

# Case Report: Noninvasive Treatment of Diabetic Peripheral Neuropathy

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Bob is a 70-year-old man with a five-year history of impaired glucose tolerance and has been taking atorvastatin (Lipitor) for approximately three years to manage blood cholesterol levels. He has never smoked, consumes fewer than three alcoholic beverages per week and walks one mile 2-3 times per week.

The A1C test (also known as the hemoglobin A1C or HbA1c test) measures average blood sugar levels over the past three months.<sup>1</sup> Bob's A1C levels are 7.4 percent, indicating that he has type 2 diabetes.

## A Far-Too-Common Presentation

Diabetic neuropathy is one of the most debilitating outcomes of diabetes mellitus (DM) and may cause pain, decreased activity and even amputation. The prognosis of diabetic neuropathy is a difficult task, as it remains silent for several years after the onset of diabetes.<sup>2</sup>

Diabetes is the leading cause of peripheral neuropathy in the United States. It is estimated that 60-100 percent of the diabetic population has some form of neuropathy, ranging from barely detectable asymptomatic neuropathy to severe, disabling, painful disease to dense anesthesia.<sup>3</sup>

The projected number / percentage of U.S. adults with diagnosed diabetes is projected to increase from 22.3 million (9.1 percent) in 2014 to 39.7 million (13.9 percent) in 2030, and to 60.6 million (17.9 percent) in 2060.<sup>4</sup>

## Quantifying Sensory Nerve Dysfunction Using the mTNS

Roughly two months ago, Bob noticed mild tingling in his feet. This was accompanied a month later by burning and pain at night, with all his symptoms gradually becoming worse. He complained that he was not able to walk as much recently due to occasional loss of sensation in his feet.

Sensory nerve dysfunction may produce a wide range of symptoms, from no symptoms to symptoms of tingling, numbness or burning; or a sense of "walking on eggshells," or "standing in a campfire." When motor nerves are affected, the prominent feature is foot deformities, particularly the claw-toe deformity. When autonomic nerves are affected, sweating is lost, and dry, cracked skin may result.<sup>5</sup>

Upon entering the office for care, Bob underwent a complete history and physical exam, yielding the results reported earlier. In addition, the Modified Total Neuropathy Score (mTNS) was used to score his peripheral neuropathy.

The mTNS form utilizes two subjective reports (sensory and motor symptoms), along with four

objective findings (pin sensitivity, vibration sensitivity, motor strength and deep-tendon reflexes).<sup>6</sup> Each parameter is scored from zero (none or normal) to four (severe or disabling). The test is performed on both lower extremities and the scores are totaled.

### A Three-Prong Treatment Strategy Including Laser Therapy

Bob's initial mTNS scores were 10 for the left and nine for the right lower extremity. Since diabetes is a systemic condition, it is expected that mTNS scores will be equal or very close to equal. If there is side-to-side disparity in the mTNS numbers, the diagnosis of diabetic peripheral neuropathy may be incorrect or the patient may have a concurrent condition, such as a lumbar disc herniation.

A treatment plan was created utilizing class 4 laser therapy, specific nutrition and vibration plate sessions. Bob was scheduled for treatment three times per week for four weeks and then two visits per week for two weeks; a total of 16 sessions. Nutrition consisted of ubiquinol,<sup>7</sup> benfotiamine<sup>8</sup> and alpha-lipoic acid.<sup>9</sup>

### Dealing With the Statin Problem

Statins are cholesterol-lowering drugs that effectively reduce the risk of major cardiovascular events and are the most widely prescribed drug worldwide. Statin drugs, such as the Lipitor Bob was taking, can deplete the body's stores of coenzyme Q<sub>10</sub> (CoQ<sub>10</sub>)<sup>10</sup> and interfere with cellular metabolism and health. Several years of clinical experience indicate that when a patient is taking a statin medication, they will not respond to laser therapy treatments as well.

A consultation was arranged with the physician who had prescribed Lipitor. When presented with the evidence regarding the effects of statin drugs on CoQ<sub>10</sub> levels, she agreed to let Bob go on a six-week "statin holiday." The conversation with the prescribing physician was recorded in Bob's chart, as doctors of chiropractic shall not make specific recommendations regarding a patient's prescription medications.

### The Laser Protocol

The first treatment session consisted of therapeutic laser treatments to the low back and both lower extremities. Photobiomodulation (PBM) is "a non-thermal process involving endogenous chromophores eliciting photophysical and photochemical events at various biological scales."<sup>11</sup> Red and infrared laser light is shined directly on the patient's skin, as laser light does not effectively pass through clothing.<sup>12</sup>

PBM treatments are proven to significantly reduce pain and improve the quality of life for patients suffering from diabetic peripheral neuropathy (DPN).<sup>13-14</sup> PBM treatments are shown to reduce the levels of inflammatory markers in patients with DPN, which is important because heightened inflammation is one of the contributory factors for pain and disability.

Due to problems with circulation in the distal extremities, diabetic patients are also susceptible to ischemia-reperfusion injuries.<sup>15</sup> When the blood supply is temporarily cut off and then allowed to return, an inflammatory event is created, further damaging the distal peripheral nerves. Laser therapy is proven in small animal studies to inhibit the production of pro-inflammatory cytokines (such as tumor-necrosis factor), and elevate anti-inflammatory cytokines<sup>16</sup> (such interleukin-10).

The low back laser protocol consisted of multiple wavelengths (660, 810, 915 and 980 nanometers) at 13 watts average power delivered in continuous wave (CW) and pulsed modes for five minutes.

This delivered 3,900 joules (J) to an area of 400 square centimeters (cm<sup>2</sup>) over the L2 to S4 spinal levels, for a surface dosage of 9.75 J/cm<sup>2</sup>. This treatment is delivered so therapeutic laser can reach the cell bodies of the peripheral nerves, in the conus medullaris and on through the lumbar plexus.

In the lower extremities, mTNS scores dictated laser treatment from the knee to the toes. In the leg, the parameters were as follows: power: 7 watts; time: 4.5 minutes in CW and pulsed modes, for a total dose of 1,890 joules. In the foot: 6 watts for three minutes, giving a total dose of 1,080 J in CW and pulsed modes.

#### Treatment Outcomes

Treatments were tolerated well and continued as scheduled. Upon the third visit, the patient commented, "I slept through the night. The pain did not wake me up!" At the eighth visit, the mTNS form was completed, with a score of five on both the left and right. This reduction from the original mTNS scores indicates positive progression of the patient's condition.

After the 16th visit, the mTNS scores were both only one, with the only finding being loss of vibration sensitivity in the tips of the toes. The patient was satisfied with care and released.

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