especially if there is nerve compression associated.

Complications

Even though sensory peripheral neuropathy is an annoyance, it can lead to some very significant morbidities. Burns and skin injuries can occur due to lack of sensation, temperature, and pain, when challenged with hot items. Falls due to weakness, loss of balance and sensation can lead to fractures. Hip, wrist, and shoulder fractures are not uncommon in the older population due to instability and carry morbidity. In the diabetic population, lack of sensation leads to many problems with compromise to the skin. This can manifest in ulceration, infection, and eventual amputation. The cost of medical care associated with this disease path is significant as it the implications to families that care for their loved ones.

Diagnosis and Medications

Peripheral neuropathy has many potential causes. A physical examination including a medical history including symptoms, lifestyle, exposure to toxins, drinking habits, and family history is required.

Evaluation of tendon reflexes, muscle strength and tone, ability to feel certain sensations (hot, cold, pin prick, vibration), and posture and coordination are evaluated. Additionally, blood tests can detect vitamin deficiencies, diabetes, abnormal immune function are done to assist with the diagnosis. Imaging with CT or MRI scans can look for herniated disks, compressed nerves, tumors, or other abnormalities affecting blood vessels and bone. Nerve function tests such as electromyography (EMG) records activity in your muscles or damaged nerves and is very useful in the diagnosis. Nerve and skin biopsies also can be helpful to look for abnormalities in the tissues. For evaluation of the autonomic nervous fibers, testing includes a sweat test, sensory testing, and tilt table.

Besides medications used to treat conditions associated with peripheral neuropathy, medications are available to relieve peripheral neuropathy symptoms. These include pain killers, anti-seizure medications, antidepressants, and topical treatments (Capsaicin cream, compounded medications).

Therapies

Various therapies and procedures might help ease the signs and symptoms of peripheral neuropathy. Transcutaneous electrical nerve stimulation (TENS) are electrodes placed on the skin that deliver gentle electric current at varying frequencies. TENS should be applied for 30 minutes daily for about a month. Plasma exchange and intravenous immune globulin procedures which help to suppress the immune system might benefit people with inflammatory conditions. Plasma exchange involves removing your blood, then removing antibodies and other proteins from the blood and returning the blood to your body. In immune globulin therapy, you receive high levels of proteins that work as antibodies (immunoglobulins). Physical therapy is beneficial for those that have muscle weakness. Adjunctive devices such a brace, cane, walker, or wheelchair can improve ambulation and stability as well as quality of ambulation. Surgery for neuropathies caused by compression of a nerve is rewarding after the anatomic reason for the pressure is obtained.

SOLTEC HEALTH (Eden Prairie, MN) is an innovative company focusing on consumer products with breakthrough technology focusing to improve sleep and reduce stress. The leadership pioneered automated sleep diagnostics and the Breathe Right nasal strips. It became evident that their technology may have significant positive effects on sensory peripheral neuropathy. This sensory dysfunction of the peripheral nervous system mainly effects the hands and feet of over 200 million individuals globally. As discussed above, this can be perceived as numbness, tingling, burning and sharp shooting pains in the extremities. SOLTEC developed a low frequency magnetic stimulation device for the reduction of sensory abnormalities secondary to peripheral neuropathy.

A pilot study was developed and implemented under the direction of Dr. Steven Kavros in a clinical setting with patients with diagnosed diabetic peripheral neuropathy. This study was a double blinded, placebo-controlled protocol to determine whether autonomic (parasympathetic) frequency stimulation would produce a reduction in pain and numbness in subjects with diabetic peripheral neuropathy.

The subjects placed the electromagnetic device on the floor, in between their feet activated the machine for thirty (30) minutes per day. There is no physical contact of the technology with the patient’s body. An app is downloaded to the patient’s smartphone enabling the company to monitor the compliance of the daily treatment time over the course of the six month study.

Patients were consented and medically evaluated for baseline sensation. A Semme-Weinstein monofilament nylon (10 gm) was used to determine the level of sensation at multiple anatomic locations of the foot and leg. Toes, plantar forefoot, plantar hindfoot (heel), medical and lateral ankle were tested bilaterally. Additionally, a vibratory tuning fork (128 hz) was used to assess feeling at the first and fifth metatarsal heads and the medial and lateral malleolus bilaterally. A pain scale of 0 – 10 was used to verbally record their described levels. The hemoglobin A1c levels ranged between 5.6 – 12.5 mg/dL. The patients were evaluated and tested once per month for a total of 6 months. Patients also commented on other factors that are directly connected to peripheral neuropathy such as stability in balance and improvement of hot and cold sensation.

Summary

SUBJECTS	PAIN	SENSATION	OUCH
(A) - Active all 6 months	0 = No Pain	16 = Normal	16 = Normal
	5 = Moderate Pain	32 = Reduced	32 = Reduced
(I) - Placebo first 3 months	10 = Worst Pain	48 = Absent	48 = Absent

NAME	Baseline + M1	M5 + M6B	aseline + M1	M5 + M6B	aseline + M1	M5 + M6
K. A. (A)	2.5	2	32	26	32	24
K. H. (A)	0.5	0	37	20	28	17
M.L. (A)	0	0	42	36	40	24
D. N. (A)	6	0	45	16	40	16
A. O. (A)	0	0	46	24	44	16
T. P. (I)	0	0	24	16	22	16
D. R. (I)	0.5	0	29	16	32	16
G. R. (I)	1.5	0	26	20	24	16
B. S. (A)	0.5	0	24	16	22	16
T. T. (I)	3	0	36	16	32	16
Mean	1.45	0.2	34.12	0.6	31.6 1	7.7
One Tailed P-Value	0.033843818		0.000266017 0		.000129727	

K. A. (A)	Continued intermittent use.
K. H. (A)	Continues to feel better. Increase in sensation.
M. L. (A)	Walking and balance improved; vibratory sensation better.
D. N. (A)	Better sensation. "Balance seems better." "Safer in shower."
A. O. (A)	Significant increase in sensation, very aware of ground and shoes.
T. P. (I)	Good sensation. Sees improvement. Without pedal/ankle edema.
D. R. (I)	Good sensation; much less numbness.
G. R. (I)	Patient improved; especially forefoot.
B. S. (A)	Better feeling overall. Good balance and lack of night discomfort.
T. T. (I)	Continues to feel more sensation. Can feel hot and cold better now.

The results demonstrated seven (7) of the subjects had improvement with respect to intermittent pain (3 had no pain at the onset of the study) and all ten (10) subjects demonstrated improvement with respect to numbness. All results were statistically significant.

This pilot study demonstrates the benefit of the SOLTEC low frequency magnetic stimulation for small fiber peripheral neuropathy. Additional studies are warranted to further evaluate this innovative technology. The ramification of improving sensation to the feet has significant implications relating to decreasing potential dermal wounds in high-risk individuals. These wounds lead to significant morbidity, potential loss of limb and even death.