

LETTER TO THE EDITOR

Manganism without Parkinsonism: Isolated Unilateral Upper Limb Tremor in a Welder

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Manganese neurotoxicity, or manganism, was first described by Couper et al. in 1837¹ and presents as hypophonia, excessive salivation, limb tremor, muscle weakness and a bent posture while walking. The phenotype of manganism can be classified based on the following predominant manifestations: 1) behavioral changes, 2) parkinsonian features, and 3) dystonia with severe gait disturbances, i.e., the “cock walk.”² The modern-day phenotype is significantly milder and is most frequently seen in welders who are exposed to manganese fumes.^{3,4} A classic MRI shows hyperintensities in the globus pallidus and substantia nigra in the T1 weighted images.⁴ Chelating agents, such as trientine, have been reported to improve neurological symptoms and imaging features in patients with manganese toxicity.⁵

A 27-year-old man had a 9-year history of occupational welding. He had not utilized respiratory protective measures, and the sites of welding were variable, i.e., indoors, outdoors, etc. He presented with a right upper limb (UL) tremor that had been ongoing for 2 years. The tremor was insidious in onset and was initially noticed while he was holding a welding torch. The tremor only occurred when the elbow was flexed, and he denied the presence of slowness, stiffness, gait difficulty or a tremor elsewhere in the body. He had no other complaints and an unremarkable medical and family history.

Upon examination, his Mini-Mental Status Examination score was 29/30, and there was no speech abnormality, significant dystonia, bradykinesia, rigidity or gait abnormality. A rest tremor

of the right UL was elicited by cognitive coactivation (Supplementary Video 1 in the online-only Data Supplement). No tremor was observed with arms outstretched, flexed at the elbow, or abducted at the shoulder. A jerky tremor was observed when the patient flexed the elbow joint with the forearm pronated or supinated and when the arm was internally or externally rotated with the elbow flexed at 90°. Minimal dystonic posturing of the right UL, characterized by wrist flexion and slight ulnar deviation, was also observed. No entrainability or distractibility was observed. Surface electromyography revealed a 4–5 Hz tremor with co-contraction of the right forearm muscles and the right biceps and triceps. An MRI of the brain showed bilateral, symmetric T1-weighted hyperintensities of the globus pallidus and substantia nigra (Figure 1). No calcification was observed on a plain CT scan of the brain (Supplementary Figure 1 in the online-only Data Supplement). Routine blood investigations, serum copper and ceruloplasmin were normal, and a slit lamp examination for a Kayser–Fleischer ring was negative. There was no evidence suggestive of liver dysfunction. The video of the patient was taken after written informed consent.

We obtained serum manganese levels based on the imaging findings and occupational history that revealed elevated serum manganese levels of 2.68 ng/mL (0.6–2.3 ng/mL). To rule out the presence of manganese transporter gene defects, we sequenced coding regions for SLC30A10 and SLC39A14, and none of the reported, or novel, pathogenic variants were observed. We pre-

