

# A case report of neuromyelitis optica spectrum disorder with peripheral neuropathy as the first episode

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## Abstract

**Rationale:** Neuromyelitis optica spectrum disorders (NMOSDs) represent recurrent autoimmune diseases, generally beginning with optic nerve neuritis or acute transverse myelitis.

**Patient concerns:** A 57-year-old male with long-term alcohol intake was hospitalized because of limb numbness. EMG examination showed the peripheral sensory nerve was in demyelination and an axonal injury was found. His symptoms could not be improved by vitamin B injection but were later significantly attenuated by dexamethasone treatment. Four months later, symptoms of optic neuritis in the left eye appeared, and 6 months later he exhibited peripheral neuropathy with acute myelitis.

**Diagnoses:** He was diagnosed NMOSD.

**Outcomes:** Immunotherapy improved his peripheral neuropathy and myelitis symptoms.

**Lessons:** NMOSD patients could represent peripheral neuropathy as the first episode.

**Abbreviations:** NMOSD = neuromyelitis optica spectrum disorder, SNamp = sensory nerve action potential, SNCV = sensory nerve conduction velocity.

**Keywords:** myelitis, NMOSD, optic nerve neuritis, peripheral neuropathy

## 1. Introduction

Neuromyelitis optica spectrum disorders (NMOSDs) are autoimmune diseases that manifest clinically with 6 core symptoms, which include acute optic neuritis, transverse long segment myelitis, and acute brainstem syndrome.<sup>[1]</sup> The first episode generally includes one or more core symptoms but does not involve pathological changes in peripheral nerves. Here, we report for the first time a case of an aquaporin-4 (AQP-4)-negative NMOSD with a first episode of peripheral neuropathy but without other core symptoms. He was diagnosed after multiple relapse and found negative for AQP-4 expression.

## 2. Case report

The study was approved by the ethical committee of China–Japan Union Hospital of Jilin University, China. Written informed consent was obtained.

A 57-year-old male was hospitalized due to limb numbness for 1 month without fever, diarrhea, or vaccination. He denied any history of hypertension, diabetes, rash, and joint pain but did report more than 20 years of drinking. Muscle strength testing value (Medical Research Council grade) showed right upper limb distal muscle strength grade 3, left upper limb distal muscle strength grade 4, limb tendon reflexes disappeared, and sensation impaired in the lower extremity (below the elbows and knees). Bilateral pathological signs were negative. Blood tests as well as liver and kidney function were normal. The latency of the right median nerve and ulnar nerve, sensory nerve conduction velocity (SNCV), and the sensory nerve action potential (SNamp) disappeared. The SNamp of the right superficial peroneal nerve and sural nerve were reduced. The latency of the H wave in the right tibial nerve was delayed. The patient was considered to have peripheral pathological nerve changes caused by chronic alcoholism. He was given B vitamins injections for 7 days, but this did not improve his condition. Dexamethasone (5 mg, intravenous for 3 days) was then added and the symptoms significantly improved. The muscle strength of the left upper limb gradually returned to normal and the muscle strength of the right upper limb returned to 4+ levels. The pain perception impairment decreased below the bilateral wrist joint and ankle joint. The patient demanded discharge. From then on, prednisone was used via oral administration (10 mg for 14 days). B vitamins were orally taken consistently. This patient could walk and hold objects, and his daily life was not affected. The patient showed increased numbness again 1 month later and visited the hospital due to continuous numb limbs 2 month later. No obvious abnormalities were found via cervical and lumbar MRI. The EMG reported prolonged ulnar nerve, median nerve, sural nerve, and peroneal nerve latencies; additionally, SNCV was slowed and SNamp was reduced. The diagnosis of peripheral neuropathy was maintained. Continued intramuscular B vitamins administration did not

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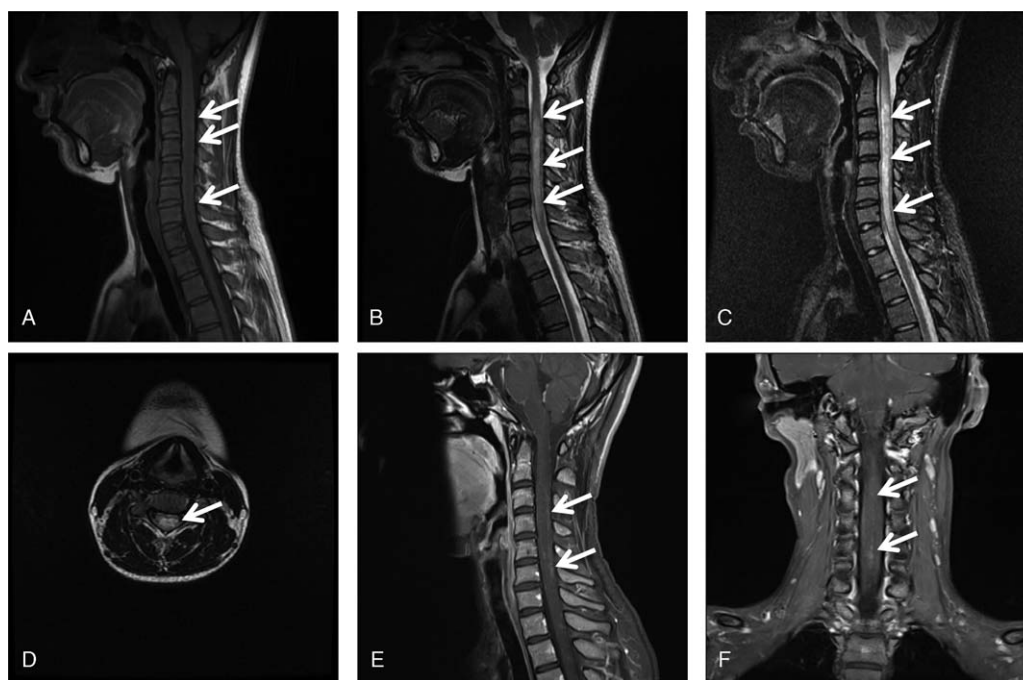
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**Figure 1.** Cervical MRI images showed long a strip and abnormal sheet signals from 2th to 8th cervical level. (A) T1WI: spinal cord showed a long signal; (B) T2WI: spinal cord showed a long signal; (C) Fat-saturated sequence showed a high signal; (D) the horizontal cross-section of 3th cervical level showed a high intraplate signal; and (E, F) enhanced scan for enhanced signals of intramedullary patches. MRI=magnetic resonance imaging, T1WI=T1-weighted images, T2WI=T2-weighted images.

