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ABSTRACT

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AUTONOMIC DYSFUNCTION IN A WELDER FOLLOWING MANGANESE TOXICITY: A CASE REPORT

Background: Manganese induced autonomic dysfunction is one of the chronic debilitating entities known to be seen primarily in welders exposed to fumes at work place. Welders absorb these fumes via inhalational route. Manganese in these fumes gets deposited in the basal ganglia and cause neuronal loss predominantly in Globus Pallidus. Unfortunately, it is under diagnosed due to lack of awareness of the disease. Though path breaking researches have been carried out in the field of Parkinson's disease (being main differential diagnosis of manganese toxicity), still very few advancements in the management of manganese toxicity is seen and only supportive therapy is helpful. Primarily, this autonomic dysfunction does not or poorly respond to levodopa which is a characteristic distinguishing factor from Parkinsonism.

Case: We are describing a case of a 50-years male presenting with complaints of slowness in the movement, gait instability with frequent falls. The patient has had persistent orthostatic hypotension. He had no significant family history and his work up showed no other cause of autonomic dysfunction. The patient had poor response to Levodopa. He had been exposed to welding fumes for 25 years. His MRI showed non-specific demyelination foci while SPECT scan was normal. The patient was diagnosed with occupational manganese toxicity based on history and Canadian consensus guidelines. The patient improved with oral fludrocortisone and bilateral lower limb elastic stockings.

Conclusion: Large scale promotion on the use of Personal Protective equipment (PPE) is required. Early intervention in these cases could save the patient from detrimental effect, decrease social economic burden and make better health related quality of life as only supportive care can be given once diagnosed.

Key words: Orthostatic hypotension, manganese, Parkinson's disease.

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INTRODUCTION / ВСТУП

Manganese is required at very low concentration to maintain normal biochemical reactions. Its deficiency is rare but its toxicity is a known phenomenon [1]. It may present in childhood as dystonia associated with hepatic dysfunction and polycythemia due to mutation in the carrier transport protein in non-exposed individual or in patients with parenteral nutrition [2, 3]. The welding fumes acts as potential source of manganese with varying manifestation depending upon the concentration of manganese in welding fumes known to cause mood changes, neuropsychiatric symptoms, Parkinsonism and even cardiac toxicity [4–9].

Case Report: A 50 year male, working as a welder for 25 years with no history of diabetes mellitus, hypertension, trauma or any other known co-morbid condition or morbidities running in families, presented with complaints of slowness of movement, gait instability, exercise intolerance, irritability, propensity to fall back, progressive since 6 months. On examination, he was conscious oriented, blood pressure was 100/60 mmHg with pulse rate of 96/min and respiratory rate of 18/min. General examination and patient's routine investigation including liver function test, kidney function test, blood sugar levels were normal. His systemic examination was unremarkable. Chest radiograph (posterior-anterior view) was normal. His Vitamin B12 and folate levels thyroid profile were normal. There was no history of anhidrosis. Human immune deficiency virus (HIV) I and II and antinuclear antibody (ANA) was also negative. His MRI imaging revealed nonspecific ischemic demyelination foci. His 2D echo, peripheral and carotid Doppler, single photon emission computed tomography (SPECT) scan were reported normal. His autonomic function test reveals orthostatic hypotension with total loss of cardiac autonomic tone with severe loss of sympathetic and parasympathetic reactivity.

In view of his long exposure to welding inhalation fumes, his serum manganese and urine manganese levels were done and values were 12.10 µg/L (reference range 5.0–15.0) and 0.41 µg/L (reference range 0.5–0.98), respectively. In our case, we diagnosed the subject as a clinically probable case of manganese toxicity with the Canadian consensus of expert panel on the management of occupational manganism as patient had history of exposure to welding fumes; presence of neuropsychological disturbance related to basal ganglia origin, unsustained response to Levodopa while Parkinson's, and other secondary Parkinson's causes were excluded [10].

