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# Unilateral Abducens Nerve Palsy as an Early Feature of Multiple Mononeuropathy Associated with Anti-GQ1b Antibody

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## Key Words

Unilateral abducens nerve palsy · Anti-GQ1b antibody · Multiple mononeuropathy · Acute ophthalmoplegia without ataxia · Inferior dental plexus

## Abstract

Patients with anti-GQ1b antibody syndrome show various combinations of ophthalmoplegia, ataxia, areflexia, or altered sensorium as clinical features. We describe herein a unique case with unilateral abducens nerve palsy as an early feature of multiple mononeuropathy involving dysfunctions of the inferior dental plexus and the ulnar nerve, which was thought to be associated with anti-GQ1b antibody. A 27-year-old man presented with acute-onset diplopia. He subsequently experienced numbness not only in the right lower teeth and gums but also on the ulnar side of the left hand. Neurological examinations revealed dysfunctions of the right abducens nerve, the right inferior dental plexus, and the left ulnar nerve, suggesting multiple mononeuropathy. Serum anti-GQ1b antibody was positive. This is a rare case report of a patient with unilateral abducens nerve palsy as an early feature of multiple mononeuropathy associated with anti-GQ1b antibody. We suggest that anti-GQ1b antibody syndrome should be taken into consideration as a differential diagnosis of acute multiple mononeuropathy if ophthalmoplegia is present unilaterally.

## Introduction

Miller Fisher syndrome (MFS) is characterized by the acute onset of external ophthalmoplegia, ataxia, and areflexia. Previous research has demonstrated that patients with MFS have serum immunoglobulin G (IgG) antibody against GQ1b ganglioside during the acute phase of the illness [1]. Anti-GQ1b antibody has not only been found in

MFS but also in Guillain-Barré syndrome with ophthalmoplegia, Bickerstaff brainstem encephalitis, and acute ophthalmoplegia without ataxia (AO). These inflammatory neuropathies are labeled ‘anti-GQ1b antibody syndrome’. Patients affected with them show various combinations of ophthalmoplegia, ataxia, areflexia, or altered sensorium as clinical features. We describe herein a unique case with unilateral abducens nerve palsy as an early feature of multiple mononeuropathy involving dysfunctions of the inferior dental plexus and the ulnar nerve, which was thought to be associated with anti-GQ1b antibody.

### Case Report

A 27-year-old male dentist had a cough and sore throat, and 1 week later suddenly experienced diplopia. On the day after the onset of diplopia, he noticed numbness in the right lower molar teeth and gums, just as if under local anesthesia. The following day, he experienced numbness of the ulnar side of the left hand. He consulted our department 2 days after the onset of neurological complications. On admission, physical examination showed him to be mentally alert with normal respiration and blood pressure. Cranial nerve examination revealed ophthalmoparesis with limitation of the right eye abduction only (fig. 1), indicating palsy of the right abducens nerve. Pupil size was normal with brisk light reflexes, and blepharoptosis was absent. Sensory deficits regarding touch, pain, temperature, and pressure were noted in the right lower molar teeth and gums, indicating dysfunction of the right inferior dental plexus, which is formed by branches of the inferior alveolar nerve. His gait was normal without ataxia, and limb muscle power was full with normal tendon reflexes. Sensory testing demonstrated paresthesia of the fourth and fifth digits of the left hand, indicating dysfunction of the left ulnar nerve.

A serum sample was negative or normal for the following components tested for: glucose level, antinuclear antibodies, rheumatoid factor, proteinase 3-antineutrophil cytoplasmic antibody, myeloperoxidase-specific antineutrophil cytoplasmic autoantibody, antibodies to SS-A and SS-B, angiotensin-converting enzyme, human immunodeficiency virus, and antibody to varicella zoster. Protein in cerebrospinal fluid was 62 mg/dl with normal cellularity. The sputum culture was positive for *Haemophilus parainfluenzae*. Electrodiagnostic studies of median, ulnar, and peroneal nerves showed no abnormalities in normal compound muscle action potential amplitudes and sensory nerve action potentials, whereas F-wave frequencies of the left ulnar nerve were markedly reduced [18% (normal: >40%)]. There was no conduction block, abnormal temporal dispersion, or pseudo-conduction block. MRI showed no abnormalities in the orbits, brain (including brainstem), and spine. In addition, diffusion-weighted images showed no abnormalities suggestive of infarction, and neither did whole-body CT scanning show any abnormalities suggestive of malignancy.

