Mercury Toxicity - A Case Report

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Introduction

Throughout the centuries, there have been several incidents of mercury toxicity. As early as 1500 B.C we know that the Egyptians used mercury, as it was found in their tombs [1]. Men may encounter mercury in an inorganic (elemental or mercuric salt) or an organic form. All three are toxic. Elemental mercury is used in Dental amalgams, thermometers and sphygmomanometers [2]. We report one such case in a dental hygienist.

Case Report

Twenty-six year old dental hygienist with five years of service who was making dental amalgams for three and a half years without taking universal precautions was hospitalised with 02 days history of irregular, low grade fever and left sided pleuritic chest pain. He had no other complaints and denied history of any major illness in the past. Clinical examination did not reveal any abnormality. Haemogram, urine analysis and metabolic profile were normal. Chest radiograph revealed distinct metallic density opacities in all zones bilaterally (Fig 1). CT scan thorax revealed additional mediastinal metallic opacities (Fig 2). A week after admission he developed an abscess over the right forearm that did not respond to antibiotics, and hence incision and drainage was

Fig. 1 : Chest radiograph showing distinct metallic density opacities bilaterally

done which drained pus mixed with metallic mercury globules (1.5 ml weighing 20 g). This clinched the diagnosis of chronic elemental mercury poisoning due to inhalation of elemental mercury vapours during preparation of dental amalgams. Retrospectively the patient was evaluated. He denied any history suggestive of CNS involvement (hyperactivity, insomnia, tremors, loss of memory, abnormal behaviour, ataxia), GI involvement (anorexia, weight loss, diarrhoea, vomiting), ocular or auditory involvement. Radiographs of the right arm (AP and lateral view) (Fig 3), left thigh and abdomen (Fig 4) revealed soft tissue metallic deposits. Peripheral visual field charting, slit lamp examination and pure tone audiometry were normal. He was offered chelation therapy with Capsule D-penicillamine, to begin with 250 mg b.i.d. an hour after meals, which was increased to 1 gm/day in divided doses for 2 weeks. The course was repeated and post treatment radiographs revealed scattering of metallic deposits.

Discussion

For centuries several incidents of mercury toxicity have been reported. Some recent exposures include Minamata Bay in Japan (1960), mercury contaminated fish in Canada and methylmercury treated grain in Iraq (1960 and 1970). Mercury is the only metal that is liquid at room temperature & weighs 13.55g per ml. It is found

Fig. 2 : CT scan thorax revealing pulmonary parenchymal and mediastinal metallic opacities

Fig. 3 : Radiograph right arm (AP and lateral view) showing soft tissue metallic deposits

in both organic and inorganic forms. The inorganic form can be further divided into elemental mercury and mercuric salts. All forms are toxic and manifestations depend on the nature of exposure, the intensity of exposure and the chemical form [3,4]. Mercury poisoning can result from vapour inhalation, ingestion, injection and absorption through the skin.

Our case had mercury toxicity due to inhalation of elemental mercury vapours. It is found in liquid form and easily vaporises at room temperature and is well absorbed (80%) through inhalation. Sources of toxicity include barometers, batteries, bronzing, calibration instruments, dental amalgams, electro-plating, finger printing products, mercury lamps, and jewellery industry, paints, silver and gold production and thermometers. Its lipid soluble property allows for easy passage through alveoli into the blood stream and red blood cells. Once inhaled, elemental mercury is mostly converted to an inorganic divalent or mercuric form by catalase in the erythrocytes. This inorganic component has poor lipid solubility, limited permeability to the blood brain barrier and is excreted in faeces. But the nonoxidised component accounts for CNS toxicity, where it is ionized and trapped. Elemental mercury is not well absorbed by GI tract and therefore, when ingested, is only mildly toxic. Acute exposure to inhaled elemental mercury can lead to fever chills, dyspnea, metallic taste, pleuritic chest pain, stomatitis and lethargy. Recovery is usually without sequelae but pulmonary complications like pneumatocoele, interstitial fibrosis, pneumothorax, pneumomediastinum and fatal ARDS has been reported [5]. Chronic exposure leads to renal failure dementia and acrodynia, tremors, gingivitis and erythrism, tunnel vision and ataxia.

Management

Supportive care begins with ABCs (airway, breathing and circulation), especially when dealing with inhalation

Fig. 4 : Abdominal radiograph revealing pelvic metallic deposits

of elemental mercury and ingestion of caustic inorganic mercury. The next step is to remove the contaminated clothing and copious irrigation of the exposed skin. Emesis is not induced for the caustic inorganic form, but for the organic ingestion gastric lavage with protein containing solutions (e.g. milk, egg whites) is recommended especially when mercury is visible in the abdominal radiographs. Activated charcoal is indicated for GI decontamination, as it will bind to both organic and inorganic mercury to some extent. Use chelating agents if the patient is symptomatic, if systemic absorption is anticipated or if increased blood or urine levels are present. British Anti Lewisite (BAL) is used only in acute inorganic ingestion. D-penicillamine forms a complex with mercury and is excreted in urine and can be used if there is no renal failure. A safer drug 2,3 - dimercaptosuccinic acid (DMSA) is useful in both inorganic and organic mercurials.

Our case had chronic elemental mercury vapour exposure related to his profession. In all probability mercury got disseminated to subcutaneous tissue/skin, and abdomen after getting absorbed from the alveoli. Formation of abscesses and mercury gradually ulcerating out from the epidermis has been reported in the past [6]. In view of objective evidence of systemic mercurial deposits, nonavailability of blood and urine mercury levels, he was offered chelation therapy with D-penicillamine, which is known to give variable results [4]. He is under regular follow-up and till now has no toxic manifestations [6].

References

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Answer to Radiological quiz

1. Congenital Diaphragmatic Hernia

The radiograph shows a gas filled rounded shadow in the left side of chest. There are multiple air filled bowel loops in the same hemithorax and a round gas shadow medially, which is stomach. The mediastinum is completely shifted to the right. The right lung is compressed and left lung is not visualized.

Commonest diaphragmatic hernias on left side are of Bochdalek's type. Intrathoracic stomach is often found along with intestines. Ultrasound may show an intrathoracic spleen.

2. Congenital Cystic Adenomatoid Malformation (CCAM)

The CCAM, as it is known is a congenital malformation of lungs where masses of cysts, some containing air and some fluid-filled occupy part or whole of lung. When the aerated mass occupies the left lower lung field, the appearance may be virtually indistinguishable from a diaphragmatic hernia as it may radiologically mimic small bowel loops.

3. Delayed closure of left hemi diaphragm

The diaphragm develops from mesoderm of body wall, septum transversum, pleuro-peritoneal folds and dorsal

mesentery of oesophagus. The right hemi diaphragm closes earlier and is moreover buttressed by the growing liver. The left hemi diaphragm closes later. At about 8-12 weeks of intrauterine life, the primitive pleuroperitoneal canal is persistent and at the same time extra-abdominal bowel loops are returning to abdomen. This permits the entry of bowel loops, sometimes stomach, spleen and colon into the left hemi thorax. Presence of viscera in the thorax causes pulmonary hypoplasia resulting in pulmonary hypertension after birth and is a detrimental factor in survival of these babies.

4. Insert a feeding tube in stomach and stop feeds

Feeding tube removes air and contents from the stomach relieving compression on mediastinum and opposite functioning lung, thereby improving oxygenation to a large extent. It also prevents further air entry into the intestine. Energetic resuscitation is mandatory. The patient is to be operated as emergency and closure of diaphragm done after reducing viscera.

References

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