Case Report:

Paresthesia of post-treatment painful diabetic neuropathy and its relation with glycemic control

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Abstract

Post-treatment painful diabetic neuropathy (PPN) usually develops several weeks after a rapid improvement in glycemic control and presents as dramatic, severe and refractory paresthesia in the lower extremities. We report a case of a Japanese patient with type 2 diabetes. The patient had experienced a long, untreated diabetic period of several years combined with poor glycemic control. Glycemic correction was performed 2 times, with PPN that occurred after the first treatment and no PPN after the second treatment. This case indicates that factors such as the speed of glycemic control, body weight trends, and the patient’s mental condition may cause PPN. When a patient with poor glycemic control has rapid improvement in glycemic control, PPN and a mental conflict may occur. It is important that both the physical and mental aspects of the patient’s situation and condition is communicated carefully and thoroughly to patients with PPN.

Key words: Anxiety, body weight loss, painful neuropathy, paresthesia

**Introduction**

Rapid glycemic level adjustments in patients with diabetes with long-term poor glycemic control may cause paresthesia in the legs, lower back and even the entire body. This symptom is a form of post-treatment painful diabetic neuropathy (PPN) (1-8). PPN usually develops several weeks after rapid improvement in glycemic control and presents as dramatic, severe and refractory paresthesia. We report a case of a patient with type 2 diabetes. Glycemic correction was performed 2 times, with PPN occurring after the first treatment and no PPN after the second treatment.

**Case presentation**

Patient: A 42-year-old male Japanese office worker. Clinical history: Phases 1–6, which were categorized based on glycemic control (Figure 1).

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Phase 1 (before starting diabetes therapy)

He performed deskwork in an office in the daytime and drank large quantities of alcohol (alcohol flush reaction) until midnight or later every night and smoked 20 cigarettes daily. His body weight (BW) was 56 kg and body mass index (BMI) was 22.2 kg/m² in his twenties, but his BW reached 68 kg (BMI 26.9 kg/m²) when he was in his mid-30s. Although he had been diagnosed with hyperglycemia in 2004, he chose to ignore medical recommendations. Numbness in his toes and the sole of his foot began in 2007, at 38 years of age. (Figure 2: paresthesia-1)

Phase 2 (at age, 39–40 years: the first period of glycemic control)

In 2008, at 39 years of age, his HbA1c was 11.4% (9). He was diagnosed with type 2 diabetes and administration of miglitol (150mg/day) was initiated. He had a BW of 51 kg (BMI 20.3 kg/m²), HbA1c of 11.2%. His Achilles tendon reflex (ATR) was not observed in both feet; but he did not have retinopathy or nephropathy in January, 2009. His medication was changed to insulin (0.35 U/kg/day) during the same month. Insulin was discontinued in March, and his medicine was changed to voglibose (0.9 mg/day). In February–March, he began to experience paresthesia-2 (Figure 2; lancinating and tingling pain throughout legs and waist–back). These symptoms were worse at night.
Figure 1: Clinical course

Figure 2: Distribution of paresthesia (shaded portion)
Paresthesia-2 did not significantly improve after treatment with loxoprofen. His sleep disorder and appetite loss were also becoming a concern around this time.

**Phase 3 (at age 40 years: the first period of glycemic control stability)**

He began his medical treatment in our hospital in July (BW 49.5 kg; BMI 19.6 kg/m²; HbA1c 6.7%; proliferative retinopathy in both eyes). He was not diagnosed with a motor disturbance or malignant disease and radiography did not detect spinal problems. Paresthesia-1 was diagnosed on the basis of the evidence of diabetic peripheral polyneuropathy, which presented as numbness of the toes and the soles and the absence of the ATR on both legs. Paresthesia-2 was diagnosed as PPN because of the appearance of symptoms immediately after rapid glycemic control. Paresthesia-2 did not significantly improve, even after the administration of mexiletine (300 mg/day) (10) and paroxetine (10 mg/day) (11). His sleeping disorder, appetite loss, depression and reluctance to go to work began to worsen. Because he was not knowledgeable about PPN, he was informed repeatedly of the clinical course of PPN and of the importance of quitting drinking and smoking. Furthermore, he was instructed not to worry excessively about the temporary paresthesia.

