Tucson Neuropathy Institute™

Specializing in Pain Relief for the Legs & Feet

Got Neuropathy?

An Introduction to Novel Approaches

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Written By
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A subdivision of Head to Toe Healthcare, PLC

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Table of Contents

Introduction & Acknowledgement

Welcome to the world of peripheral nerves and neuropathy. While the author has had significant training in his profession, current AENS president Dr. Richard Jacoby of the Scottsdale Neuropathy Institute and Dr. A. Lee Dellon exposed him to a novel approach to help preserve and improve nerve function in 2007. This remains a relatively new frontier and perhaps a well kept secret to many, even those in the medical profession.

There are two types of nerves: central nerves, primarily the brain and spinal cord, and peripheral nerves, nerves that extend to your arms and legs. When central nerves are damaged, they do NOT regenerate. When Christopher Reeves fell off his horse, he was left paralyzed with little chance of recovery because he injured central nerves within his neck. This publication will focus on peripheral nerves. The most exciting aspect of peripheral nerves is that following injury, they have the ability to regenerate! Carpal tunnel is an example of a peripheral nerve disorder, which can be improved with surgery.

Who is Dr. Dellon and Why Listen?

Dr. A. Lee Dellon, MD, PhD is arguably the world's foremost authority in Peripheral Nerve Surgery. He has dedicated a life's work to understanding and treating nerve pain. Following graduation from John Hopkins School of Medicine in 1970, he completed 8 years of additional training including 2 years of research with the National Institutes of Health. Currently a Professor of Plastic Surgery & Neurosurgery at the John Hopkins University School of Medicine & the University of Arizona, Doctor Dellon has won fifteen national research awards, authored 72 book chapters, and published more than 375 articles in peer-reviewed journals.

He recently received a PhD for his basic science and clinical research into the surgical treatment of compressed nerves in the patient with diabetic neuropathy. He received his PhD from the University of Utrecht in the Netherlands on March 6, 2007.

Dr. Shih, Director of Neuropathy Services at Head to Toe Healthcare, is committed to improving & restoring sensation to neuropathic feet. He has completed the Lower Extremity Peripheral Nerve Surgery advanced training in Baltimore, accredited by the American Society of Plastic Surgeons and directed by Dr. A. Lee Dellon. There are roughly 220 surgeons, primarily consisiting of plastic, orthopedic, general, and podiatric surgeons worldwide who have received this training. Dr. Shih is a Fellow of the Association of Extremity Nerve Surgeons (AENS).

Why I Wrote This Book

Peripheral neuropathy afflicts millions of Americans. It is important to note that there are several types and causes. The most common form of peripheral neuropathy is diabetic peripheral neuropathy. More than 60% of non-traumatic lower limb amputations are due to diabetic neuropathy. One in six diabetics will have ulcers of the lower extremity. One in six diabetics who have ulcerations will have amputations. Over 200,000 lower extremity amputations were performed in the United States and Europe last year. This is simply too much!

There is now hope for patients suffering from diabetic neuropathy, as well as other neuropathy causes. A relatively new surgical technique is allowing neuropathic patients to retain their limbs, live pain-free and have a better quality of life. For patients who had little chance for symptomatic improvement, we may now have the real opportunity to prevent ulcers and amputations in many diabetics.

Other causes of peripheral neuropathy are related to alcoholism, various chemotherapeutic agents, certain drugs, as well as a large group of idiopathic neuropathy (unknown cause). There are several scientific studies available that suggest an underlying theme with many of these varying types of peripheral neuropathy. Many of these peripheral neuropathies may be aggravated by a compression or squeezing of the nerve in tight tunnels the nerves must pass through.

What a Patient Has to Say about Peripheral Nerve Decompression?

Dr Shih,

Thank you for the follow up about my surgery. I am doing great after the surgery. I am no longer in pain and I have full strength back to my right foot. This is remarkable since it had been about 8 years that I started experiencing foot pain. After seeing 4 different foot doctors over the years and getting several orthotics I still had pain. The shoe inserts helped but did not fix the problem. After the surgery I can wear any shoe type and do any activity I want. I am 48 years old and I hike long and hard now. Thank You!

I am glad you had the technical expertise to find the real problem with the foot pain and not just tell me to wear another shoe insert. As an Engineer I respect that level of competence in finding the root cause of the problem and not just working on the symptom.

I would like to thank your office staff. They were at all times very friendly and helpful.

Thanks again,
BP

Let's talk Nerves!

