Case Report

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A Case Study on Diabetic Neuropathy

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Abstract

For the past nine years, a 54-year-old woman has had decreased glucose tolerance. A low dose of an angiotensin-converting enzyme inhibitor is used to treat her sole other medical problem, hypertension (ACE) & Metformin + Vildagliptin 50/500mg. She has had a stress ECG every two years, and the results have always been fine. During normal lab tests, she had a positive result for glucose intolerance. The first step in treating diabetic neuropathy is glucose control once the condition has been identified. Rigid insulin management dramatically decreased the likelihood of developing neuropathy, according to research by the Diabetes Complications and Control Trial Research Group. Even in patients with "excellent" blood glucose control, stricter management may result in improvements or a slowdown of the progression of neuropathy symptoms. Her vitamin B12 levels were found to be insufficient. She was taking a vitamin supplement containing folate, therefore there was no indication that she had macrocytic anemia. B12 therapy started for the patient. She claimed that although her neurological issues had only somewhat improved after 4 months of therapy.

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INTRODUCTION

Diabetes mellitus (DM) is a disorder characterized by high blood sugar levels over prolonged time periods. The condition causes damage to nerves due to prolonged hyperglycemia. Neuropathy associated with DM may cause tingling, numbness, pain, burning sensation, muscle weakness, and even loss of feeling in feet and hands [1]. These symptoms are often caused by nerve damage, and they tend to get worse over time. Diabetic foot ulcers (DFU) occur when diabetic neuropathy results in soft-tissue breakdown in the skin and/or underlying tissues of the lower leg [2]. DFUs are painful sores that can become infected and lead to amputation if left untreated. Diabetic neuropathy occurs when nerve cells lose their normal function. As a result, people who experience this problem may feel pain, discomfort, and reduced sensitivity in certain parts of their body. These changes can affect the way that people walk, stand, sit, and perform daily activities. People suffering from diabetic neuropathy may also benefit from using compression garments. Compression socks are tight fitting socks that wrap around the

affected limb(s). They help to decrease swelling and promote circulation. In addition, they may provide some relief from pain and numbness [3].

According to the World Health Organization, 422 million adults have diabetes and another 1.5 million people become newly diagnosed each year. In 2015, there were estimated to be 463 million diabetic patients globally. Of these, approximately 80% had type 2 diabetes. Type 2 diabetes is associated with obesity, physical inactivity, unhealthy diet, genetics, and aging. People who have type 2 diabetes are at risk for several long-term complications including heart disease, stroke, kidney failure, retinopathy, peripheral artery disease, amputations, erectile dysfunction, depression, anxiety, vision loss, and nerve damage [4]. Diabetic neuropathy is a complication of diabetes mellitus and occurs when a person's blood sugar level is abnormally high over time. As a result of high blood sugar, the body produces excess amounts of sorbitol, a sugar alcohol that damages the small fibers of the nerve. Damage to these fibers causes them to lose their ability to transmit nerve impulses. While some people recover completely after many years of high blood sugar, others may develop milder symptoms that last for months or even years. Symptoms vary depending on the location of the damaged nerves. Most commonly, people experience numbness, burning, or tingling in their feet or hands. Other possible symptoms include weakness in the legs or arms, problems walking, difficulty speaking, dizziness, blurred vision, headaches, stomach aches, fatigue, and mood changes [5].

Other types of diabetes mellitus include type 1 diabetes mellitus (T1DM), type 2 diabetes mellitus (T2DM), gestational diabetes, juvenile diabetes, monogenic diabetes, and mongolian diabetes. T1DM is an autoimmune disease in which the pancreas does not produce insulin anymore. In contrast, T2DM is a metabolic disorder characterized by excessive amounts of glucose in the blood. Gestational diabetes is a temporary condition arising during pregnancy and disappears once the baby is born. Juvenile diabetes is a chronic disease that affects children. Monogenic diabetes is a rare inherited disease [6]. Mongolian diabetes is a type of diabetes that develops in people who have been exposed to radiation. There are several ways to treat diabetic neuropathy [Figure 1]. These treatments vary depending on what type of neuropathy is present. In general, the goal is to improve blood flow to the affected area and reduce inflammation. Treatment for diabetic neuropathy includes medications, surgical procedures, and physical therapy. Medications that help control blood sugar levels can reduce the risk of developing complications related to diabetic neuropathy. Surgery may be necessary to treat severe cases of diabetic neuropathy. Physical therapy focuses on strengthening muscles and joints to improve walking ability [7].

