Reversible myelopathy with vitamin B12 deficiency

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ABSTRACT

Vitamin B12 deficiency causes haematological, gastrointestinal, psychiatric and neurological diseases. Subacute combined degeneration (SCD) of the spinal cord, characterised by degeneration of the lateral and posterior columns, is often found due to vitamin B12 deficiency. We report SCD occurring in a 57-year-old man who presented with a 2.5–month history of gradually progressing tingling in the fingers and toes and neck ache. Laboratory data revealed vitamin B12 deficiency and magnetic resonance (MR) imaging of the cervical spinal cord demonstrated abnormal hyperintense signal changes on T2-weighted imaging of the posterior columns. In our case, follow-up MR imaging findings correlated well with clinical outcome after treatment with vitamin B12 supplements. Neurological symptoms in vitamin B12 deficiency are frequent. Early spinal MR imaging assists in the early diagnosis and treatment of the disease.

Keywords: myelopathy, reversible myelopathy, spinal cord degeneration, subacute combined degeneration of the spinal cord, vitamin B12 deficiency

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INTRODUCTION

Vitamin B12 deficiency is caused by malabsorption in the gastrointestinal tract, insufficient nourishment by food or genetic deficiency of methylmalonyl-CoA mutase enzyme. It usually presents with various haematological, gastrointestinal and neuropsychiatric manifestations. Commonly-seen neuropsychiatric manifestations include myelopathy, neuropathy, dementia, neuropsychiatric abnormalities and rarely, optic nerve atrophy.[1] The present report highlights a subacute combined degeneration (SCD) diagnosed on spinal magnetic resonance (MR) imaging and electrophysiological signs in a 57-year-old man presenting only with sensory symptoms.

CASE REPORT

The patient presented with a 2.5-month history of abrupt onset of tingling beginning below the elbow and extending to the fingers, difficulty in opening and closing the fingers, opposing the finger tips, tingling in the toes and neck ache. The patient had undergone stent application for coronary artery disease 1.5 years ago. The patient's background and history did not reveal pre-existing diabetes mellitus, alcohol addiction, vegetarian food preference or gastrointestinal symptoms. On examination, deep tendon reflexes were slightly hyperactive on upper and lower extremities. Impaired sensation and hypoaesthesia of the distal part of upper extremities was determined. Vibration, joint position sense and cerebellar examination were evaluated as normal. Romberg's sign, Babinski's sign, and Lhermitte's sign were absent.

Laboratory tests revealed fasting blood glucose 80 mg/dL, aspartate aminotransferase (AST) 19 U/L, alanine aminotransferase (ALT) 18 U/L, blood urea nitrogen 26 mg/dL, creatinine 0.9 mg/dL, Hb 13.3 g/dL, mean corpuscular volume (MCV) 123.7 fL, white blood cell count 4,600 m/μL, and sedimentation rate 13 mm/hr. Vitamin B12 level was 60 pg/ml (189–883 pg/ml) and HbA1C level was determined as 4.6. Somatosensorial evoked potential (SEP) studies disclosed prolonged P40 latency and diminished amplitude. Electromyography was normal (the peripheral nerve conduction studies; sural nerves, peroneal motor and sensory nerves, median and ulnar motor and sensory nerves were normal). Upper gastrointestinal examination revealed partly linear erythema and oedema of the gastric antrum, and erythema and deformity of the duodenal bulb. Gastric and small intestine mucosa were normal on histological examination. Brain MR imaging was normal.

Cervical spine MR imaging showed gliotic areas that were isointense in the T1-weighted image, and hyperintense in the turbo inversion recovery magnitude (TIRM)-weighted and fluid attenuation inversion recovery (FLAIR) images (Fig. 1). There was no contrast enhancement noted. The radiological studies and measurement of tumour markers showed no evidence of metastasis. Following clinical and laboratory examinations, the patient was evaluated as cervical myelopathy due to Vitamin B12 deficiency and treatment included IM cyanocobalamin replacement. The symptoms totally disappeared two months after IM supplementation of vitamin B12 (1,000 μg IM daily for a week and then weekly for six weeks) and the MR imaging abnormalities significantly improved (Fig. 2). However, impairment of the SEP continued.

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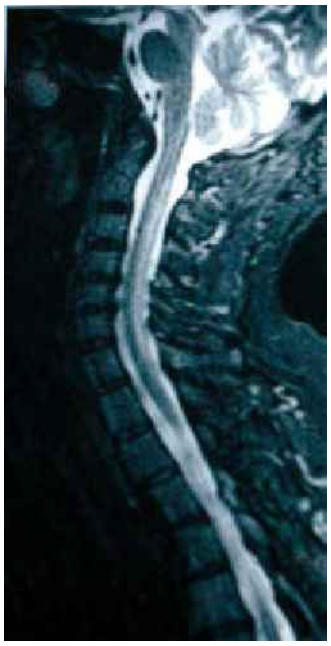

Fig. 1 Sagittal T2-W MR image shows high signal abnormality in the posterior aspect of the cervical cord extending from C1 through C7.

