

Acute Local Mercury Toxicity Induced by Self Injection: A Rare Occurrence

Manohar KN¹, Venkata Sai Shashank Mutya^{1*}, Irfan Ibrahim K¹, Srikanth V²

¹Department of Internal Medicine, Manipal Hospital Bangalore, India; ²Department of Plastic Surgery, Manipal Hospital Bangalore, India

ABSTRACT

Mercury can exist in three states as mercury vapour, elemental mercury as liquid and inorganic salts and organic compounds. Mercury can enter the body either by inhalation, ingestion and injection. When entered mercury can cause neurotoxicity, nephrotoxicity, GI disturbances, endocrine imbalance, psychiatric problems, and infertility and may even lead to death. Mercuric toxicity should be identified quickly and treated. Here we present to you a rare case of a 29 year old woman who had injected herself with mercury on the misbelief that it can cause weight loss. She presented with fever and multiple painful and tender swellings at the sites of injection with cellulitis of the above skin and subcutaneous tissue. She was treated with adequate tissue exploration and debridement along with chelation therapy with dimercarpol. She tolerated the therapy without any side effects with regular monitoring of renal parameters. This case emphasizes the need of regulation on sale of such hazardous products to common people and the requirement of proper guidelines for early identification, stratification and treatment of patients with mercury toxicity.

Keywords: Neurotoxicity; Nephrotoxicity; Inhalation; Fever; Mercuric toxicity

INTRODUCTION

A 29 year old female came to the Emergency room with complaints of fever and multiple painful swellings on bilateral upper limbs. On further questioning she admitted that she had injected herself in three sites on her upper limbs with mercury 1 week back which she had procured through an online e-commerce website 1 year ago, on the impression that mercury causes weight loss.

CASE STUDY

A twenty nine year old woman with fever symptoms and painful swellings in the bilateral upper limbs came to the emergency room. On further interrogation, she admitted that she had injected mercury 1 week ago, which she had purchased from an online e-commerce website 1 year ago, into three places on her upper limbs, on the impression that mercury induces weight loss. No history of similar incidents in the past or any history suggestive of depression, suicidal tendencies or any psychiatric conditions. After she had allegedly injected she was asymptomatic for the first three days after which she developed high grade fever associated with severe pain in both of her upper limbs.

She went to a nearby hospital from where she was referred to a tertiary center for further evaluation and treatment. On examination she was febrile, toxic and dehydrated. Detailed local examination revealed multiple hard tender swellings (one in right forearm, one in right arm and one in left arm being the largest.) Skin over all the swellings was red with local rise of temperature.

Clinically, the swellings were localized in the subcutaneous and muscular planes with overlying cellulitis.

X ray of the extremities done showed multiple radiopaque densities suggestive of presence of foreign bodies (Figure 1) consistent with metal like mercury in bilateral arm and right forearm. The radio opacities of the left arm represented likely intravenous extension. CT scan with 3d enhancement of the extremities was done to find out the exact localisation of the foreign bodies. Routine laboratory investigation was done along with liver, kidney and thyroid profile which were normal. The patient and the patient attenders were explained regarding the patient's condition and the hazards of mercury toxicity [1,2]. Urine mercury levels done were elevated (27.3 normal being less than 2). She was started on IV antibiotics IV analgesics and other supportive measures. All the swelling were surgically explored and debrided with primary closure under aseptic conditions by the surgical team (Figure 2). After due consents she was started on chelation. She was treated with dimercarpol 5 mg/kg body wt IM loading dose followed by 2.5 mg/kg Body wt. IM from day 2 to day 10 throughout the course of her therapy her kidney profile was monitored and she tolerated the therapy without any adverse effects and was discharged in a hemodynamically stable and conscious state. She was followed after 2 weeks. Urine mercury levels done at the end of 2 weeks after the chelation therapy showed the reduction in levels. She was followed up telephonically after 2 months and found to have an uneventful course of recovery.

Correspondence to: Mutya VSS, Irfan IK. Department of Internal Medicine, Manipal Hospital Bangalore, India, Tel: +919620167564; E-mail: sai291095@gmail.com

