DIABETIC NEUROPATHIES: Information for patients and their families

John D. Stewart, MBBS, FRCP(C), Neurologist,
Lions Gate Hospital, North Vancouver, BC
Last reviewed, June 2006

INTRODUCTION

Many diabetics go through life with few if any complications from their diabetes. However in the same way that diabetes may damage a variety of organs in the body, it can produce damage to the peripheral nerves, giving rise to a variety of "peripheral neuropathies".

WHAT ARE PERIPHERAL NERVES?

Peripheral nerves are like electrical wires. They run from the spinal cord to the muscles and from the sensory organs in the skin and joints back to the spinal cord. They work by conducting electrical impulses that either signal a muscle to contract or signal when your skin has been exposed to a stimulus such as touch, warmth or cold. Thus good peripheral nerve function is important for muscle strength, good sensation, good coordination and agility. Peripheral nerves, like all other cells in the body, are living structures that require energy. This is provided by glucose and other substances. It is thought that in diabetes the biochemical content of the nerves can be abnormal and this will ultimately lead to nerve fiber damage.

TYPES OF DIABETIC NEUROPATHY

The peripheral nerves of a diabetic may be damaged in several different ways, giving rise to different symptoms.

Polyneuropathy: This is by far the commonest type of diabetic neuropathy. The feet are involved first. If the neuropathy progresses then the symptoms move up from the toes to involve the whole foot and gradually further up to the knees. Later on, if the neuropathy progresses further, the hands may be similarly involved. The symptoms of neuropathy are variable and almost always worse at night. The commonest symptom is numbness - a reduction in sensation. The patient notices this by not feeling the coolness of the bathroom floor or the texture of the carpet when barefoot. Often there will be a sensation of something abnormal under the sole of the foot such as a wrinkled sock or an irregularity in the sole of the shoe or even a feeling as if walking on pebbles, even though it is clear that this is not so. Other common symptoms are a prickling, tingling sensation in the foot. In some patients this becomes a painful burning.

Another very common feature of polyneuropathy is coldness of the feet. Often the feet are genuinely cold so much so that the patient's partner complains of the cold feet in bed at night. But sometimes even though the patient thinks their feet are cold, when they touch them with their hands they are actually warm. This discrepancy is because the sensory nerves from the feet are sending incorrect messages up to the brain to tell the patient that their feet are cold when in fact they are not.

Another symptom is excessive sensitivity of the feet to touch. Patients usually notice this at night when they find that the touch and pressure of the edclothes on their feet is unpleasant. Sometimes there is discoloration of the feet such that they are a dusky red or paler than normal. Sometimes this discoloration will swing from one colour to the other.

When severe, neuropathy can damage the sensory nerve fibers that tell the patient where their feet are and so they become unsteady when walking. This is worsened by weakness of the muscles in the lower legs and feet because of damage to the nerve fibers that control muscle movement.

Many patients attribute these symptoms of abnormal sensations in their feet to circulation problems. While it is true that diabetics may get blocked arteries in their feet, the symptoms just described are due to nerve damage, not blockage of the arteries.

A doctor will examine a patient for signs of neuropathy by testing strength of muscles, the reflexes, and how a patient feels sensations such as cotton wool, a gentle pinprick, and the vibration of a tuning fork.

Compression neuropathies: Several nerves in the body pass through narrow spaces where they are susceptible to being compressed. Diabetics are more prone to this happening than non-diabetics. The main examples of compressive neuropathies that may afflict diabetics are carpal tunnel syndrome and ulnar nerve compression at the elbow.

Carpal tunnel syndrome: This is due to pressure on the median nerve as it passes through a narrow space in the wrist. It is a common problem in diabetics and non-diabetics alike. However there is no doubt that diabetics have carpal tunnel syndrome more often than non-diabetics. The symptoms are numbness and tingling in the fingers, characteristically much more so at night than in the daytime. Patients will often wake because of the symptoms and shake or rub their hands for relief. If the symptoms are allowed to progress without treatment, then clumsiness of the hands will develop.

Ulnar neuropathies: The ulnar nerve is the big nerve that crosses the inner aspect of your elbow and is what's called the "funny bone". When you hit your funny bone you feel an electric shock in your elbow that often sends tingles down into the little finger. Diabetics may have damage to this nerve at the elbow and it produces numbness in the little finger and/or clumsiness in the hand.

Diabetic proximal neuropathy: This is a much less common condition than those so far described. The symptoms are pain in the groin area and thigh muscles with weakness of the thigh muscles and numbness over the thighs. All of these symptoms may be on one side or both. The symptoms may be accompanied by weight loss.

