کارگاه های آموزشی مرکز اطلاعات علمی جهاد دانشگاهی

کارگاه آنلاین آشنایی با پایگاه های اطلاعات علمی
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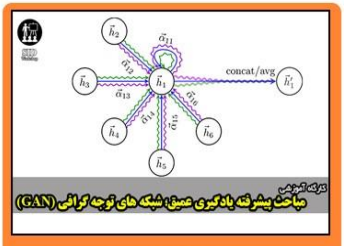

مباحث پیشرفته یادگیری عمیق؛
شبکه های توجه گرافی
(Graph Attention Networks)

کارگاه آنلاین مقاله نویسی IEEE و ISI
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CASE REPORT

HYPERTENSIVE ENCEPHALOPATHY INDUCED BY MERCURY POISONING; A REPORT OF 3 CASES (IN AN IRANIAN FAMILY)

M. Sharifian MD[1],
M. Noorisafa MD [2] ,
M. Kiahosseini MD[3]

Abstract:
Objective
Mercury poisoning is one of the important recent causes of mortality and mortality in children worldwide, particularly in industrial environments; mercury is a poisonous metal, especially harmful to the nervous and immune systems and the kidneys and can even be fatal. Elemental mercury is present in thermometers, barometer batteries, sphygmomanometers and latex paints. Inorganic mercury salts are found in antiseptics, pesticides, pigments and explosives and are used as preservatives in medicine. Mercury was once used to stop fever, and this worked because the immune system was so weakened that it could no longer sustain the attack for which the fever was created. Some medical drugs still contain mercury chloride and mercurous chloride and certain forms of mercury are still used in some laxatives.
Mercury toxicity of the nervous system causes anorexia, ataxia, lack of ability to coordinate voluntary muscle movements, dementia, depression, dizziness, emotional instability, erethism (abnormal irritability in response to stimulation), incoordination, insomnia, irritability, loss of ability to speak, memory impairment, numbness, saresthesias (sensation of prickling, tingling or creeping on the skin), psychosis, tremors, drowsiness, fatigue and weakness.
Other organ damages include kidney failure, headaches, hearing impairment, visual impairment, hypertension, dermatitis, digestive tract problems, colitis, diarrhea, stomatitis and excessive salivation, loss of teeth, metallic taste, chromosomal damage, birth defects and ensuing organ failure. Chronic mercury poisoning can cause Acrodynia (Pink disease). Mercury poisoning is a rare cause of hypertension in children. Herein we report 3 cases, the first a child with hypertensive encephalopathy due to severe mercury poisoning and his two siblings with moderate symptoms.
Case report
A 10 year old boy was admitted in psychiatric ward of Imam Hossein Hospital with behavioral disorder, irritability, mood change and convulsion. Because of his blood pressure which was 160/120 he was referred and admitted to the Pediatric Nephrology department. On arrival, for his hypotonia and the pink discoloration of his fingers a diagnosis of Acrodynia (Pink disease) was considered; his history showed that he has played with a ball of mercury, taken from a laboratory. He and his 2 siblings received British Anti Lewisite(BAL) and D-penicillamin; at follow-up all symptoms had gradually disappeared and they are well now.
Keywords: Mercury poisoning, Children, Renal complications, Hypertensive encephalopathy

1. Associate professor of pediatric Nephrology, Shaheed Beheshti University of medical Sciences
2. Assistant professor, Shaheed Beheshti University of medical Sciences
3. General practitioner
Corresponding author:
M. Sharifian MD
Tel: +98 9121485647
Fax: +98 22220254
Email:msharif@sbmu.ac.ir

Introduction

Mercury poisoning is the second most common poisoning with heavy metal that is associated with various disasters, like multiple organ failure and especially irreversible brain lesions leading to death (1, 2). Poisoning with this metal is known as "Pink disease" and "Acrodynia"(3, 4).Because of the non specific symptoms in most cases, if poisoning is overlooked by the physician, diagnosis and treatment is delayed and the patient may suffer irreversible complications; even when the patient presents with the specific symptoms of Acrodynia, early diagnosis and treatment is not always available.