Chapter 1

Peripheral Arterial Disease (PAD)

Before we focus on neuropathy, let's discuss our circulatory system. There are many cases in which the vascular system may be the predominant cause of your leg pain. The artery, vein, and nerves all course together and ruling out peripheral arterial disease is important. PAD is narrowing or blockage of arteries that results in poor blood flow to your legs. When you walk or exercise, your leg muscles do not get enough blood and you can get painful cramps. Peripheral arterial disease is also called peripheral vascular disease or simply poor circulation. Just like clogged arteries in the heart, clogged arteries in the legs mean you are at risk for having a heart attack or stroke. Plaque buildup in the legs does not always cause symptoms, so many people can have PAD and not know it. People who do experience symptoms, such as pain or cramping in the legs, often do not report them, believing they are a natural part of aging or due to another cause.

One in every 20 Americans over the age of 50 have PAD and it is estimated that over 8 million are undiagnosed. Early detection of PAD has been shown to save limbs and lives, so if you have any of the risk factors you should undergo PAD screening by your podiatrist yearly or more often if symptoms occur.

The exact cause of plaque buildup in the limbs is unknown in most cases. However, there are some conditions and habits that raise your risk for developing poor circulation.

Your risk increases if you:

1. Are over the age of 50.

2. Smoke or used to smoke. Those who smoke or have a history of smoking have up to four times greater risk of PAD.

3. Have diabetes. One in every three people over the age of 50 with diabetes is likely to have PAD.

4. Have high blood pressure. Also called hypertension, high blood pressure raises the risk of developing plaque in the arteries.

5. Have high blood cholesterol. Excess cholesterol and fat in your blood contribute to the formation of plaque in the arteries, reducing or blocking blood flow to your heart, brain, or limbs.

6. Have a personal history of vascular disease, heart attack, or stroke. If you have heart disease, you have a one in three chance of also having PAD.

7. Are African-American. African-Americans are more than twice as likely to have PAD as Caucasians.

What are the symptoms of PAD?

Most patients with PAD have little or no symptoms until the disease is advanced; that's why screening exams are so important. Those who do experience symptoms have reported the typical signs and symptoms:

Claudication: fatigue, heaviness, tiredness, cramping in the leg muscles (buttocks, thigh, or calf) that occurs during activity such as walking or climbing stairs. This pain or discomfort goes away with rest or once the activity is stopped and during rest.

Rest Pain: pain in the legs at night that often disturbs sleep

Wounds or sores that heal very slowly or not at all

Color changes to the skin on the feet and lower legs

Cold, pale feet and legs

Decreased hair and nail growth on the feet

How is PAD Diagnosed?

Your podiatrist will start with checking the pulses in your foot and ankle, examining the skin for changes and wounds that are poorly healing. Often an ABI (ankle-brachial index) is performed which compares the blood pressure in your arms to your ankles. A Doppler exam may be ordered. This test uses sound waves to measure the blood flow in the veins and arteries in your arms and legs. If any of these exams are abnormal, your podiatrist may refer you to a vascular surgeon to discuss options for treatment.

How is PAD Treated?

The overall goals for treating PAD are to reduce any symptoms, improve quality of life and mobility, and prevent heart attack, stroke, and amputation. There are three main approaches to treating PAD: making lifestyle changes, taking medication, and in some cases, having a special procedure or surgery. Your physicians will determine the best treatment options for you, based on your medical history and the severity of your condition.

How Can I Prevent PAD?

The cornerstone of prevention is lifestyle changes.

Exercise is very important and you should aim for 30-45 minutes of moderate intensity exercise each and every day.

Stop smoking immediately and ask your doctor for help if you have difficulty with smoking cessation.

Keep your cholesterol and blood glucose levels down.

Keep your blood pressure in the normal range.

Decrease stress.

If you are overweight or obese, aim for a normal weight and again, ask your doctor for help! A diet low in saturated fats, trans fats and cholesterol is also helpful.

More than anything, talk to your doctors about a comprehensive treatment plan that decreases your PAD risks.

One in every 20 Americans over the age of 50 have PAD and the incidence is higher in diabetics. Most patients have little or no symptoms until it is too late! Early detection of PAD has been shown to save limbs and lives, so if you have any of the risk factors you should undergo PAD screening by your podiatrist.

Chapter 2
Peripheral Neuropathy

Burning, tingling, numbness, pain or shooting to your feet?! Does this sound familiar? Are you experiencing some or all of the symptoms? You may be experiencing classic signs of peripheral neuropathy. You may also be experiencing a cramping in the feet, curling of the toes, or weakness and loss of control to your legs and feet. Many people experience the same complaints in their hands.