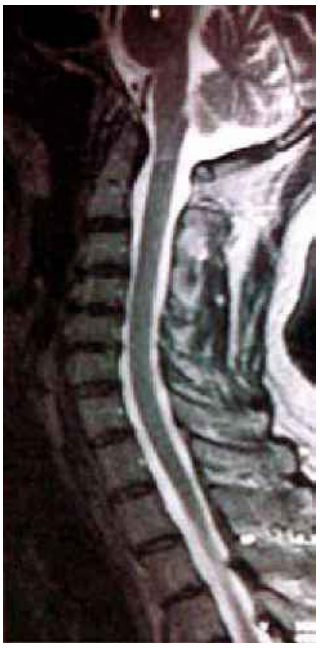

Fig. 2 Sagittal T2-W MR image shows resolution of signal abnormality in cervical cord after the start of therapy.

DISCUSSION

The true prevalence of vitamin B12 deficiency in the general population is unknown. Cobalamin (vitamin B12) deficiency is the most common cause of megaloblastic anaemia. Among patients aged > 65 years, between 10% and 15% have cobalamin deficiency. The causes of cobalamin deficiency are pernicious anaemia, food-cobalamin malabsorption, other malabsorption syndromes, nutritional deficiency, and other gastrointestinal causes (e.g. Zollinger-Ellison syndrome, Crohn's disease, coeliac disease or chronic pancreatic insufficiency).[2]

Vitamin B12 deficiency usually presents with brain, spinal cord, optic nerve and peripheral nervous system manifestations. Clinical symptoms can evolve as symmetrical sensory disturbances. The most serious damage is seen by the involvement of the posterior and lateral columns of the cervical and upper dorsal parts of the spinal cord. Regarding the pathophysiological mechanism, lack of adenosylcobalamin (required as a cofactor for the conversion of methylmalonyl-CoA to succinyl-CoA) leads to accumulation of methylmalonyl-CoA, causing a decrease in normal myelin synthesis, incorporation of abnormal fatty acids into neuronal lipids. This leads to involvement of the spinal column, which is responsible for the impairment of position sense, paraparesia and tetraparesia. This clinical picture is termed SCD.[3] The clinical profile of our patients was dominated by damage to the posterior column of the spinal cord. The major findings were dysaesthesia and gait disturbance with impairment of position and vibration sense in the lower limbs and often in the upper limbs.[4] SEP studies disclosed prolonged P40 latency and diminished amplitude in this case.

MR imaging of the posterior column, and rarely lateral column, of the spinal cord that showed abnormally increased T2-signal hyperintensity in SCD have been documented.[5,6] Differential diagnoses of abnormal signal lesions in the posterior columns of the spinal cord include infectious or postinfectious myelitis, peripheral neuropathy, lymphoma and other neoplasm, paraneoplastic myelopathy, cervical spondylosis, radiation myelitis, multiple sclerosis, sarcoidosis, arterial or venous ischaemia, traumatic cord injury, arterial or venous ischaemia, vascular malformations of the dura and spinal cord, and syringomyelia, metabolic disease (including vitamin E deficiency) and acute transverse myelitis.[7] Treatment with hydroxycobalamin or cyanocobalamin delays disease progression, and to some degree of reversal of symptoms, with complete recovery in almost half of the patients. Treatment included IM 1,000 µg/day cyanocobalamin injections. Vitamin replacement is applied daily in the first 7–14 days, weekly in the subsequent month, and monthly afterwards, to store cyanocobalamin in the body.[8]

In summary, SCD is clinically characterised by predominant involvement of the posterior column, resulting in impairment of position and vibration sense and dysaesthesia. In some patients, MR imaging shows abnormalities of the spinal cord, indicating demyelination of the posterior column. Early diagnosis and treatment play an important role in the reversibility of neurological deficits; delayed treatment results in irreversible disabling neurological impairment.

REFERENCES

1. Lee GR. Pernicious anemia and other causes of vitamin B12 (cobalamin) deficiency. In: Lee GR, Foerster J, Lukens J, et al, eds. Wintrobe's Clinical Hematology. 10th ed. Baltimore: Williams & Wilkins, 1999: 941-64.
2. Pennypacker LC, Allen RH, Kelly JP, et al. High prevalence of cobalamin deficiency in elderly outpatients. J Am Geriatr Soc 1992; 40:1197-204.
3. Yamada K, Shrier DA, Tanaka H, Numaguchi Y. A case of subacute combined degeneration: MRI findings. Neuroradiology 1998; 40:398-400.
4. Hemmer B, Glocker FX, Schumacher M, Deuschl G, Lucking CH. Subacute combined degeneration: clinical, electrophysiological, and magnetic resonance imaging findings. J Neurol Neurosurg Psychiatry 1998; 65: 822-7.
5. Wolansky LJ, Goldstein G, Gozo A, et al. Subacute combined degeneration of the spinal cord: MRI detection of preferential involvement of the posterior columns in a child. Pediatr Radiol 1995; 25:140-1.
6. Locatelli ER, Laureno R, Ballard P, Mark AS. MRI in vitamin B12 deficiency myelopathy. Can J Neurol Sci 1999; 26:60-3.
7. Vorgerd M, Tegenhoff M, Kuhne D, Malin JP. Spinal MRI in progressive myeloneuropathy associated with vitamin E deficiency. Neuroradiology 1996; 38 Suppl 1:111-3.
8. Bolaman Z, Kadikoylu G, Yukselen V, et al. Oral versus intramuscular cobalamin treatment in megaloblastic anemia: a single-center, prospective, randomized, open-label study. Clinical Therapeutics 2003; 25:3124-34.