A case of neurosyphilis accompanied by deterioration of type 2 diabetes management

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Abstract
A 66-year-old man was admitted with visual impairment, functional disability, and worsening glycemic control. On admission, he had optic atrophy without diabetic retinopathy in both eyes, sensory impairment of the lower extremities, ataxia, and cognitive impairment. As both serum and cerebrospinal fluid tested positive for syphilis, he was diagnosed with neurosyphilis and treated with antibiotics. Functional ability and cognitive function improved after conducting syphilis treatment; we consequently started him on an insulin self-administration program. Two years later, his glycemic control has normalized. Dementia caused by neurosyphilis is one of the most important differential diagnoses of treatable dementia; hence, early diagnosis and early treatment are important.

Keywords
cognitive impairment, diabetes mellitus, IADL, neurosyphilis, treatable dementia

1 | INTRODUCTION

Neurosyphilis is caused by treponema pallidum infection of the central nervous system. If it is detected early, neurosyphilis is known to be one of the treatable forms of dementia. However, the disease has become relatively rare with the advancement of antibiotics. On the other hand, it has been reported that dementia and diabetes mellitus are closely related1 and that along with the decrease in cognitive functions, glycemic control becomes difficult for patients to manage.2 Herein, we report a case in which we observed some improvements after treating a patient suffering from neurosyphilis. Instrumental activity of daily living (IADL), cognitive functions, and glycemic control in type 2 diabetes improved.

2 | CASE PRESENTATION

A 66-year-old man who had been receiving treatment for type 2 diabetes mellitus using some oral hypoglycemic agents for 14 years was admitted to our hospital with visual disturbance, decline in IADL, and worsening diabetes control. Half a year before he came to our hospital, he began to experience photophobia. Moreover, his visual acuity began to worsen suddenly in both eyes. Although he had been able to ride his bicycle to the hospital as 1 month prior, recently, he started to fall even when walking. At around the same time, his medication intake became irregular. On the other hand, glycemic control deteriorated rapidly from HbA1c 7.5% to 9.9% during the last 2 months.

On arrival, his unaided vision had deteriorated to 0.2 (right) and 0.15 (left). Any evidence of skin rash, aphtha, genital ulcer, or gumma was not revealed. The neurological examination showed that he had a wide-based gait and was neither able to stand on one foot nor perform a tandem gait, which indicated that he had ataxia. There was decreased tactile sensation in both upper and lower extremities, decreased pallor, and diminished deep tendon reflexes. The other nervous system examinations and manual muscle test were assessed as normal. He scored 17 points on Hasegawa’s Dementia Scale-Revised Score (HDS-R) and 18 points on the Mini-Mental State Examination (MMSE).

Laboratory examinations on admission were as follows: Fasting blood glucose was 188 mg/dL, and HbA1c was 10.3%. Other factors...
such as peripheral blood count, blood biochemical analysis, and serum electrolytes did not show any abnormalities. Antinuclear antibodies and anti-aquaporin-4 antibody were not detected. Serologic test results for syphilis were as follows: rapid plasma reagin (RPR) was 19.4 RU, and treponema pallidum hemagglutination assay (TPHA) was 35.9 TU. The screening of sexually transmitted infections including hepatitis B virus, hepatitis C virus, and human immunodeficiency virus was negative. Cerebrospinal fluid (CSF) test results were as follows: The number of cells was 55/mm3, protein 114 mg/dL, RPR 9.4 RU, and TPHA 35.9 TU. We found optic atrophy in both although fundus examination did not indicate diabetic retinopathy. The sural nerve and the tibial nerve conduction velocities were diminished. Brain magnetic resonance imaging revealed old left watershed infarction.

Serological and CSF analyses led us to the diagnosis of neurosyphilis. We treated the patient with penicillin G for 14 days (Figure 1). Although visual disturbances and diminished nerve conduction velocities did not improve, the patient's ataxia and IADL improved. There were also some improvements in cognitive functions: One year later, he scored 27 on the HDS-R and 23 on the MMSE, and 2 years later, he scored 28 on the HDS-R and 27 on the MMSE.

To treat diabetes, we tried to switch from using combination therapy with four oral hypoglycemic agents to the basal insulin-supported oral antidiabetic therapy (BOT) immediately after hospitalization. However, we abandoned the switch because he could not learn the procedure of insulin self-administration. Six months after starting the antisyphilis therapy, we once again tried to instruct him in the procedure of insulin self-administration. This time, he could learn the procedure. Therefore, we started him on BOT and improved his glycemic control: One year later, HbA1c was 6.7%, and 2 years later, HbA1c was 5.8%.

3 | DISCUSSION

The idea of treatable dementia was suggested in the 1980s. Some of the diseases that can cause such treatable dementia are as follows: normal pressure hydrocephalus, brain tumors, subdural hematoma, hypothyroidism, vitamin deficiencies, dehydration, alcoholism, or toxic disorders. As presented in this study, neurosyphilis is one such disease that can cause treatable dementia and furthermore, should not be overlooked as an etiology for progressive dementia because delay in starting treatment worsens improved cognitive dysfunction.

At first, in this case, we thought that the IADL decline was due to diabetic retinopathy and diabetic neuropathy. However, there were no retinal lesions and he was affected by cognitive impairment. Moreover, the patient exhibited some versatile and rapid neurological symptoms that could not have been explained by diabetic neuropathy alone. To our knowledge, the same kind of case study has only been reported once in the past. There have been some reports on the relationship between syphilis and diabetes mellitus, whereas no firm conclusions have been reached. Recently, there was a report in a case-control study that neurosyphilis and diabetes mellitus are closely related. In the future, we hope there will be further studies not only in the field of epidemiology but also regarding the mechanisms and prognoses of these diseases.

It has been reported that diabetic patients have a higher risk of developing dementia. Meanwhile, dementia patients often experience distress with diabetes management in everyday clinical practice. It was also reported that diabetes management deteriorated significantly for diabetic patients who also experience cognitive dysfunctions. The mechanisms for the deterioration of diabetes management are assumed to be factors such as memory loss and mobility impairments, which cause proper medication adherence and lifestyle habits to suffer. In this case, we judge that a successful antisyphilis therapy led to improved cognitive and physical function. They also contributed to his learning the procedure of self-administration of insulin, improving medication adherence, and lifestyle habits by enhancing IADL, which improved diabetic management.

In conclusion, for neurosyphilis, early diagnoses and medical interventions can improve not only cognitive functions but also physical function.
functions. This will lead to better diabetic management and improve quality of life extending healthy life expectancy in this case.

CONFLICT OF INTEREST

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

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