Peripheral neuropathy is actual nerve damage that results from a systemic disease. The most common form of neuropathy is from diabetes. There are many other causes of neuropathy like chemotherapy, thyroid disorders, arthritis (rheumatoid, lupus), vitamin deficiencies, heavy metal toxicity, drug-induced, leprosy, and alcoholism. Many people today are overweight, have high cholesterol, and high blood pressure. They are "Pre-diabetic" (Metabolic Syndrome / aka Syndrome X). Their neuropathy is often an earlier phase of diabetic peripheral neuropathy. Many times the cause of neuropathy is unknown, that is called idiopathic neuropathy.

Anyone who is a diabetic or knows a diabetic understands the havoc it can wreak on the body. The nerves are included in this path of destruction and this includes the nerves to your lower extremity and your feet. The damage to the nerves in your feet makes you unable to really feel your feet and can lead to open wounds (ulcerations). Ulcerations can lead to amputations. How does this happen?

Neuropathy can affect the motor nerves which control the muscles in your body. Damage to these types of nerves produces weakness in the muscles. This weakness can affect your balance. Loss of motor nerve function also causes loss of the tone of the muscle (atrophy of the muscle).This causes your foot to lose its original shape and produces areas of increased pressure. This increased pressure can cause breakdown of the foot which can lead to skin ulcerations.

Neuropathy can also affect the autonomic nerves which affect your skin's ability to maintain moisture. This loss of moisture makes your skin dry. Dry skin can lead to cracking, and this cracking in your skin can lead to ulcerations.

The most devastating effect neuropathy has is on the sensory nerves. This numbness, burning and/or tingling is the loss of sensation you may be experiencing. This can affect part of your foot, your whole foot, or even your entire lower extremity. This loss of sensation means a loss of your body's ability to perceive increased pressure areas or changes in temperature. This loss of natural protection puts you at risk for ulcerations.

When you hear of a diabetic losing part of his or her foot, or one or both legs, you can now understand why this at any time could become your battle. The damage produced by neuropathy does not occur rapidly. On the contrary, it usually occurs so slowly and subtly that it is not enough for you to notice. The longer you have neuropathy, the longer you are undiagnosed, or the longer you have uncontrolled diabetes, the more danger you place on your limbs and your life.

Why is controlling this important? The amputation of part of the foot dramatically increases the likelihood of further amputation of your foot or your limb within the next few years. The loss of one limb puts increased pressure on the other limb and this increased pressure inevitably results in breakdown of this foot and loss of this limb. The lifetime expectancy for a single amputee is five years. The lifetime expectancy for a double amputee is less than five years.

Are you experiencing numbness, burning, and/or tingling in your feet? Whether you have a history of diabetes in your family or not, we urge you to come in to have this evaluated. There are many times where these symptoms have resulted in a diagnosis of diabetes. At the very least, this discovery alone could save your limbs. At the very most, this discovery could save your life.

Chapter 3
Foot Drop and the Common Peroneal Nerve

Have you ever crossed your legs, only to find your leg tingling with a sensation of 'pins & needles?' Since the Common Peroneal nerve is relatively exposed, similar to the 'funny bone' in your elbow, this is not unusual.

A nerve the thickness of a pen, the Common Peroneal Nerve crosses from behind your knee, around the outside of your knee, to enter the muscles of the outside of your leg. This nerve gets compressed between the white covering of the muscles and the underlying bone, the fibula. Many times this nerve becomes subtly compressed and goes unnoticed.

This nerve is susceptible to compression and may cause symptoms like difficulty lifting up your foot or toes, so your foot drags. It may cause numbness or buzzing below your knee, or feel like your leg is going to "give out" on you. Depending on the severity of nerve compromise, several conservative and surgical treatment options exist.

Chapter 4
Small Fiber Peripheral Neuropathy

Peripheral nerves in a general sense, can be subdivided into large and small nerve fibers. Typically, small nerve fibers are affected before large nerve fibers. Small fiber neuropathy, aka: small fiber sensory neuropathy (SFSN), or C fiber neuropathy is a newer focus of neuropathy that is able to offer an earlier detection of neuropathy. Small nerve fibers are the nerve fibers near the skin's surface, which is why the symptoms deal with sensation. Usually the symptoms start in the feet and lower legs. The symptoms may include insensitivity to heat and/or cold, tingling, numbness, muscle weakness, cramps, pain, and other symptoms. Some people describe the pain as an electric shock, or walking on broken pieces of glass, or bags of ice on their feet. Sometimes people experience a loss in the ability to feel and do not even know it.
The disorder can be caused by diabetes, alcoholism, or other conditions, but many times it is idiopathic. Identifying that you have small fiber neuropathy is the first step. Other tests to identify potential causes is the next step, as therapy often consists of treating the underlying cause, as well as relieving the symptoms.

