Subacute Combined Degeneration of the Spinal Cord: Detection of preferential involvement of the fasciculus cuneatus using MRI

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Abstract

The patient was a 68-year-old man, hospitalized due to subacute onset of finger ataxia and gait disturbance. Laboratory examination revealed macrocytic anemia, decreased level of serum vitamin B₁₂, and the presence of antiparietal and antiintrinsic factor antibodies. High signal intensity was observed in the fasciculus cuneatus of the spinal cord on T2-weighted MRI. Intramuscular injection of vitamin B₁₂ resulted in reduction of intensity lesion on MRI and improvement of symptoms.

Key words

vitamin B₁₂ deficiency, fasciculus cuneatus, MRI, spinal cord, subacute combined degeneration

INTRODUCTION

Subacute combined degeneration of the spinal cord is well known as neuropathy caused by vitamin B₁₂ deficiency. There have been reports of the disease accompanied by a variety of MRI findings¹⁻¹²). We will present the MR findings demonstrating a focal lesion of the fasciculus cuneatus in a patient with subacute combined degeneration of the spinal cord who had improvement in clinical symptoms as well as abnormalities on MRI after the administration of vitamin B₁₂.

CASE REPORT

The case discussed here is a 68-year-old male. He had difficulty in using his fingers and walking for 5 months. He suffered from severe anemia and underwent treatment including blood transfusion and vitamin B₁₂ in a hospital, then he was transferred to our hospital because of gait disturbance and finger ataxia with gradually worsening symptoms. He had a history of diabetes mellitus for 3 years prior to admission.

General physical findings on admission revealed no abnormality other than mild anemia in the palpebral conjunctiva. The patient had a clear conscious although light psychological agitation was observed. In cranial nerves the restriction in abduction of the left eyeball was observed. He had normal muscle tone and strength, but the gait was unsteady.
and wide-based. Romberg's sign was present. Deep tendon reflexes were normal in the upper extremities, but decreased in the lower extremities. Babinski's sign was negative. The superficial sensation showed glove and stocking hypoesthesia. Vibration and position sense were decreased in his extremities. His fingers demonstrated pseudoathetosis. Coordination was normal in the arms, but the leg was ataxic.

Fig. 1a Sagittal T2-weighted MRI image (TR 3500/TE 110) of the cervical cord showing the involvement of the posterior half of the cord (arrow).

Fig. 1b An abnormal intensity lesion was limited to the fasculus cuneatus on axial T2-weighted MRI (TR 3500/TE 110) of the cervical cord at the C3 level (arrow).

Fig. 2 Abnormal high signal intensities in the cervical cord were markedly decreased on T2-weighted MRI (TR 3000 /TE 120) and axial T2-weighted MRI (TR 3000 /TE 120) at 3 weeks after administration of vitamin B12 as shown in Fig. 1-a and b.
Blood examination on admission in our hospital demonstrated 10.1 g/dl of hemoglobin and 118.3 fl of mean corpuscular volume, indicating macrocytic anemia. The concentration level of serum vitamin B₁₂ was low (155 ng/ml), while serum folic acid and vitamin B₉ were normal. The antiparietal antibody was 80 fold and the antiintrinsic factor antibody was positive.

Sagittal T2-weighted cervical MRI on admission showed a high signal intensity (Fig. 1a) from level C2 to C4. The high signal intensity (Fig. 1b) was localized at the dorsal cord, corresponding mainly to fasciculus cuneatus in particular, on axial scans at level C3. T1-weighted MRI and contrast enhancement images showed no abnormality.

After three weeks of the treatment with cyanocobalamine (1000 µg/day I.M.), pseudoaetosis of fingers and gait disturbance were improved and marked resolution of the abnormal signal intensity in the spinal cord was also observed (Fig. 2a, b).

**DISCUSSION**

This patient showed pseudoaetosis and loss of sense with position and vibration. These deficits were responsive to vitamin B₁₂ treatment. Although he had antiparietal and antiintrinsic factor antibodies, other evidence did not suggest any other diseases. According to these characteristic symptoms, the effects of those treatment, and other clinical findings including MRI and laboratory data, we diagnosed this case as subacute combined degeneration of the spinal cord.

Except for the report of Berger and Quencer¹, there have been a few reports of this disease²-¹² of subacute combined degeneration of the spinal cord with a lesion detected using MRI. Most of these cases were treated by vitamin B₁₂, and resulted in the reduction of the intensity lesion on MRI and improvement in symptoms. A T2 high signal intensity corresponding to the dorsal cord have been considered as the characteristic sign of this disease on MRI, but the lesion occasionally has been reported as the lateral column¹² or the anterior column³. MRI findings of patients with abnormal contrast enhancement ⁴⁻⁵ and spinal cord expansion⁵ have also been reported. Only one report⁵ mentioned the detection of a lesion limited to the fasciculus cuneatus on MRI.

Scott et al¹³ have suggested that the accumulation of methylmalonyl-CoA induced by vitamin B₁₂ deficiency causes neuropathy in patients with subacute combined degeneration. The primary characteristics of the disease are pathologically considered to be demyelination and axonal degeneration with gliosis. In our case, the fasciculus cuneatus might be specifically affected, suggesting that this portion might be selectively sensitive to vitamin B₁₂ deficiency. The present case, however, was already at the cure stage by administrating vitamin B₁₂ in the previous hospital and the size of the lesion seemed to be decreasing when the patient was transferred to our hospital. Therefore, it might have been difficult to detect the lesion of the posterior column of the spinal cord, especially in the fasciculus cuneatus compatible with gait disturbance. Since atypical lesions in the patients with subacute combined degeneration of the spinal cord have been reported³⁻⁵ as shown in this case, it seems to be necessary to examine more cases of this disease. Accumulation of a more precise MRI image of this disease is necessary.

**References**

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