



Demystifying a Case of 10 Years of Chronic Chelation for Mercury Poisoning

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Received: July 01, 2020

Accepted: Aug 21, 2020

Published Online: Aug 25, 2020

Journal: Journal of Community Medicine

Publisher: MedDocs Publishers LLC

Online edition: <http://meddocsonline.org/>

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Keywords: Mercury; Poisoning; Self-injection of mercury; Chelation.

Introduction

Mercury (Hg) has been used in various industries for day-to-day amenities like thermometers, lotions, enema, pesticides. Three forms of mercury are available: metallic elemental Hg, inorganic mercurial salts and organic mercury. Literature suggest this element has adverse effects on the body on exposure and it depends on the form, route and duration of exposure. At room temp, metallic or elemental mercury is heavy, shiny and odorless liquid and is slightly volatile but becomes significantly

Abstract

Introduction: Mercury is a rare element and can cause poisoning with accidental acute exposure [1], chronic exposure [2] and rarely with self-injection. Literature suggests few cases of self-injection of mercury for self-harm or superstition with or without any psychiatric illness [3]. We present a rare case of self-injection of mercury with pulmonary symptoms and 10-year duration of chelation therapy for unknown reasons.

Clinical presentation: A 46-year-old presented with worsening dyspnea and past history of accidental mercury inhalation 10 years back. He reports to be on chelation for the last 10 years, but further investigation with the State Toxicology Department revealed prior history of repeated admissions to different hospitals with self-injection of elemental mercury. His blood mercury levels were 211 on presentation.

Conclusion: As the patient was lost for follow-up, exact cause of self-injection and proper management of mercury poisoning was not done. This case is unique because it also highlights the importance of the role of the State Toxicology board in monitoring patient progress specially in heavy metal poisoning like mercury.

volatile when heated (produces Hg oxide which is highly irritating to the mucous membrane). Elemental Hg has low solubility in both water and organic solvents, is readily available. It is used in batteries, dental amalgams, thermometers and electro analysis, mining industries, manufacturing caustic soda and chlorine. Inhalational exposure is more toxic compared to intravenous injections.



Cite this article: Dutta A, Kesari K, Ghatol A. Demystifying A Case of 10 Years of Chronic Chelation for Mercury Poisoning. J Community Med. 2020; 3(1): 1019.

Mercury poisoning can occur by accidental or intentional oral ingestion, intravenous injection or inhalation of mercury. Acute inhalational exposure causes chemical pneumonitis and is the most severe form which usually progress to ARDS, death. Acute damage may resolve completely, but some progress to diffuse pulmonary fibrosis, restrictive lung disease, chronic resp insufficiency. Gastrointestinal symptoms are frequent in the initial period with metallic taste, nausea, vomiting, diarrhea, abdominal pain. Central nervous system symptoms can also be prominent with headache, weakness visual disturbance. Self- injection of elemental mercury causes extravasation into tissues and later distribution to the lungs via circulation [4]. In these patients, pulmonary symptoms are more common than renal and central nervous system [5].

Chronic exposure causes accumulation and damage to CNS and kidneys. Tremor, anxiety, emotional lability, forgetfulness, insomnia, anorexia, fatigue, cognitive and motor dysfunction, polyneuropathy, neuromuscular changes have been noted.

Timely chelation therapy is important. 2, 3-Dimercaptopropane-1-sulphonate and meso-2, 3-Dimercaptosuccinic acid are used for mercury chelation. For intravenous injections with local extravasation, physical removal along with chelation hastens removal of mercury.

Case description

A 46-year-old male with past medical history of essential hypertension and mercury poisoning presented to the Pulmonology clinic with worsening shortness of breath for a few weeks. He was having exertional dyspnea for the last 10 years which had recently increased on severity. He denied any feet swelling, decreased urine output, orthopnea, chest pain. According to the patient, he was accidentally exposed to mercury for around 1 month when a bottle of mercury was found spilled at his house. His father was a miner who was the owner of that bottle. Social history was positive for 60 pack years of smoking. According to the patient, he has been on chelation therapy with DMSA for 10 years for his h/o mercury poisoning.

Physical Examination showed pulse rate 70/min, blood pressure 106/76 mmHg, O₂ saturation 95%, BMI 22.9. No jugular venous distention or thyromegaly noted. Breath sounds were bilaterally diminished, no wheeze or rhonchi heard. Cardiac sounds were normal without any murmurs, rubs or gallops. Abdomen was Soft, non-tender. No evidence of any pedal edema was noted. Appropriate mood and affect were noted.

Chest X ray showed hyperinflation and small 1 to 2 mm extremely radiopaque nodules all over the lung fields consistent with his mercury inhalational exposure (Figure 3).

CT chest showed radiopaque particles diffused over bilateral lungs consistent with his history of mercury poisoning (Figure 1, 2).



Figure 1: Sagittal section of CT chest showing diffuse radiopaque particles.