Chapter 5
Diagnostic Testing

The most important part of a patient visit is the history and physical exam, which allows the physician to become familiar with the patient and his/her problems. No diagnostic modality can compare to a through history and physical examination. However, there are some tests that can provide better understanding of nerve function.

Pressure Specified Sensory Device (PSSD) was developed by Dr. Dellon and an Aerospace engineer. It is a computer-based device which painlessly measures how hard the skin has to be pressed before it can be sensed by the patient. It is the most accurate method of measuring for sensory deficits. This test offers a way to stage the degree of neuropathy you are experiencing, and to determine if your nerves are

regenerating or continuing to degenerate. The test tends to indentify small fiber neuropathy.

Nerve Conduction Velocity (NCV) is a test commonly used to evaluate nerves, more commonly identifying large fiber neuropathy. An electrical current is used to stimulate the nerve. Since the nerve is in effect an electrical conduit, the time for the electrical impulse to travel to a site further along the nerve is measured. Normal values have been established, and comparison of your test to these values helps to indicate if there is damage to your nerves.

Electromyography (EMG) is typically an invasive technique, in which needles are inserted into your muscles. This test helps to identify disorders in the activation of muscles and their stimulating nerves, or neuromuscular diseases. Normal muscles at rest fall into certain ranges of electrical activity. Abnormal electrical activity might indicate some nerve and/or muscle damage.

Epidermal Nerve Fiber Density Testing (ENFD) In short, epidermal nerve fiber density testing involves taking a small "punch" of skin from the calf to visually count the number of nerve fibers. This allows a physician to identify small fiber peripheral neuropathy. Additionally, it also establishes an objective baseline so a physician can determine if treatments are effective.

Chapter 6
Treatment of Neuropathy

If you have a form of neuropathy that can be treated, like diabetes, or vitamin deficiency, or low thyroid function, then you must see your primary care doctor for the medical treatment specific to the disease. Treating the underlying medical condition can often relieve the neuropathy symptoms.

When there is no known medical cause for your neuropathy, often times prescription medications for the pain, like Neurontin (an anti-seizure medication), Cymbalta (an anti-depressant), Lyrica, or narcotics are

often given. Many of these medications carry some side-effects, such as drowsiness that should be reviewed. Additionally, there are several medications that are more along the lines of nutritional supplements for the nerve.

It is important to note that neurological problems are some of the most challenging problems encountered by physicians and patients alike, with the diagnosis and treatment plans rarely being straightforward. This is a constantly evolving area, so follow-up with your physicians is warranted.

Although surgery has made a large impact, conservative treatment is usually attempted first. New dietary supplements, oral, topical, and injectable medications are being used to increase the oxygen supply to the diseased nerves and help "wake them up". Patients are regaining sensation and strength in their legs and feet. Many patients are beginning to feel relief from years of pain, numbness and muscle weakness with these conservative treatments.

One of the world's foremost experts in peripheral nerve surgery, Dr. A. Lee Dellon, MD, PhD, from John Hopkins University, is a pioneer in the field of neuropathy and peripheral nerve surgery. He has developed surgical procedures that can alleviate neuropathic pain, numbness and muscular disorders in both diabetics and non-diabetics.

Chapter 7
Dellon Nerve Decompression (Surgical Management)

In the past, neuropathy was approached as a painful disease state for which symptoms could only be masked, but could rarely be cured. Some doctors subscribe to the theory that the nerve dies from the effects of neuropathy, and that the only treatment is to mask the pain and live with the disease.

We now know that the nerve is not dead, but has poor conducting abilities, similar to that of a short in electrical wiring. This is caused by

the compression around and within the nerves. This compression is much like that seen in carpal tunnel syndrome where the hand experiences numbness, tingling and burning due to compression of the wrist nerve. In fact, if the compression continues long enough within the carpal tunnel, loss of muscular strength will also occur.

Dellon Decompression is an exciting new treatment option for patients that suffer from peripheral neuropathy, drop foot and neuritis. This procedure was developed by Dr. A. Lee Dellon, a Plastic Surgeon from John Hopkins University School of Medicine. This has truly been a revolutionary procedure that has helped thousands of patients. The surgical procedure for lower extremity neuropathy is similar to that done for carpal tunnel, and relieves pressure in the legs, ankles and feet. Studies have found that by performing a surgical nerve decompression, 80% of all patients have good to excellent relief from their neuropathic pain or numbness.