Figure 1: Diabetic Patient Foot

Case Study

A 54 years old woman, working as a bank employee is suffering with an impaired glucose tolerance since 9 years. Hypertension, which is her only other medical issue, is managed with a low dose of an angiotensin-converting enzyme inhibitor of (ACE) and diabetes mellitus with Metformin + Vildagliptin 50/500mg. She has had stress electrocardiograms every two years with normal results and has no dyslipidemia. On normal laboratory tests, her glucose intolerance was found. She received diabetes education, learned how to check her blood sugar at home, and followed a diet and exercise regimen recommended by our diabetes educator. She was not overweight and lived an active lifestyle, playing golf frequently and going on brisk walks virtually every day. With the help of this routine, she was able to normalize her blood glucose levels and lose 10 pounds. She began to experience burning and tingling in her feet around three months ago [Table 1]. She acknowledged that she hadn't felt as good as usual and that walking was getting harder. She denied feeling breathless or having chest pain. She claimed not to have any other symptoms and was free of a cough, fever, chills, bloody stools, or hematuria. She has put on 5 pounds since being seen in the office. Her physical examination revealed no abnormalities other than some little hyperesthesia in both of her feet and a diminished vibratory sensation. Her pulse reflexes and thyroid all functioned normally. She wasn't down, though.

Her fasting and pre-meal blood glucose levels were typically less than 130 mg/dl, according to an examination of her blood glucose log. Almost invariably, postprandial glucose levels were greater than 150 mg/dl. Studies in the lab indicated normal chemical compositions other than fasting blood glucose of

Table 1: Results of Laboratory Findings

S.No	Lab Tests	Results
1	White blood cells	2.14 x 109/L (4-10 x 109/L)
2	Hemoglobin	9.7 g/dL (12-15 g/dL)
3	Hematocrit	27% (36%-47%)
4	Platelets	358 x 1097/L (150-400 x 109/L)
5	Mean corpuscular volume	106 fL (80-100 fL)
6	Mean corpuscular hemoglobin concentration	34.3 g/dL (33-36 g/dL)
7	Red blood cell distribution width	(11.5%-14.5%)
8	Reticulocytes	(0.5%-1.5%)
9	Ferritin	(12-150 ng/mL)
10	B12 486	(130-700 ng/L)
11	Folate	(2-20 ng/mL)
12	FBS	130 mg/dl (70-110 mg/dl)
13	RBS	(110-180 mg/dl)
14	PPBS	150 mg/dl (110-0180 mg/dl)
15	GRBS	8.41 (7.82-11 mmol/L)
16	HbA1C	7.4 (6.3-14 mmol/L)

146 mg/dl. Her HbA1c was 7.2%, up from 6.1% six months prior (normal range: 4.0–6.0%). Prostate-specific antigen (PSA) testing, a complete blood count, a lipid panel, a liver screening, and a kidney profile were all normal. Repaglinide was started, who was prescribed 0.5 mg twice day with breakfast and dinner. She was asked to fax in her blood glucose readings every two weeks for the following two months while continuing to check her blood sugar. She was urged to resume her previous exercise routine. Her blood glucose levels nearly normalized after a few weeks [Figure 2]. She reported no instances of hypoglycemia. She lost the 5 pounds she had acquired plus an extra 4 pounds by the time she returned to the office two months later. Her HbA1c level has increased to 7.6%. However, she said that her exhaustion had not significantly improved and that the pain in her feet—where small ataxia had been noticed had increased.