improve his numbness. Four months later, he developed blurred vision in the left eye, which was diagnosed as optic neuritis. He was offered methylprednisolone treatment but refused. Six months later, limb numbness had developed, accompanied by significant limb weakness, difficult walking and urinating. Examination results were as follows: left eye vision 0.8, right eye vision 1.2, hand and foot muscle atrophy, (more obvious in the right limbs), right upper limb proximal muscle strength 4, distal muscle strength 2, left lower limb muscle strength 4, right lower limb proximal muscle strength 3, distal muscle strength 4, and limb tendon reflex disappeared. The pain sensation level was bilateral at the 2nd cervical level. Deep feeling impairment was on the bilateral 3rd thoracic level. Cervical MRI showed long signals on T1-weighted images (T1WI) and T2-weighted images (T2WI) from the 2nd to 8th cervical level, as well as a high signal of spinal fat saturated sequence (Fig. 1). Serum AQP4-IgG was negative. Right upper and lower limb EMG results were as follows: for the right median nerve (thumb), right ulnar nerve, and sural nerve, Lat, SNCV, SNamp disappeared; for the right median nerve (middle finger), the SNamp was attenuated; the right median F wave incidence decreased. For the first interosseous muscle, the right tibialis anterior muscle and the right gastrocnemius muscle, no spontaneous potentials were observed at a resting state. The double peripheral segments were prolonged and the amplitude decreased. The visual evoked potential of bilateral N75, P100, and N145 latencies were prolonged. Finally, he was diagnosed with NMOSD and received methylprednisolone treatment. His condition significantly improved. The patient was discharged but continued taking azathioprine and gradually reduced prednisone orally. After 6 months, he could walk on his own and take care of himself. The left eye visual acuity was 1.0 and the right eye vision was normal.

### 3. Discussion

In addition to the 6 core symptoms, NMOSD may be accompanied by other symptoms of immune diseases<sup>[2]</sup> but is generally not associated with peripheral neuropathy. At present, only 6 NMOSD cases with peripheral neuropathy have been reported.<sup>[3]</sup> Some researchers consider its pathogenesis to be associated with AQP4 antibody-mediated astrocyte loss or complement activation associated with peripheral AQP4 antibodies.<sup>[4]</sup> NMO recurrence was also reported to occasionally exhibit both central and peripheral nerve demyelination; however, its mechanism remained elusive.<sup>[3]</sup> This is consistent with this patient in our report. Although our case also was AQP4-negative, his symptoms were different from the previous reported 6 cases. Our case only presented with peripheral neuritis at the first onset without myelitis or optic nerve inflammation. In contrast, both peripheral nerve and central nerve systems were involved for first onset or at the recurrence in the other reported 6 cases of NMOSD.

In our report, the patient shows recurrent NMOSD. During the 3rd onset, myelitis, optic neuritis, peripheral nerve demyelination, and axonal injury changes simultaneously appeared. The general performance of the first onset of NMOSD should involve one or more of the core symptoms mentioned above. However, this patient only showed peripheral neuropathy at the early phase. Chronic alcoholism can lead to a lack of vitamins and hence peripheral neuropathy.<sup>[5]</sup> However, after temperance and long-term treatment with B vitamins, his peripheral neuropathy was not improved. Conversely, the steroid treatment alleviated the symptoms. Additionally, after prednisone therapy, the peripheral nerve conduction velocity, latency and amplitude were markedly improved. These indicated that the patient's first

onset of peripheral neuropathy was caused by immune factors, rather than long-term drinking-induced nutritional metabolic disorders. The mechanism underlying peripheral neuropathy as the first episode of NMOSD is not clear. We assume that long-term drinking could cause a certain degree of peripheral nerve metabolic disorders, which results in a high sensitivity to immune regulation and the first onset of neuropathy in the peripheral nerve system.

#### 4. Conclusion

Peripheral neuropathy could represent a primary onset of NMOSD even before core symptoms.

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