Poisoning in personnel with access to mercury

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Abstract

Introduction
This case deals with a 25 year old male bio-medical engineer who had consumed alcohol with subsequent ingestion of mercury liquid at his workplace.

Case Report
The patient presented to our medical team, immediately within an hour, with mild abdominal discomfort along with episodes of vomiting upon admission. He had mild hyperreflexia of the extremities, with no other neuropsychiatric manifestations. He had no other symptoms or signs; in particular, there was no evidence of local caustic damage to the mouth or oropharynx. We shed some light on the different types of mercury poisoning and its assessment and management, along with pertinent patient counselling.

Conclusion
We advise the prompt usage of chelators upon confirmation of mercury poisoning, and plasma exchange and haemodialysis must be used whenever possible. Also, the psychiatric evaluation and counselling of these patients are very important in those attempting suicide.

Introduction
Mercury poisoning occurs owing to the deliberate infliction of self-harm, accidental exposures, contaminated seafood or contact via medical instruments like broken sphygmomanometers or thermometers. Chelators, plasma exchange and haemodialysis are standard of care in the management of mercury poisoning.

We report an unusual case presentation in our emergency department, of deliberate self-poisoning in a male bio-medical engineer with access to mercury liquid at his workplace, substantiated with hyperreflexia of his extremities and unusual abdominal x-rays.

Case Report
A 25 year old male biomedical engineer had consumed alcohol initially and was admitted within an hour upon deliberate ingestion of liquid mercury from a sphygmomanometer, with suicidal ideation. He complained of mild abdominal discomfort and had multiple episodes of vomiting upon admission. He had no other symptoms or signs; in particular, there was no evidence of local caustic damage to the mouth or oropharynx. He had no significant past medical history.

On admission, observation of the patient’s blood, ECG and clinical examination were unremarkable. The patient claimed to have consumed 180 ml of whiskey prior to ingesting the liquid mercury. His blood alcohol concentration (BAC) level was 40 mg/dl (permissible BAC is less than 30 mg/dl in India). Mercury levels were assessed and reported as 133 nmol/l (normal being less than 20 nmol/l). Environmental health advised that he should be isolated and that bodily excretions be exposed safely. Erect x-rays of his abdomen showed mercury markings in the gastrointestinal system (Figure 1 and Figure 2).

He was managed in the ward conservatively upon the presumptive diagnosis of mercury poisoning. A gastric wash was given initially and he was administered oral activated charcoal, as he presented within an hour of ingestion of liquid mercury, and intramuscular dimercaprol subsequently. Intravenous fluids and parenteral antiemetics were also administered.

He was being continuously observed for three days, wherein he had received activated charcoal every six hours and three doses of dimercaprol overall. Dimercaprol was preferred to oral Succimer as the patient could not afford the latter. We had promptly initiated a referral to the Psychiatry department, and they had counselled him appropriately. In lieu of his attempt at committing suicide and consuming mercury, he was advised to get a psychiatric referral and workup including observation, counselling and treatment, with regards to possible depression or any other possible psychiatric ailments upon recovery.

It was revealed that his reason for attempting suicide was increasing financial constraints and impending debts which he was unable to repay.

The patient’s family consented on transferring him over to the Psychiatry department upon symptomatic recovery from this poisoning episode. However, owing to financial constraints, neither transfer to the Psychiatry ward nor haemodialysis/plasmapheresis was attempted in this patient, as he had been discharged against medical advice.

Body fluids and excreta were disposed by our hospital’s Environmental Health and Safety personnel, following strict protocol with regards to toxic environmental exposure.

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On examination, the patient was alert, conscious and co-operative. He was of moderate build and nourishment. He did not complain of any headache or insomnia. His cognitive functions were intact. Sensory examination revealed no abnormalities. Motor examination revealed mild hyperreflexia in all the extremities. No ataxia, tremors, co-ordination or sensorineural abnormalities was noticed. His vision and hearing were normal. He had not showed features of emotional instability or any mood disorders.

Oral cavity examination revealed no features of stomatitis or caustic erosive damage to the mucosa. The patient was passing urine adequately and had no trouble breathing. Oxygen saturation was 96% on room air.

The patient had normal total and differential blood counts with a blood haemoglobin level of 15 g/dl. Serum electrolytes were within the normal ranges. A repeat blood mercury level on the third day post admission was 25 nmol/l (normal being less than 20 nmol/l). Liver function tests and renal function tests were also normal, with serum levels of urea being 12 mg/dl (normal: 8 - 20 mg/dl) and creatinine being 0.6 mg/dl (normal: 0.5 – 1.5 mg/dl in adult males).