After hearing repeated explanations of PPN, he reduced the amount of alcohol. Compared to lifestyle described in Phases 1–2, daily life rhythm was stabilized and steady glycemic control was maintained throughout Phase 3. Although he stated that the internal medicine therapy did not soothe the effects of paresthesia-2, he began to think that his condition was not as severe as he had imagined it would be after hearing continual explanations of PPN. Thereafter, his appetite gradually returned to normal and paresthesia-2 began to improve slowly. He was tapered off mexiletine and paroxetine until October. In September, his trait anxiety score (12) was 43 and his Center for Epidemiologic Studies Depression Scale score (13) was 20.

As he increased his food intake, HbA1c and BW once again showed an upward trend. Daily life rhythm was stabilized along with the increase in his appetite and paresthesia-1 was sustained while paresthesia-2 was reduced.

**Phase 5 (at age 41 years: the second period of glycemic control)**

We presumed that slowing down the rate of glycemic control would cause relapse of paresthesia-2 observed in Phases 2–3. Daily intake of food was limited to 1600 kcal and daily life rhythm was stabilized. Subsequently, glimepiride (0.5 mg/day) was administered because the upward trend in HbA1c was noticed again. Although paresthesia-1 remained to a small extent, paresthesia-2 was reduced.

**Phase 6 (at age 41–42 years: the second period of glycemic control stability)**

Daily life rhythm became steady and dietary intake was closely monitored. HbA1c decreased slowly compared to the decrease in Phases 2–3. He occasionally experienced a mild paresthesia-1, but did not experience paresthesia-2.

**Discussion**

In this case, BW dropped before starting diabetes therapy because of hyperglycemia. Furthermore, PPN was experienced after first glycemic control, followed by appetite loss and a subsequent BW loss, as seen in Phases 2–3. A steady appetite resulted in an increased BW, as seen in Phases 5–6 (second glycemic control).

Although the levels of glycemic control in Phases 2 and 5 (fluctuation band of HbA1c) were the same (with HbA1c values of 11% and 6%, respectively), the period spent on glycemic control in Phase 2 was relatively short (several months), while the period spent in Phase 5 was longer (one year). The pathways of glycemic control in Phase 2 were rapidly corrected during the first treatment with insulin, while a gentle and slow correction was performed in Phase 5. Diabetic retinopathy deteriorates after rapid glucose control in patients having poor glycemic control and a long diabetic contraction period (14, 15). This case study
showed rapid diabetic retinopathy deterioration in Phases 2 and 3. Therefore, the systemic metabolism had experienced a combination of a state of long-term poor glycemic control (increased catabolic state) and rapid short-term blood glucose control in this case. This resulted in a delicate homeostatic glucose metabolism of systemic instability, rapid short-term blood glucose changes and control of blood glucose through the enhancement of insulin action; these actions affect the metabolism and result in a rapid systemic de-stabilization. This situation caused individual-level adaptations to fail, and this phenomenon of lessening symptoms is thought to have emerged from the progressive worsening of PPN and retinopathy.

An important feature of this case is that the distribution areas of paresthesia-2 were not limited to a particular dermatome or adjacent dermatomes but were spread across dermatomes, occurring in the legs, waist, and back region. This finding suggests that the rapid modulation of glycemic levels confuses the metabolism of the entire body, producing unusual sensations that cannot be the sole result of diabetic neuropathy. PPN shows periods of improvement when observed over an average of one year (6). In our patient, paresthesia-2 improved after 6 months.

Our patient had habit of alcohol consumption and smoking. Alcoholism and vitamin deficiencies can cause widespread damage to nerve and smoking is associated with the presence of diabetic neuropathy. The positive effects of reduced alcohol consumption in Phases 3 must be taken into consideration. Smoking is associated with diabetic neuropathy. Our patient could not stop smoking and we did not measure serum vitamin B12 levels.

Certain psychological traits have been associated with patients with diabetes (16) and chronic pain (17-19). Our patient had a trait anxiety score of 43 (Stage 4: high), suggesting that he had an anxious personality. Excessive attention to pain is dependent upon the presence of pain-related fear (19). Furthermore, large individual variations exist in the perception of paresthesia because the level of paresthesia is a subjective sensation. Initially, our patient did not expect to get better because he was not knowledgeable about PPN. Pain catastrophizing (20) might affect the level of PPN. After our patient received continual explanations, PPN improved slowly. Thus, these explanations may have led to meaningful reductions in the level of anxiety associated with PPN.

Conclusion

PPN caused when a patient with poor glycemic control has rapid improvement in glycemic control may be exacerbated when there is an existing mental conflict. In itself PPN may also create a mental conflict and further exacerbate the situation. It is important that both the physical and mental aspects of the patient’s situation and condition is communicated carefully and thoroughly to the patient with PPN.

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References