Patient was treated with Fludrocortisone and lower limb elastic stockings with other supportive therapy. Patient condition clinically improved and patient advised to remain in follow up with team of neurologist, chest physicians and rehabilitation services.

Discussion: Manganese with iodine, selenium, copper and zinc are one of the trace elements needed to maintain normal functioning of cell physiology. Total manganese content of human body is about 12–20 mg [11]. It is required in many reactions where enzymes are manganese dependent for eg. iso-citrate dehydrogenase in Kreb's cycle, pyruvate carboxylase in gluconeogenesis and arginase in urea synthesis. Hypermanganesemia is a known phenomenon and it occurs mainly due to genetic mutation running in families with *SLC30A10* (a manganese transporter presenting as dystonia, polycythemia, liver cirrhosis), however, sporadic mutation is also reported mainly presenting as childhood dystonia and adult onset parkinsonism [12]. The excess of manganese is excreted through bile but by mechanisms which are unknown, manganese gets accumulated in basal ganglia mainly in the Globus pallidus, related to behavioral changes. Autonomic dysfunction in welders is known phenomenon. The pathogenesis starts with inhalation of welding fumes. Use of Personal Protective Equipment (PPE) would help in reduction of incidences. As no specific treatment is available only prevention would help to reduce its incidence.

In our case, patient did not have dystonia which is a predominant symptom in manganese toxicity (inherited) as compared to Parkinson's disease, but patient's long & positive occupational history with poor response to Levodopa and negative family history of Parkinson's disease pointed towards manganese toxicity [12–14]. Neuro-psychiatric manifestation with high blood manganese (Mn) level has been demonstrated earlier but half-life of

manganese is short 10 to 42 days and that of urine is 30 hours [15–17]. So, this could not give us a supportive evidence as in our case the first presentation was more than 3 years after cessation of exposure. But in our case poor response to levodopa is a characteristic finding distinguishing it from Parkinsonism and other possible etiologies of autonomic dysfunction were ruled out. Absence of obvious MRI finding can be explained by cessation of exposure and decrease in signal intensity [18, 19]. Clinical improvement was seen with Fludrocortisone and other supportive therapy.

CONCLUSIONS / ВИСНОВКИ

With increase in our understanding in the pathogenesis of diseases in contemporary sciences and advancement of imaging, still sometimes the etiology remains unclear. Following basic steps in the history (occupational history) taking, may solve this issue and not only help in the diagnosis but also may cure the disease or at least decrease its severity to some extent, if diagnosed early. Many cases of manganese toxicity remain undiagnosed due to unawareness of the possible consequences of these toxins. Large scale promotion on the use of Personal Protective equipment (PPE) is required. Early intervention in these cases could save the patient from detrimental effect, decrease social economic burden and make better health related quality of life. Though path breaking researches have been carried out in the field of Parkinson's disease (being main differential diagnosis of manganese toxicity), still very few advancements in the management of manganese toxicity is seen and only supportive therapy would be helpful.

CONFLICT OF INTEREST / КОНФЛІКТ ІНТЕРЕСІВ

The authors declare no conflict of interest.

CONSENT / ЗГОДА

Patient consent taken.

FUNDING / ДЖЕРЕЛА ФІНАНСУВАННЯ

None.

AUTHOR CONTRIBUTIONS / ВКЛАД АВТОРІВ

Name of Authors	The conception and design of the study, acquisition of data or analysis and interpretation of data	Drafting the article or revising it critically for important intellectual content	Final approval of the version to be submitted	Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved
Dr. Devesh Pratap Singh	Yes	Yes	Yes	Yes
Dr. Omkar Kalidasrao Choudhari	Yes	Yes	Yes	Yes
Dr. Sonam Spalgais	Yes	Yes	Yes	Yes
Dr. Umesh Chandra Ojha	Yes	Yes	Yes	Yes

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