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Case Report

Eye-of-the-Tiger-Sign Caused by Mixed Organic Solvents

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ABSTRACT

A 68-year-old male presented to the neurology clinic with an extrapyramidal syndrome and cognitive complains years after exposure to mixed organic solvents. Exam showed parkinsonism and frontal lobe deficits. Extensive laboratory testing was unrevealing including gene sequencing for neurodegeneration with brain iron accumulation. Neuroimaging revealed symmetric lesions of the Globus pallidus consistent with Eye-of-the-tiger-sign. This case report implies that Eye-of-the-tiger-sign, once considered a pathognomonic feature of neurodegeneration with brain iron accumulation, can occur also from exposure to mixed organic solvents.

INTRODUCTION

Eye-of-the-tiger-sign is a characteristic MRI finding originally considered pathognomonic of neurodegeneration with brain iron accumulation; former Hallervorden-Spatz syndrome [1]. However, further etiologies later on became implicated in the genesis of this radiographical findings such as Wilson disease [2] atypical Parkinsonism [3], and exposure to organophosphate poisoning [4]. This case illustrates a man who developed parkinsonism, mentation changes, and neuroimaging findings of Eye-of-the-tiger-sign caused by exposure to mixed organic solvents.

CASE REPORT

A 68-white man presented with six-year-history of progressive extrapyramidal symptoms, dysarthria, dysphagia, tremor, ataxia, REM-Behavior disorder (RBD), and impairment in short-term memory and executive function. In 1969-1970 he was stationed at the Camp Lejeune, North Carolina (Marine Base) and was exposed to water contaminated with four organic solvents: trichloroethylene, perchloroethylene, benzene, and vinyl chloride. He denied consumption of unhealthy amounts of alcohol, illicit drugs, or tobacco. Eye examination revealed no Kaiser-Fleisher's rings. Neurological exam revealed impairment in vertical saccades, bilateral appendicular rigidity and resting hand tremor, bradykinesia, and parkinsonian gait. Head MRI axial T2 weighted and FLAIR showed symmetrical hyperintense signal in the Globus pallidus consistent with the Eye-of-the-tiger-sign (Figures 1A and 1B). Laboratory data showed normal levels of vitamin B6, B1, B12, folate, celiac panel, ANA, Lyme antibodies, creatinine kinase, aldolase, and hemoglobin A1C, manganese, ceruloplasmin, and GAD-65. PANK2 and PLA2G6 gene sequencing was negative for neurodegeneration with brain iron accumulation.

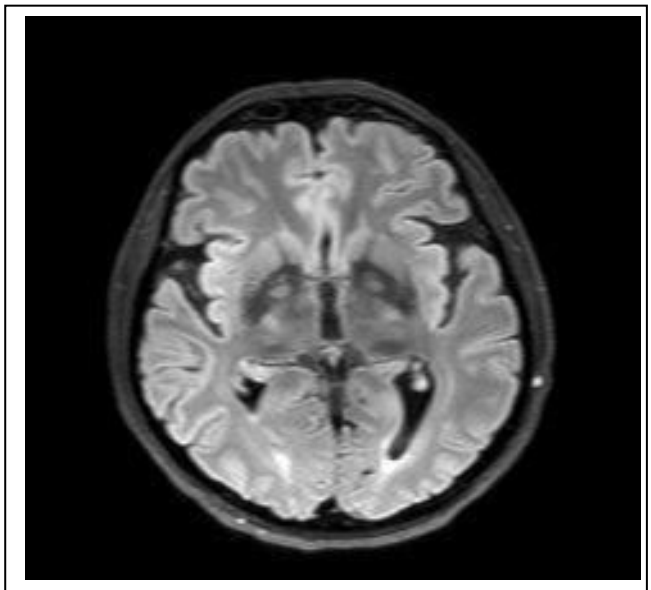

Figure 1A and 1B: Brain MRI axial T2-weighted (1A) and FLAIR (1B) images show a heterogeneous hyperintensity with surrounding hypointensity in the central area of Globus pallidus, known as Eye of the tiger-sign.

The MRI finding of Eye-of-the-tiger-sign is encountered in several extrapyramidal parkinsonian disorders such as cortical-basal ganglionic degeneration, early-onset levodopa-responsive parkinsonism, progressive supranuclear palsy, neurodegeneration with brain Iron deposition, Wilson's Disease, Leigh syndrome, methylmalonic acidemia, cerebral hypoxia and toxic exposures to carbon monoxide, cyanide, and organophosphates. The Eye-of-the-tiger-sign probably results from hypoxic changes of the Globus pallidus resulting in gliosis, increased water content, neuronal loss with disintegration, vacuolization, and cavitation of the neutrophils, and necrosis [4]. This patient represents a case of parkinsonism and MRI Eye-of-the-tiger-sign caused by mixed organic solvent exposure.

Organic solvents are extensively used in the industry and military as metal degreasing agents, paint thinners, detergents, and dry cleaners, and often become environmental contaminants. Chronic exposure to solvents causes Parkinson's disease with earlier age of onset (by 3 years) and more refractory to therapy than patients with Parkinson's disease without exposure to solvents [5]. Trichloroethylene and its metabolites are neurotoxic via reversible inhibition of the mitochondrial complex I (bioenergetic production decrement), and increment in intracellular a-synuclein, oxidative stress, microglial re-activation, and apoptosis of the substantia nigral. This in turn leads to degeneration of the striatonigral fibers and loss of the dopaminergic neurons [6]. Chronic exposure to the perchloroethylene or benzene is implicated in cognitive and behavioral changes, reflected clinically in impairment of attention, memory, visuospatial dysfunction, and personality changes. However, how these solvents trigger basal ganglia abnormalities remains elusive. In animal studies, perchloroethylene causes decrement of acetylcholine in the striatum and benzene damages the dopaminergic system. Vinyl chloride exposure causes peripheral neuropathy and myopathy, but no extrapyramidal disorders [6]. In our patient, it remains unknown which solvent specifically, or their combination was responsible for the changes in the Globus pallidum which resulted in MRI Eye-of-the-tiger-sign.

CONFLICT OF INTEREST

Authors report no disclose and no conflict of interests.

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