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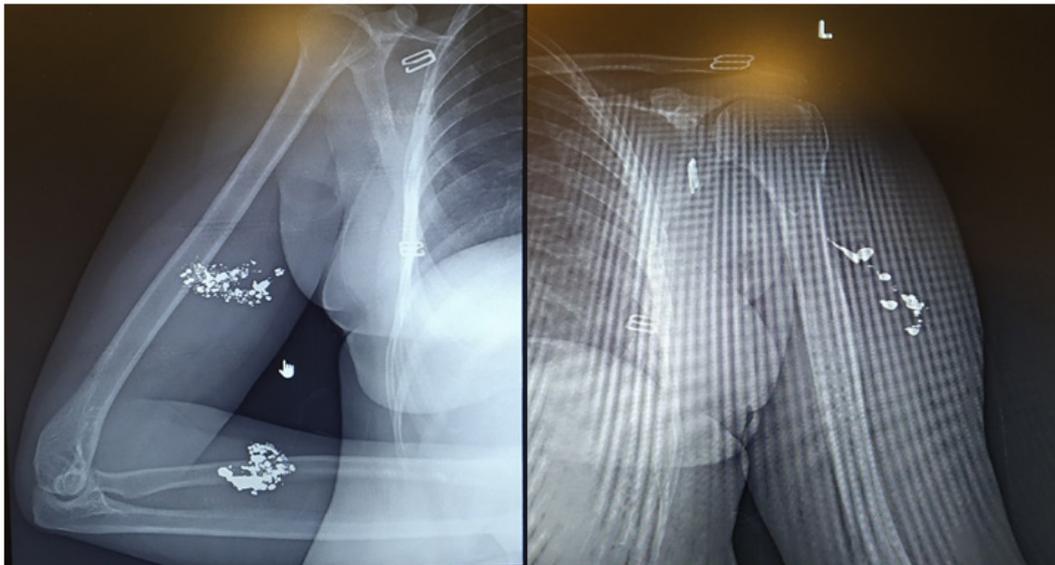


Figure 1: X rays Bilateral upper limbs showing radio-opaque densities consistent suggesting the presence of foreign bodies.



Figure 2: Surgical incision site showing small shiny pellet of mercury flowing out..

DISCUSSION

Mercury is a heavy metal that exists in three forms. Elemental mercury which exists as shiny non-volatile liquid, a colourless non odourless vapour and in the forms inorganic mercuric salts or organic compounds. Exposure can occur in many ways such as inhalation of its vapour, ingestion and injection. Among all the routes of exposure inhalation is more toxic than ingestion and

injection while organic compounds are more toxic as compared to inorganic salts and elemental mercury [3]. Organic compounds have a tendency to get accumulated in the food chain and their concentration increases as we go above the food pyramid. The classic example is Minamata Bay Disease which occurred in the residents around the Minamata bay in Japan where fish from contaminated water are the main source [4]. Mercury was also an essential part of many different medicines in the past such as diuretics,

antibiotics and antiseptics. At present mercury is used in tooth fillings, thermometers, sphygmomanometers and in vaccines [5].

Excretion of mercury is largely through urine and stool, although significant amounts are shed through sweat, tears, breast milk, and saliva. The main mechanism of mercury toxicity is due to the irreversible inhibition of selenoenzymes, such as thioredoxin reductase which restores the antioxidant molecules back to their reduced form [6-9]. Mercury is believed to interfere with DNA transcription and protein synthesis [10], including protein synthesis in the developing brain, with destruction of endoplasmic reticulum and disappearance of ribosomes [11]. Adverse effects have also been described on heme synthesis [12].

Mercury toxicity occurs in various other ways depending on the form of mercury, the amount of exposure, and the route of entry into the body. It most commonly affects the neurological, gastrointestinal and renal systems. Symptoms of mercury toxicity can be acute, subacute or chronic. With massive acute exposure to mercury vapor, erosive bronchitis and bronchiolitis potentially leading to respiratory failure may be accompanied by CNS symptoms such as tremor or erythrim. At low-level exposures, nonspecific symptoms like weakness, fatigue, anorexia, weight loss, and gastrointestinal disturbance have been described. Higher exposure levels are associated with mercurial tremor: fine muscle fasciculations punctuated every few minutes by coarse shaking. Erethism may also be observed: severe behavior and personality changes, emotional excitability, loss of memory, insomnia, depression, fatigue, and in severe cases delirium and hallucination [13]. Ingestion of mercuric salts produces extensive precipitation of intestinal mucosal proteins, mucosal necrosis, generalized abdominal pain, bloody diarrhea, and shock. If the patient survives, acute renal failure may follow [14]. Thyroid dysfunction seems associated with inhibition of the 5-deiodonases, with decreased free T3 and increased reverse T3 [15]. Accumulation in the testicles appears to inhibit spermatogenesis [16]. Atrophy and capillary damage have been described in thigh muscle [17]. Self-subcutaneous injection of elemental mercury is rare and generally does not lead to systemic effects [2]. Abscess formation is the most common local presentation in patients with self-injection of mercury [3].

Mercury toxicity should be diagnosed quickly and decontamination started by removing clothes, washing skin with soap and water followed by chelation and physical removal as in a case of injection. Chelation of acute mercury poisoning can be done with DMSA (dimercaptosuccinic acid), DMPA (2, 3-dimercapto-1-propanisulfonic acid), dimercaprol [British anti-Lewisite (BAL)] or D-penicillamine (DPCN) [7]. Even though N-Acetylcysteine (NAC) and glutathione (GSH) were used in the past, evidence suggests that they can be counterproductive [8]. In some studies zinc and selenium have been shown to exert a protective effect most likely by induction of metal binding proteins, such as metallothionein and selenoprotein, but some found little evidence for this [9]. The duration of chelation depends on the serum mercury levels, and should be continued till the levels become normal.

