Hemiplegic peripheral neuropathy accompanied with multiple cranial nerve palsy

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Abstract

A 32-year-old man experienced double vision around January, 2010, followed by weakness of his left upper and lower extremities. Articulation disorders and loss of hearing in his left ear developed, and he was admitted to our hospital on February 14, 2010. Physical examination was normal, and neurological examination showed clear consciousness with no impairment of cognitive function, but with articulation disorders. Olfactory sensation was reduced. Left ptosis and left gaze palsy, complete left facial palsy, perceptive deafness of the left ear, and muscle weakness of the left trapezius muscle were observed. Paresis in the left upper and lower extremities was graded 4/5 through manual muscle testing. Sensory system evaluation revealed complete left-side palsy, including the face. Deep tendon reflexes were slightly diminished equally on both sides; no pathologic reflex was seen. No abnormality of the brain parenchyma, cerebral nerves or cervicothoracolumbar region was found on brain magnetic resonance imaging. On electroencephalogram, alpha waves in the main frequency band of 8 to 9 Hz were recorded, indicating normal, and neurological examination showed clear consciousness with no impairment of cognitive function, but with articulation disorders. Olfactory sensation was reduced. Left ptosis and left gaze palsy, complete left facial palsy, perceptive deafness of the left ear, and muscle weakness of the left trapezius muscle were observed. Paresis in the left upper and lower extremities was graded 4/5 through manual muscle testing. Sensory system evaluation revealed complete left-side palsy, including the face. Deep tendon reflexes were slightly diminished equally on both sides; no pathologic reflex was seen. Chest X-ray, electrocardiogram, thoracoabdominal computed tomography, abdominal ultrasound, and peripheral hematological values were normal. Blood chemistry revealed glucose 174 mg/dL, HbA1c 7.8%, CK 366 U/L, and no other abnormal findings. Anti-acetylcholine antibody, anti-Jo-1 antibody, and antiganglioside antibody were all negative. Spinal fluid revealed a cell count of 3/μL, protein 68 mg/dL, glucose 98 mg/dL, showing albumino-cytologic dissociation; myelin basic proteins and oligoclonal bands were not detected. No gene mutation related to mitochondrial encephalomyopathy was discovered. Nerve conduction velocity test showed delay of conduction in the bilateral peroneal nerve and median nerve at motor conduction velocity with conduction blocks and only a slight delay in sensory conduction velocity. Needle electrode examination was normal. No abnormality of the brain parenchyma, cerebral nerves or cervicothoracolumbar region was found on brain magnetic resonance imaging (MRI). On electroencephalogram, alpha waves in the main frequency band of 8 to 9 Hz were recorded and no obvious paroxysmal discharge was observed, indicating normal findings. 

Case Report

A 32-year-old man experienced double vision around January, 2010, followed by weakness of his left upper and lower extremities. Articulation disorders and loss of hearing in his left ear developed, and he was admitted to our hospital on February 14, 2010. Physical examination was normal, and neurological examination showed clear consciousness with no impairment of cognitive function, but with articulation disorders. Olfactory sensation was reduced. Left ptosis and left gaze palsy, complete left facial palsy, perceptive deafness of the left ear, and muscle weakness of the left trapezius muscle were observed. Paresis in the left upper and lower extremities was graded 4/5 through manual muscle testing. Sensory system evaluation revealed complete left-side palsy, including the face. Deep tendon reflexes were slightly diminished equally on both sides; no pathologic reflex was seen. Chest X-ray, electrocardiogram, thoracoabdominal computed tomography, abdominal ultrasound, and peripheral hematological values were normal. Blood chemistry revealed glucose 174 mg/dL, HbA1c 7.8%, CK 366 U/L, and no other abnormal findings. Anti-acetylcholine antibody, anti-Jo-1 antibody, and antiganglioside antibody were all negative. Spinal fluid revealed a cell count of 3/μL, protein 68 mg/dL, glucose 98 mg/dL, showing albumino-cytologic dissociation; myelin basic proteins and oligoclonal bands were not detected. No gene mutation related to mitochondrial encephalomyopathy was discovered. Nerve conduction velocity test showed delay of conduction in the bilateral peroneal nerve and median nerve at motor conduction velocity with conduction blocks and only a slight delay in sensory conduction velocity. Needle electrode examination was normal. No abnormality of the brain parenchyma, cerebral nerves or cervicothoracolumbar region was found on brain magnetic resonance imaging (MRI). On electroencephalogram, alpha waves in the main frequency band of 8 to 9 Hz were recorded and no obvious paroxysmal discharge was observed, indicating normal findings. Brain SPECT scan showed reduced blood flow in the right inner frontal lobe and both occipital lobes (Figure 1). Nerve biopsy (left sural nerve) showed reduction of nerve density by 30%, with demyelination, but no adventitial thickening around capillaries, ruling out diabetic peripheral neuropathy. After high-dose intravenous gammaglobulin (25 g/day, 5 days) therapy, articulation disorder, ocular movement disturbance, hearing loss, and motor disturbance of the distal muscles and distal sensory disturbance in the left lower extremity resolved and the patient was able to walk, though mild motor disturbance of the distal muscles and distal sensory disturbance in the left upper extremity remained.