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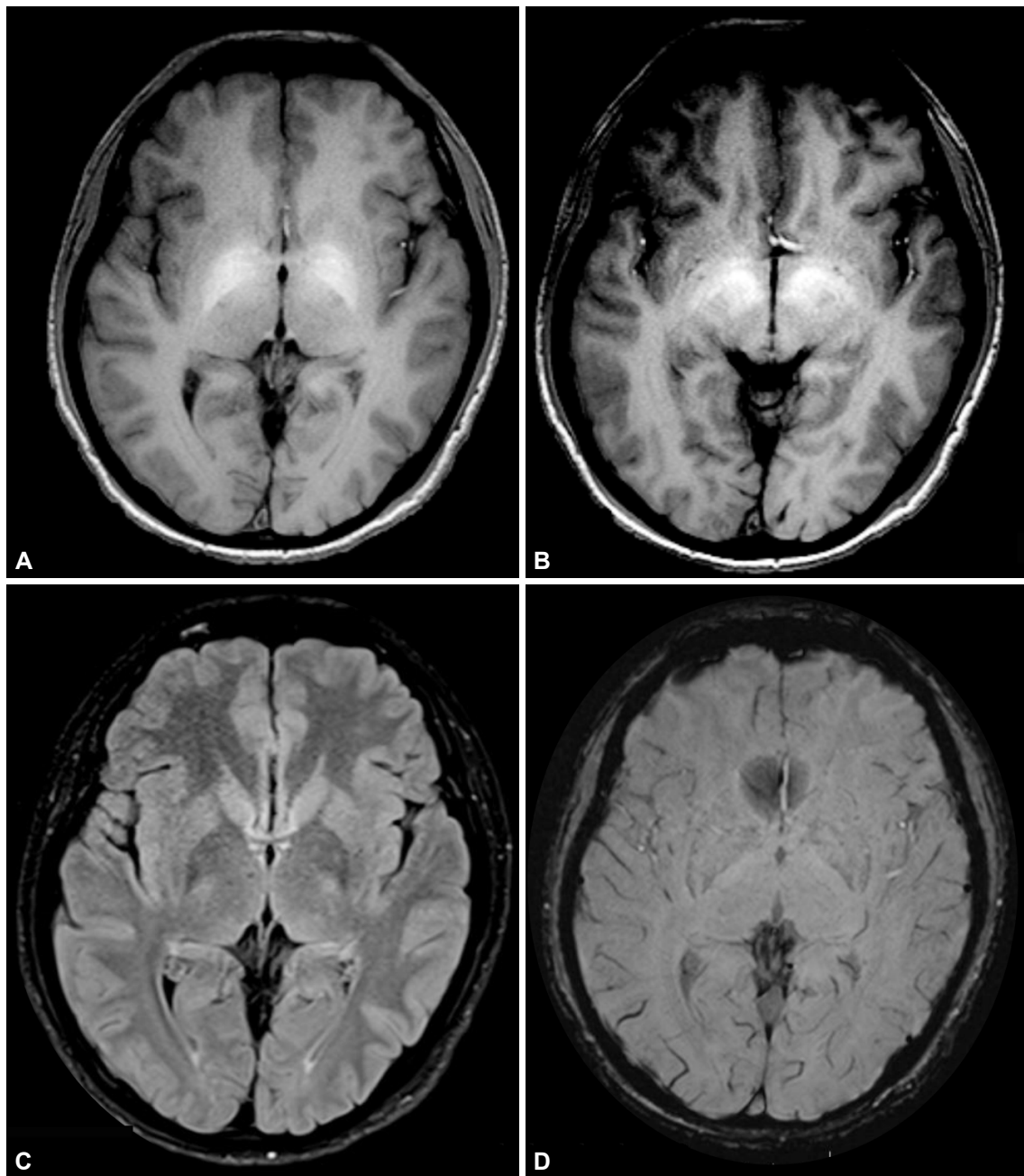


Figure 1. Magnetic resonance images demonstrating features suggestive of manganese toxicity. A and B: Axial T1-weighted images showing bilateral and symmetrical hyperintensities of the globus pallidus and substantia nigra. C: Normal T2 fluid-attenuated inversion recovery imaging. D: Normal susceptibility weighted imaging.

scribed clonazepam to the patient and recommended a change of occupation; however, he was lost to further follow-up.

A diagnosis of manganese neurotoxicity was considered even though the patient had no signs of parkinsonism, which is the hallmark of manganese toxicity. The classical tremor in manganese is a low-amplitude, rapid, postural tremor limited to the ULs.⁶ However, a rest tremor may also occur.³ Reports pertaining to a position specific tremor are sparse and are limited to

Wilson's disease and a few cases with no specific neurological disorder.^{7,8} With the presence of an isolated limb tremor with position dependence and minimal dystonic posturing, it is possible to also consider the possibility of a dystonic tremor, which may be observed in scans without evidence of a dopaminergic deficit.⁹ However, limb dystonia is a frequent phenotype related to occupational¹⁰ or hereditary manganese exposure.¹¹ In the present case, although it is uncertain if a direct causal relation-

ship exists between the observed tremor and manganese neurotoxicity, this diagnosis has to be considered in the absence of other abnormal findings.

In conclusion, a unilateral UL tremor, in the absence of overt parkinsonism, may be a presenting symptom in patients with manganese toxicity. This condition should be evaluated and excluded in those who are at risk of manganese exposure.

Supplementary Video Legends

Video 1. Segment 1: A jerky rest tremor was observed with cognitive co-activation. There was no postural tremor when arms were held outstretched, flexed at the elbow or held abducted at the shoulder. No intention tremor was observed. When the patient attempted to flex the elbow joint with the forearm pronated or supinated a jerky tremor was observed. A similar tremor was observed when the arm was internally or externally rotated with the elbow flexed at 90°. Segment 2: Surface electromyography revealed a 4–5 Hz tremor with co-contractions of the right forearm extensor and flexor muscles and of the right biceps and triceps.

Supplementary Materials

The online-only Data Supplement is available with this article at <https://doi.org/10.14802/jmd.18068>.

Conflicts of Interest

The authors have no financial conflicts of interest.

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