Mercury poisoning has been known for over 3000 years. Considering the extensive use of mercury in the industrial and medical fields of industry and medicine, especially in the production of diuretics, laxatives, antiseptics, anti syphilitic and anti parasitic drugs, mercury poisoning can be very common. More than any other age groups, the human fetus and children are prone to this poisoning. Renal blood flow constitutes 20% of the body's total flow, hence kidneys are the main sites of damage in mercury poisoning, especially the inorganic type; renal injury due to mercury toxicity occurs both in the tubules and glomeruli, with the proximal tubules being the most vulnerable to severe injury.

Mercury toxicity of the renal tubular cells results in excretion of hydrogen peroxide, followed by severe necrosis of tubules. Mercury links to sulphydril groups of lysosoms leading to increase of their activity and cellular injury. Symptoms of renal injuries are summarized in table1. In this article we report 3 cases of mercury poisoning in one family, with hypertensive encephalopathy in the first child.

Case Reports

The first patient, H.Z, a 10 year-old boy from Hamadan with psychiatric symptoms including auditory hallucination, and mood, behavioral, cognitive and arousal changes was referred to Tehran and admitted in the psychiatric ward of the Imam Hossein hospital with a provisional primary diagnosis of mental disease (Figures 1 and 2). In the physical examinations, a high blood pressure of 160/120 was noted and he referred to the pediatric unit for consultation; simultaneously severe itching and cutaneous lesions in the hands and feet, and palmar and plantar erythema were observed (figures 3 and 4).

His history showed that since the past 4 months he had suffered from backache, lower limb pain and muscle weakness, for which he had been admitted in the Hamadan hospital and investigated from various aspects; patient symptoms had continued until 10 days prior to his referral, when he had suffered 3 generalized tonic-colonic seizures during a day (3, 6 and 10 am); the duration of the first 2 spells was 10-15 minutes, and was followed by speech disorder. Symptoms the patient presented with symptoms were crying, delusion, insomnia, aggression, irritability and lethargy, for which he was given anti psychotic drugs. Simultaneously severe itching in head, hands, and feet, skin lesions in the form of mild swelling, erythema of the hands and feet and reddish and bullous lesions were observed, as were diarrhea and rectal prolapse in defecation. The child's personal history revealed no special disease, except for hypospadiasis, for which he had been operated 5 months ago.

Six months earlier, he had exposure to elemental mercury, while playing with a ball of mercury for duration of one week with his sister and brother (the other 2 patients). The parents were not related, and had had no occupational exposure to mercury. In the physical examination, the patient was alert but did not have good communication; severe irritability and hypotonia were observed that caused the patient to bend forward and reach the floor in the sitting position (figure 4), sometimes elevating the feet bilaterally above the head (figure 5). Palmar and plantar regions were erythematous and pinkish, and fingers tips were necrotic and gangrenous. Various pinky plaques with some degree of ecchymotic changes in the legs were seen. Multiple ecchymosis in the forearm and elbow were seen. In the palmar region, scars of previous bullous lesions were seen and in some areas, especially in the fingers, excoriation was seen. The patient was not febrile and head and neck examination revealed no lymphadenopathy.ENT examination was unremarkable except for pharyngeal erythema and some post nasal discharge. Chest examination and pulmonary auscultation were normal and just tachycardia was noted (pulse rate: 150) in the cardiac examination.The abdomen was firm and without distension or organomegaly. Examination of the extremities yielded nothing, except for the mild atrophy and skin lesions mentioned earlier. Examination of anal region, revealed the anal fissure in

the midline was seen and rectal prolapse during defecation, both reversible and not severe. Defecation was diarrheal and sometimes bloody. On arrival, blood pressure was 160/120 but decreased after several doses of sublingual nifedipine and returned to normal after several days of treatment with hydralazine and atenolol. The patient was mentally oriented; remote and recent memory was intact but immediate memory was fairly impaired and his speech was slurred.

His cranial nerve examination was normal and muscle force was about 4/5, tendon reflexes were about 1+ with no Babinsky sign. No irregularities were seen in the sensory examination. Although cerebellar tests (finger to nose, heal to chin, Romberg, diadokynesia) were normal, the gait was fairly ataxic and tendon gait was impaired. On para clinic evaluation, the routine test results (CBC, ESR, total protein, Alb, PT, PTT, U/A, U/C, blood gas) were normal. ECG and echocardiography were also normal, while EEGs showed various spikes in some asymmetric regions. Brain CT scan was reportedly normal but in the MRI, in T2, a hyper signal region in the occipital cortex and left posterior parietal cortex was reported. Fundoscopy was normal and slit lamp showed no lesion. Ultrasonography of the kidneys and DMSA scan were normal. Plasma renin activity and ANCA evaluations were not done. Blood catecholamines VMA, and HVA, in 24h urine were normal, C3=110, C4=40, CH50=94, ANA and anti DNA were negative. Tuberculin test was negative and CSF analysis, liver function tests and bone marrow aspiration were also normal.