Discussion

Tumors, vascular disease, trauma, tuberculosis, and bacterial infection are the most frequent major causes of multiple cranial nerve palsy. Other causes include demyelination neuropathies such as Guillain-Barré syndrome, CIDP, Charcot-Marie-Tooth disease, granulomatous lesions such as Tolosa-Hunt syndrome and sarcoidosis, vasculitis such as Behcet’s disease and Sjögren syndrome, and diabetes mellitus. The sudden onset of double vision, articulation disorders, and left hemiplegia in our patient suggested cerebrovascular disorder, multiple sclerosis, or diabetic external ophthalmoplegia. The patient also showed manifestations of multiple cranial nerve disorder, i.e., of the trigeminal nerve, glossopharyngeal nerve, vagus nerve, and hypoglossal nerve. Whole-body examination was negative. Finally, based on ischemic brain
SPECT images, spinal fluid findings and nerve biopsy results, peripheral neuropathy accompanied with multiple cranial nerve palsy was diagnosed. High-dose intravenous gamma-globulin (25 g/day, 5 days) was initiated. After two weeks, articulation disorders, left ocular motility, deafness of the left ear, and left trapezius muscle weakness were improved. Brain SPECT findings also improved. On grounds of neurological examination and brain SPECT were improved after high-dose intravenous gamma-globulin therapy, I assumed that this case may be associated with some kind of inflammatory change.

Although this patient had disturbances of the central nervous system including the cranial nerves, no abnormal findings were found on brain MRI. However, SPECT revealed a decrease in cerebral blood flow (CBF) in the right frontal lobe contralateral to the affected side of the body, extending to the region around the anterior cingulate gyrus and right cerebral cortex. The Fab region of the immunoglobulin molecule binds to various antigens while the Fc region binds to effector cells to regulate immune response. Human blood components include 3 types of Fc receptors (FcγRI, FcγRII, and FcγRIII) whose ligand is the Fc region of immunoglobulin, and most of these receptors activate inflammation. However, FcγRIIB is an exception and is known to enhance immunological tolerance and suppress inflammation. In CIDP, it has been demonstrated that genetic polymorphism in the promoter region of FcγRIIB correlates with decrease in FcγRIIB expression on B cells. Decrease in FcγRIIB is likely to lead to the breakdown in the immune suppression system and result in excessive activation of the inflammatory reaction. Therefore, we believe that a similar condition was caused in this patient and inflammation spread to not only the peripheral nerves but also the central nerves, resulting in the decrease in CBF on SPECT. In addition, the decrease in CBF in this patient may be partially due to a transient ischemic condition arising from a change in the central process of the primary sensory nerves caused by a sensory disturbance through C fibers activated by inflammation. A published report on the therapeutic experience of 10 patients with CIDP or its subtype notes that anti-TNFα medications were effective in treating sensory disturbance. Therefore, the inflammatory mediator that activated C fibers in our patient may be associated with TNFα cytokines. That is, we think that, since the inflammatory response disappeared after high-dose intravenous immunoglobulin therapy, this accounts for the improvement of SPECT findings after therapy. Cases of multiple cranial nerve palsy due to diabetes mellitus have been reported, though without complications of impairment of motion. But CIDP with central nervous system symptoms as in this case is rare, and no study presenting the changes in SPECT before and after treatment has been reported.

In addition, this case is important and valuable because it presents findings indicating that the central nervous system symptoms observed in a patient with CIDP may be related to an ischemic condition caused by an inflammatory change in the central nervous system. The present case is a very unusual one of hemiplegic peripheral neuropathy accompanied with multiple cranial nerve palsy.

References

Figure 1. Brain single photon emission computed tomography scan showed reduced blood flow in the right inner frontal lobe and both occipital lobes. Improvements in flow can be seen two weeks after intravenous gamma-globulin (25 g/day, 5 days).