Figure 2: Diabetic Neuropathy Foot of a Patient

DISCUSSION

Diabetes is the most common cause of peripheral neuropathy in the West. According to estimates, 60–100% of people with diabetes have some form of neuropathy, which can range from a scarcely perceptible asymptomatic neuropathy to a severe, debilitating, painful condition to dense anesthesia. There is little doubt that the severity and length of hyperglycemia are the main causes, despite the fact that the underlying mechanisms are intricate, incompletely known, and currently the subject of active research [8]. No symptoms, tingling, numbness, or burning symptoms, as well as the sensation of ”walking on eggshells” or a ”strange sensation” beneath the ball of the foot, can all be signs of sensory nerve dysfunction. Foot abnormalities, especially claw-toe deformity, are a conspicuous symptom of motor nerve damage. Sweating stops when autonomic nerves are compromised, and dry, cracked skin may develop as a result. Since diabetes is only one of many possible causes of peripheral neuropathy, it is very crucial to take a thorough medical history while dealing with neuropathy. Usually, the ”exposure neuropathies” (abuse of alcohol, poisons, HIV, etc.) may be ruled out in the past. To identify familial neuropathies, inquire about similar symptoms in family members [9].

In addition to diabetes, other differential diagnosis for someone complaining of painful, burning feet include alcohol poisoning, HIV infection, an underlying malignant tumor, or amyloidosis. Peripheral

neuropathy, thyroid illness, rheumatoid arthritis, diabetes, and amyloidosis are more likely diagnoses if carpal tunnel syndrome is present. Another indicator of the etiology of various neuropathies is when symptoms first appear, with mononeuritis having an abrupt onset and "entrapment" causes being more chronic and progressive [10]. To evaluate vibration, light touch, and temperature sensations, reflexes, and proprioception, a thorough physical examination should be performed. When evaluating protective feeling, a 10-g filament that is widely accessible, disposable, and simple to use is highly helpful. Complete blood counts, general chemistries, and assessments of glycemic control using the HbA1c test should all be part of laboratory tests. To rule out thyroid disease, a thyroid stimulating hormone (TSH) test should be performed, and measurements of folate and vitamin B12 should be taken to rule out pernicious anemia. Other tests including antinuclear antibodies, sedimentation rate, rheumatoid factor, and urine protein electrophoresis might be necessary if there is still a doubt about the etiology [11].

A definitive diagnosis can be made with the aid of nerve-conduction studies, which determine whether the myelin or nerve axon is impacted. Electromyography can tell if weakness is caused by a problem with the muscles or the nerves. A nerve biopsy can detect vacuities, amyloidosis, sarcoidosis, and several genetic neuropathies in patients with severe and progressive disease. The underlying cause is addressed during treatment after a comprehensive evaluation. Glycemic management is the first step in treatment once diabetic neuropathy has been identified. The Diabetes Complications and Control Trial Research Group found that intensive insulin therapy had a substantial impact on preventing neuropathy. At five years, the prevalence rates in those receiving rigorous therapy had been cut by half. Tighter control may result in improvements or a slowdown of the evolution of neuropathy symptoms in people even whose blood glucose control is in the "excellent" range. Her (Patient) vitamin B12 status was found to be inadequate. Since she was taking a vitamin supplement containing folate, no macrocytic anemia was discovered. Because people with pernicious anemia have a higher risk of developing gastric cancer, a colonoscopy and upper gastrointestinal X-rays were performed on her because she had never had one to rule out any malignancy. These test outcomes were typical. Treatments with B12 were started for the patient [12]. She claimed that her neurological issues had only slightly improved after 4 months of therapy, but her exhaustion had subsided.

CONCLUSION

A 54-year-old lady who works as a bank employee has had reduced glucose tolerance for the past nine years. Her only other medical condition is hypertension, which is treated with a low dose of an angiotensin-converting enzyme inhibitor of (ACE) diabetes mellitus with Metformin + Vildagliptin 50/500mg. Every two years, she has had a stress ECG, and the findings have been normal. She also has no dyslipidemia. She tested positive for glucose intolerance on routine lab exams. Once diabetic neuropathy has been diagnosed, the first step in treatment is glycemic control. According to research conducted by the Diabetes Complications and Control Trial Research Group, rigorous insulin therapy significantly reduced the risk of developing neuropathy. Even in patients whose blood glucose control is in the "excellent" range, tighter control may lead to improvements or a slowing in the growth of neuropathy symptoms. Her level of vitamin B12 was found to be insufficient. There was no evidence of macrocytic anemia because she was taking a vitamin supplement containing folate. The patient began receiving B12 treatments. After 4 months of therapy, she asserted that her neurological difficulties had only minimally improved, but her weariness had subsided.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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