Diabetic truncal neuropathy: This is also one of the less common diabetic neuropathies. The symptoms are characteristically numbness and tingling and burning and a sensation as if the skin has been scalded in a patch of varying size over the front or back of the chest or abdomen. A characteristic symptom is also sensitivity of the skin so that even the touch of clothes is unpleasant.

Diabetic autonomic neuropathy: The autonomic nervous system is a network of nerves that control many of the functions of the body that we take for granted, for example the control of blood pressure, stomach, intestinal and bowel function, bladder and sexual function, sweating and temperature control. Abnormal function in these nerves is

relatively rare in diabetics with one exception that is discussed below. Symptoms of disordered autonomic nerves include low blood pressure on standing. This particularly is noticeable in the morning when on getting out of bed, relieved by sitting down or lying back in bed. Bloating after eating a meal, as well as unexplained diarrhea or constipation are also symptoms of autonomic disturbance. Bladder disturbances can also be due to autonomic nerve damage. Sweating can be abnormal in diabetics, but this usually goes unnoticed by patients. However some patients are troubled by a phenomenon called "gustatory sweating". This is excessive sweating in the face and head brought on by eating meals. Sometimes specific foods can be identified.

The only frequent autonomic disturbance in diabetics is that of sexual dysfunction in men. Erections are brought about by the shunting of blood into spongy tissue in the penis. This process is controlled by nerve fibers that are particularly susceptible to damage in diabetics. Thus about 40 percent of men with diabetes will develop impairment of erections.

WHICH DIABETICS GET NEUROPATHY?

Both insulin-dependent and non-insulin-dependent diabetics may develop neuropathy. By and large, like most complications of diabetes, the patients with severe diabetes and uncontrolled blood sugars and with diabetes of long duration, tend to get more complications than others. However there is a tremendous variability and sometimes patients may even develop a neuropathy before their diabetes has actually been discovered. Other patients will go many, many years with diabetes and not develop neuropathy.

TESTS FOR NEUROPATHY

When a doctor wishes to confirm the diagnosis of neuropathy he will either arrange for the patient to be seen by a neurologist and/or request an EMG test. In the EMG laboratory neuropathy is tested for by applying small electrical shocks to the nerves and recording the activity from muscles or from the same nerve some distance away. Sometimes this test is accompanied by a fine needle being inserted in one or more muscles.

WHAT CAN BE DONE ABOUT NEUROPATHY?

Some neuropathies tend to get better on their own without any specific treatment. Proximal diabetic neuropathy and truncal neuropathy are two examples. Both are painful conditions and so the pain has to be treated but ultimately within weeks or months the nerves repair themselves and the weakness and numbness subside. However the commonest of the diabetic neuropathies, diabetic polyneuropathy, does not recover on its own. Unfortunately, there are no medications that can cure or halt its progression. However it has been shown convincingly that very good diabetes control will tend to prevent or delay the development of neuropathy. It will also tend to slow the worsening of the neuropathy.

Controlling pain and burning and discomfort (when present) in patients with diabetic polyneuropathy is very important. This can be done in milder cases with acetaminophen on its own or combined with codeine. For more marked symptoms we use two medications that are mainly used for the control of epilepsy, carbamazepine (tegretol) and gabapentin (neurontin). The other group of medications that can be quite effective are a certain type of anti-depressant. It has been discovered that these medications are quite effective in reducing pain of any sort, but particularly in pain caused by nerve damage. Other measures that can be taken by the patient himself or herself is to wear soft thick socks in bed to keep the feet warm and protected from the rubbing of bed clothes. Another trick is to make a cradle that goes over the end of the bed so that the bed clothes don't actually touch the feet but cover the end of the bed and therefore keeps the feet warm.

Diabetic polyneuropathy is one of the contributing factors to the development of foot ulcers. This is because the diabetic patients can't feel properly with their feet so that a tight shoe or something like that is not felt as a source of discomfort and therefore the skin may break down and a foot ulcer develops. Therefore good footwear and good care of the feet as discussed in many booklets available for diabetics is very important.

For carpal tunnel syndrome the treatment is the same for a diabetic as a non-diabetic. The first step is for the patient to wear a wrist splint at night. This often controls the daytime symptoms as well. If this does not improve the symptoms then a small surgical decompression of the nerve at the wrist is indicated. For ulnar neuropathies at the elbow, the first important step is to avoid leaning on the elbows because this can squash the nerve. Sometimes a surgical decompression of that nerve is performed.