Our patient presented with acute mercury toxicity with high urinary mercury levels. Radiological investigations supported the diagnosis. Chelation was started with intramuscular dimercaprol and at the same time surgical exploration and removal of tissues containing mercury was also done. Psychiatry assessment stated that woman is of sound mental health and of normal IQ. The fever was transient and disappeared within a few days. Urine mercury levels reduced to normal and the woman made an uneventful.

Although self-injection of elemental mercury is rare, it is often as a part of suicide attempts or among drug users. Unusual instances are that of injection of mercury with the misbelief that it can enhance strength or immunity. Sukheeja, et al. have reported similar case of a 15 year-old-male child who presented with multiple non healing ulcers of the left forearm due to self-injection of mercury after watching a movie [2]. Mudalige, et al. Have also reported a similar case of self-injection of mercury in a 15 year old child where they have treated with both surgical exploration and medical chelation therapy [18].

CONCLUSION

Self-injection of elemental mercury can also occur in mentally sound people and rapid diagnosis and decontamination is required. This case also signifies the importance of imposing restrictions to such hazardous products both in the online and offline retail agencies. There is a need for a universal diagnostic and treatment protocol to identify and classify the patients of acute mercury toxicity depending on the mode, type of exposure and their clinical presentation which would help all the doctors in early identification of risk factors and prompt treatment as we all know the adverse effects of mercury toxicity which can ultimately lead nervous impairment kidney failure and even death.

CONSENT

Written informed consent was obtained from both the patient and her husband for publication of this case report and any accompanying images. A copy of the written consent is available for review by the editor of this journal.

REFERENCES

- Gochfeld M. Cases of mercury exposure, bioavailability, and absorption. *Ecotoxicology Environ Saf.* 2003;56:174-9.
- Sukheeja D, Kumar P, Singhal M, Subramanian A. Subcutaneous mercury injection by a child: a histopathology case report. *J Lab Physicians.* 2014;6(1):55.
- Gopalakrishna A, Kumar TP. Intravenous injection of elemental mercury: A report of two cases. *Ind J Plast Surg.* 2008;41:214.
- Harada M. Minamata disease: Methylmercury poisoning in Japan caused by environmental pollution. *Crit Rev Toxicol.* 1995;25:1-24.
- Clarkson TW. The three modern faces of mercury. *Environ Health Perspect.* 2002;110(Suppl 1):11.
- Carvalho CM, Chew EH, Hashemy SI, Lu J, Holmgren A. Inhibition of the human thioredoxin system a molecular mechanism of mercury toxicity. *J Biol Chem.* 2008;283(18):11913-23.
- Clifton JC. Mercury exposure and public health. *Pediatr Clin North Am.* 2007;54(2):237.
- Rooney JP. The role of thiols, dithiols, nutritional factors and interacting ligands in the toxicology of mercury. *Toxicology.* 2007;234:145-56.
- Watanabe C. Modification of Mercury Toxicity by Selenium: Practical Importanc? *Tohoku J Exp Med.* 2002;196:71-7.
- Gruenwedel DW and Lu DS. Changes in the sedimentation characteristics of DNA due to methylmercuration. *Biochemical and Biophysical Research Communications.* 1970;40:542-548.
- Herman SP, Klein R, Talley FA, Krigman MR. An ultrastructural study of methylmercury-induced primary sensory neuropathy in the rat. *Laboratory Investigation.* 1973;28:118.

12. Fowler BA and Woods JS. Ultrastructural and biochemical changes in renal mitochondria during chronic oral methyl mercury exposure. The relationship to renal function. *Experimental and Molecular Pathology*. 1977;27:403- 412.
13. Bernhoft RA. Mercury Toxicity and Treatment: A Review of the Literature, *Journal of Environment and Health*, 2012.
14. Berlin M, Zalups RK, Fowler BA, Nordberg GF, Fowler BA and Nordberg M, et al. Mercury in Handbook on the Toxicology of Metals. Chapter 33, Elsevier, New York, NY, USA. 2007 3rd edition.
15. Ellingsen DG, Efskind J, Haug E, Thomassen Y, Martinsen I, and Gaarder PI. Effects of low mercury vapour exposure on the thyroid function in chloralkali workers. *Journal of Applied Toxicology*. 2000;20:483-489.
16. Rao MV and Sharma PSN. Protective effect of vitamin E against mercuric chloride reproductive toxicity in male mice. *Reproductive Toxicology*. 2001;15:705-712.
17. Nadorfy LE, Torres SH, Finol H, Mendez M, and Bello B. Skeletal muscle abnormalities associated with occupational exposure to mercury vapours. *Histology and Histopathology*. 2000;15:673-682.
18. Priyangika TN, Karunarathna W, Liyanage I, Gunawardana M, Dissanayake B and Udumalgala S, et al. A rare case of self-injection of elemental mercury. *BMC Res Notes*. 2016;9:189.