After admission to our hospital on day 5, the patient’s right abducens nerve palsy became worse. His ankle tendon reflexes became gradually hypoactive and later completely absent. Anti-ganglioside antibody was assayed by ELISA of serum obtained on day 6. We investigated both IgG and IgM antibody activity against the gangliosides GM1, GM2, GM3, GD1a, GD1b, GD3, GT1b, GQ1b, GA1, Gal-C, and GT1a, and detected high titers of anti-GQ1b IgG antibody [400 (normal: <200)] and anti-GT1a IgG antibody (400). On day 7, considering the diagnosis as AO, he underwent intravenous immunoglobulin treatment (IVIg) 0.4 g/kg for 5 days, and made a rapid recovery. On day 15, deep tendon reflex and sensory function of the fingers of the left hand became normal. In addition, the F-wave frequencies in the left ulnar nerve improved (75%). There was no change in the ulnar sensory nerve action potentials after therapy. The numbness in the right lower molar teeth and gum disappeared on day 17. The right abducens nerve palsy lessened from day 18, and was fully resolved on day 52.

### Discussion

This is a rare case report of a patient with unilateral abducens nerve palsy as an early feature of multiple mononeuropathy associated with anti-GQ1b antibody. Our patient showed an acute onset of external ophthalmoplegia and areflexia without ataxia following an infection. He exhibited a rapid recovery from all neurological symptoms after IVIg.

Together with positive serum anti-GQ1b antibody, these clinical courses indicate that he had AO associated with anti-GQ1b antibody. It is known that some patients show unilateral abducens nerve palsy as a clinical feature of anti-GQ1b antibody syndrome [2]. However, acute multiple mononeuropathy is rare for a clinical feature of anti-GQ1b antibody syndrome.

It is striking that our patient showed such unusual features consistent with multiple mononeuropathy including dysfunction of the unilateral abducens nerve, the trigeminal nerve branch, and the ulnar nerve. It has been demonstrated that GQ1b is widely expressed in the oculomotor cranial nerves [3], and such anatomical distribution may account for frequent development of ophthalmoparesis in anti-GQ1b antibody syndrome. Although binocular involvement is more common in AO, unilateral ophthalmoparesis has occasionally been described in anti-GQ1b antibody syndrome [4, 5]. Moreover, previous research demonstrated that some patients with AO exhibited paresthesia of the hands or feet [5]. These clinical features of AO are consistent with those of our case.

Our patient appeared to have selective dysfunction of the right inferior dental plexus, which is formed by branches of the inferior alveolar nerve. Dysfunction of the inferior alveolar nerve is typically caused by tumor invasion or iatrogenic injury [6, 7]. However, these causes cannot explain the dysfunction of the right inferior dental plexus observed in our patient. Therefore, the remaining explanation for the present case is that dysfunction of the right inferior dental plexus was associated with anti-GQ1b antibody. Dysfunction of the inferior dental plexus associated with anti-GQ1b antibody has not been reported, but trigeminal neuropathy has been reported to occur in anti-GQ1b antibody syndrome [3]. Thus, we believe that the patient's neurological symptoms, including dysfunction of the inferior dental plexus, are consistent with multiple mononeuropathy associated with anti-GQ1b antibody syndrome.

We should also note that the combination of anti-GT1a IgG and anti-GQ1b IgG antibodies is often seen in cervicobrachial variants with ophthalmoplegia [8]. However, it has been shown that such patients have anti-GT1a IgG antibodies which do not cross-react with GQ1b [9]. In addition, their characteristic features were defined as bulbar palsy, neck weakness, absence of sensory disturbance, and positive *Campylobacter jejuni* serology [10]. In our patient, however, the titers of anti-GT1a IgG and anti-GQ1b IgG antibodies were the same level, and neither bulbar palsy nor neck weakness was observed. Taken these findings together, we think that the clinical features of our case are more consistent with anti-GQ1b IgG than anti-GT1a antibodies. Although the exact pathomechanism remains unclear, multiple mononeuropathy should be considered as a rare manifestation of post-infectious auto-immune disorders in association with serum antibodies to gangliosides.

## Conclusion

Our case indicates that anti-GQ1b antibody syndrome should be taken into consideration as a differential diagnosis of acute multiple mononeuropathy, especially given an antecedent infection, if ophthalmoplegia is present unilaterally. Early detection of antibodies against gangliosides including GQ1b would lead to a rapid cure with IVIg and improve patients' quality of life.

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## Disclosure Statement

No conflicts of interest.



**Fig. 1.** Extraocular movements on day 6. The patient showed a limitation of abduction on the right side, indicating right abducens nerve palsy.

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