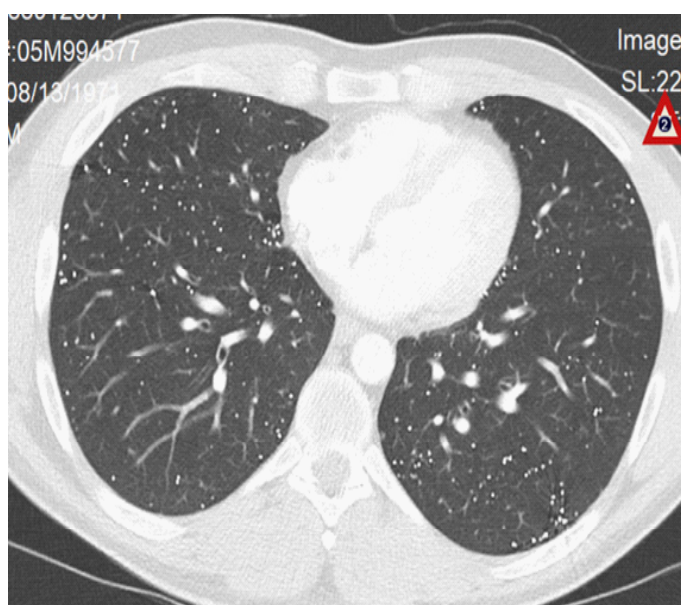


Figure 2: Cross-sectional view of CT chest showing refractile particles.



Figure 3: PA view of chest showing 1-2 mm radiopaque nodules all over the lung fields.

Pulmonary Function Testing (PFT) showed a restrictive pattern with poor diffusion capacity and air trapping. Prebronchodilator forced expiratory volume in 1s (FEV1) was 1.67 (43% predicted), post bronchodilator FEV1- 1.46 (37% predicted), FEV1/Forced vital capacity (FVC) was 73 (93% predicted), forced expiratory flow at 25% was 2.38 (33% predicted), Total lung capacity was 4.50 (66% predicted), Diffusion lung CO - 13.91 (44% predicted).

Labs:

Glucose- 91mg/dL, BUN -16, Cr- 1.0mg/dL, Sodium 137 mmol/L, potassium 3.9mmol/L, chloride 105mmol/L, carbon dioxide 25.4mmol/L, anion gap 6.60, BUN/Cr 16.0, calcium 9.4mg/dL, AST 27U/L, ALT 18U/L, Alkaline Phosphatase 81U/L, Bilirubin 0.6mg/dL, WBC- 11.32 x 10³/uL, Hb 13.8g/dL, MCV 93.3fL, MCHC 34.0g/dL, platelet 208 X 10³/uL

Serum mercury levels 2 years back was 399 which rose to 852 and then trended down to 211 on presentation (Table 1).

Table 1: Mercury levels in body fluids.

Timeline	Blood mercury (mcg/L)	Urine mercury per volume (24-hour collection) (ug/L)
26 months back	399	
24 months back		1351.3
22 months back	197	852.4
20 months back	363	> 80
18 months back	307	
10 months back	258	
On presentation	211	

With his smoking history, worsening lung capacity and PFTs findings, combination of COPD with restrictive lung disease was suspected. He was started on budesonide/formoterol and tiotropium inhalers and was counseled on smoking cessation with a follow up scheduled in 4 months. To further investigate the reason for long term chelation therapy, the State Department of Toxicology was consulted. On detailed discussion, it was found that the department have been following up this patient for the last 10 years. He was found to have multiple admissions in different hospitals with self-injections of mercury. He has history of injections of mercury in his both ante-cubital fossa and bilateral lower extremities leading to repeated presentations with high levels of mercury. Since mercury is very slowly excreted via kidneys, in each hospital admission, he receives DMSA therapy. They advised us to give a dose of chelation if we encounter the patient again. But the patient was lost for follow-up even after phone call request from the physician office. The reason for his self-injection of mercury was never found. He was never been diagnosed with any psychiatric illness as per our records, but he did mention he feels anxious because of his breathing problems.

Discussion

Elemental mercury is the most commonly used form of mercury and is readily available in certain workplaces and are easily purchasable [6]. Mercury self-injection is rare but has been noted in psychiatric subjects, drug addicts, personality disorder for self-harm or superstitious reasons. It has also been used for

homicidal intent, to enhance physical performance, tattooing [6]. Pulmonary embolization is rare and usually occur with self-intoxication or injection [7]. Our patient self-injected mercury for unknown reasons as psychiatric illness was not evident in the single encounter. Mercury inhalation causes interstitial fibrosis and has a residual restrictive disease pattern which was found to be consistent with our patient PFT [8]. DMSA or DMP-SA is the treatment of choice and our patient received adequate treatment [9]. He was appropriately treated with DMSA in every encounter but due to its slow excretion via kidneys and repeated exposure, he needed multiple courses of chelation over 10 years [6].

We report this case as mercury self-injection is rare and have dangerous effects on multiple organs specially lungs, and at the same time these cases are easily missed due to loss for follow-up. This case also highlights an important perspective of how important and valuable is to contact the State Toxicology Department in such encounters. They monitor patients with heavy metal poisoning and record data to follow up and guide their treatment. As mercury self-poisoning is rare, any presentation with h/o long-term or multiple cycles of chelation, high levels of blood mercury with or without acute symptoms or pulmonary embolization should be of low threshold to suspect for self-harm or potential abuse.

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