Chapter 8
Optimism for Diabetic Neuropathy

The purpose of this chapter is to provide you with information that brings optimism for patients with diabetes. By having a yearly measurement made of the sensibility in your feet, the earliest stages of neuropathy can be identified and appropriate changes in diabetes management can be made. In certain circumstances, it may be found that areas are present in your legs that cause compression of your nerves. These sites of pressure on your nerves can be treated with surgery in order to restore sensation to your feet.

Nerves begin in the spinal cord and extend into the fingers and toes. Along this path, there are anatomic areas of narrowing. These exist in everyone and many are already known to you, such as your “funny bone” at the elbow and the carpal tunnel at the wrist. In the leg, there are similar tight places at the outside of your knee and inside of your ankle, called the tarsal tunnel. Although some people may have been born with structures that would make the tunnels more narrow and the nerves more likely to become pinched, like a smaller ankle or extra

muscles that go through one of these tunnels, the diabetic has two unique reasons that make nerves susceptible to compression.

The first reason is that the nerves in a diabetic are swollen. Sugar from the blood enters into the nerve to give the nerve energy. This sugar, glucose, is converted into another sugar, called sorbitol. Sorbitol's chemical formula makes it attract water molecules, and so water is drawn into the nerve, causing the nerves in a diabetic to become swollen. It is Dr. Dellon's hypothesis that if a nerve swells in a place that is already tight, like those anatomic areas described above, then the nerve becomes pinched or compressed, causing symptoms.

The second reason is related to the transport of systems within the diabetic nerve. The nerve is filled with a substance that lets important chemical messengers move along the nerve, carrying messages that let the nerve's central part know what is happening at its other end. If the nerve becomes damaged, by compression, for example, and its cell membranes need to be rebuilt, these building proteins are transported downstream inside the cell along tracks called tubulin. This mechanism, called the slow anterograde component of axoplasmic transport, does not work normally in diabetics. Dr. Dellon's hypothesis is that the decrease in axoplasmic transport means that the nerve cannot repair itself well, rendering it more likely to remain in trouble from compression, and therefore produce symptoms.

If someone were squeezing your neck, choking you, you would be yelling and screaming, struggling to get air into your lungs. If your nerve gets choked, or pinched, it also does not get enough oxygen. The nerve makes you aware of this lack of oxygen by sending you a warning message. You will feel buzzing, tingling or numbness in the areas that are supplied by that nerve.

Summary

In this brief publication, we touched on some of the most common causes of neuropathy. While much is still unknown about neuropathy, the exciting news is that new developments continue to surface. We hope you have gained a greater insight, and if you have friends or family with neuropathy, bring them to see a neuropathy specialist today!

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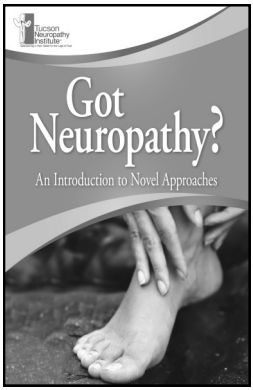

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ABOUT the DOCTOR

Dr. Alan Shih is director of Neuropathy services at the Tucson Neuropathy Institute, a subdivision of Head to Toe Healthcare, PLC. He earned a Bachelor of Science in Movement Science from the University of Michigan and then graduated with his doctorate from the Dr. William M. Scholl College of Podiatric Medicine in Chicago. After graduation, he completed four years of residency, culminating with the highest level of surgical training at a level-one trauma center in Chicago -- Advocate Illinois Masonic Medical center – where he spent his last two years. Upon completion of his residency, Alan had the privilege and unique opportunity to study the Ilizarov technique in its birthplace of Russia for a mini-surgical fellowship. Additionally, he has received advanced training at the Dellon Institute for Peripheral Nerve Surgery, an affiliate of John Hopkins School of Medicine. About 220 surgeons worldwide, primarily consisting of Plastic, Orthopedic, Neuro, and Podiatric Surgeons, have gained this privilege. Both of these unique subspecialties are training that less than 1% of the podiatric profession has gained.

For a brief time following graduation from residency, Alan also enjoyed teaching podiatric students surgical techniques as a visiting lecturer at the Rosalind Franklin School of Medicine in Chicago. Dr. Shih is a member of the American College of Foot and Ankle Surgeons and the American Association of Lower Extremity Peripheral Nerve Surgeons. Dr. Shih is an author of multiple medical journal articles and is currently in collaboration with the University of Arizona Medical Center, Department of Surgery to continue the advancement and understanding of foot, ankle, and leg disease.

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To deliver Advanced Eye & Foot care in a friendly, relaxed, and professional environment. To ensure our patrons are well informed, with an end goal of improved health and quality of life.

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