We believe that since the patient presented promptly within an hour of consuming the mercury, and him vomiting multiple times on admission, along with prompt initiation of gastric lavage and activated charcoal with chelation therapy, there probably would not have been significant systemic absorption of mercury, thus explaining the mild systemic features and a normal lab workup. Also, upon elemental mercury ingestion, systemic absorption via the gastric route is known to be low.

He was discharged on the fourth day of admission against medical advice, citing financial constraints. We wanted to monitor him closely for another week to observer for any untoward complications, along with a thorough psychiatric workup. Up to the time of discharge he had developed no further symptoms or complications.

We advised him to return back in a week on an out-patient basis to know if his condition had stabilized, but he defaulted from presenting to us and therefore we do not have further information on him or a follow up abdominal X-ray.

**Discussion**

Mercury historically has been used in the production of industrial chemicals, paints, thermometers, sphygmomanometers, electronic instruments, etc. Mercuric compounds are used as antiseptics and diuretics in medicine. It is also an essential component of Thiomersal which helps prevent contamination of vaccines. Occupational and accidental exposure to mercury mainly occurs in individuals working in dentistry, chloralkali industries, thermometer factories and mercury mines 1.

Routes of mercury exposure are via ingestion, inhalation or subcutaneous/intravenous use. Mercury exists in its elemental form, inorganic salt or as an organic compound. Cause of poisoning can be due to infliction of self-harm, accidental exposure, contaminated seafood, through medical appliances like broken sphygmomanometers or thermometers 2.

Poisoning can be manifested in an acute or chronic fashion. Inhaling mercury vapours are extremely lethal and can cause pneumonia, adult respiratory distress syndrome, severe progressive pulmonary fibrosis and even death 3.

Acute poisoning can cause ulceration in the mucosal lining of the gastrointestinal tract. Toxicity to the uriniferous tubules leads to anuria. Chronic poisoning presents as stomatitis, diarrhoea, ataxia, hyperreflexia, sensorineural impairment and emotional instability known as hydrgyria or Mad Hatter Syndrome 4.

One of the recent trending topics of late is the “dental amalgam controversy”, as many dental fillings, to date, contain mercury in them.

An expert panel from the World Health Organization believe that the average exposure from dental amalgam is roughly 10 mcg/day. However, there is not enough data as of now which concludes that the amalgam fillings are associated with toxicity, and therefore mercury use in dental amalgams is still used until date 5.

Owing to the increased attention to minimizing exposure during the recent
years, there has been a significant drop in the exposure rate to mercury.

Ambient mercury concentrations used in dentistry have dropped from 25 mcg/m in 1960s to the current values of below 5 mcg/min due to improved ventilation and handling of amalgam 6.

In humans the biotransformation of mercurial compounds is not yet fully understood, in contrast to the well-known methylation that occurs in environmental premises 9.

Upon elemental mercury ingestion, systemic absorption is generally low, around 15 percent, unless there are gastrointestinal anomalies such as diverticulosis. Therefore, elemental mercury can be accumulated over a long duration. Delayed manifestations seen in both acute and chronic exposures to mercury include acute tubular necrosis, nephritic syndrome, depression, anxiety and headaches 2.

The kidney is a major site where mercury deposits. Nephrotoxicity is commonly manifested as nephrotic syndrome and tubular injury. Nephrotic syndrome is commonly due to membranous nephropathy. Proteinuria disappears as exposure to mercury ceases 7.

Blood and urine levels of mercury help quantify the degree of exposure. If blood and urine concentrations of inorganic mercury are less than 100 mcg/l, clinically significant poisoning is unlikely; however, subclinical toxicity can occur below this threshold 8.

Management of patients with mercury poisoning includes patient isolation, obtaining complete blood counts, renal function tests and serum electrolyte levels. Chelators used worldwide include dimercaprol (BAL), dimercaprosuccinic acid (DMSA) and 2, 3-Dimercapropropene-sulphonate (DMPS). Plasma exchange and haemodialysis may assist in this and its use must be always considered in all patients due to the possibility of ensuing long-term neuropsychiatric complications 10.

**Conclusion**

We highlight the importance of mercury ingestion or inhalation in health care personnel who present with accidental or deliberate poisoning with easy access to mercury, like the biomedical engineer in our case. Though the rate of gastric absorption of mercury is known to be less, prompt symptomatic treatment is always warranted.

Blood and urine levels of mercury help quantify the degree of exposure. The kidney is a major site where mercury deposits and hence, renal function tests are very important to monitor. We advise the prompt usage of chelators upon confirmation of mercury poisoning, and plasma exchange and haemodialysis must be used whenever possible.

Also, the psychiatric evaluation and counselling of these patients are very important in those attempting suicide. People who suspect exposure to inorganic mercury must always consult their doctors, as early as possible. It is important to follow up with these patients and obtain subsequent periodic X-rays with appropriate laboratory investigations.

**Consent**

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

**References**