Based on patient's symptoms, a diagnosis of mercury poisoning was considered and blood and urinary mercury levels were measured. In the initial measurement, blood mercury level was 2.5ug/ml (normal level: 0.3) and dimercaptosuccinic acid was prescribed and simultaneously treatment with D-Penicillamine (50 mg/kg) dividing in to 4 doses, was initiated. During the course of treatment, the patient complained of insomnia, severe itching, abdominal pain, and severe pain in the extremities that sometimes discomfort severe enough to immerse the extremities in cold water for relief; acetaminophen and Diclofenac were also administered for his pain but were ineffective. Insomnia was to some extent cured with Lorazepam. For lethargy and itching, cimetidine and chlorpromazine and Hydroxyzine were administered without any clear effects. After preparation of Dimercaprol (BAL), a course of IM therapy was recommended and then followed by D-Penicillamine again. Two weeks later, blood mercury level was reported to be 1.1ug/dl with a urinary level of 3.54. After 4 weeks, blood and urinary mercury levels were 1.5 and 0.56ug/dl, respectively. Three months later, serum mercury level was reported 2.5ug/dl, although this was unexpected, blood and urinary mercury level, based on laboratory references 0.3, was still elevated but lethargy and other symptoms were significantly resolved.

Cases 2 and 3

The two other patients, siblings of the first, were an 11 year-old sister and 8 year-old brother, with complaints of abdominal pain, feet pain, backache and some degree of body itching, symptoms that appeared after one month of case 1. On physical examination, blood pressure was within the upper normal limit in both cases, without any other clear symptoms. Serum levels of mercury in the sister and brother were 1.1 and 1.5ug/dl respectively. After 2 weeks, sister's blood and urinary level were 2.2 and 11.38 and the brother's were 1.3 and 32.60. Three months later, serum mercury levels in the sister and brother were 66ug/dl and 1.4ug/dl respectively, with resolution of all symptoms.

After confirmation of mercury poisoning in these three children, the environment health team of the ministry were informed and following a survey of the site, did not find any other suspicious cases; it seems that just these three children, away from their parent's surveillance, had played with the mercury ball.

Discussion

The wide applications of mercury in agriculture, industry, daily living and also in medicine, result in increased mercury poisoning cases, especially in children, Toby Litovitz et al. in the national poisoning center of Washington, reported 2382 cases of eating of small mercury batteries during 7 days; in 33% of these, the batteries were extracted from hearing aids and then were swallowed (2).

History documents that, Andre Jackson (1767-1845), the president of USA, suffered from mercury poisoning due to Calomel use. If the elemental mercury is swallowed, its toxicity isusually not severe and systemic because its absorption in the GI system is very low but inhalation

of its steam can be very dangerous; methyl mercury and phenyl mercury absorption from the GI is 100% and passes through the blood brain barrier and placenta, resulting in irreversible effects with symptoms including mental retardation, brain disorders, seizure, spasticity and peripheral neuropathy, This constellation of symptoms fulfills the criteria for the diagnosis of Minamata disease, Minamata being the name of city where this disease was first discovered.

Chronic mercury poisoning is associated with symptoms that include irritability, anorexia, sweating, stomatitis, and salivation, pinky coloration of extremities (Pink disease), albuminuria, acute tubular necrosis, and renal failure. Other manifestations of mercury poisoning are seizure, tremor, photophobia, necrotizing bronchitis, pneumonia, muscle weakness, stomach ulcers, cardiac arrhythmia, cardiomyopathy, and acrodynia, mental disorders, and blood pressure disturbances due to renal involvement and hypersensitivity and elevated serum aldostrone. Dr Gewen and colleagues (3) reported a 12-year old girl with motion disorder, joint pain, weakness, vomiting, sweating, chorea symptoms, severe itching especially in the genital tract, mental disorders, abnormal positioning in rest, high blood pressure (150/90mmHg) and weight loss due to mercury steam exposure after spilling of the mercury on the carpet. Clinical manifestations and symptoms of this patient, and both the type of poisoning and etiology resemble those of our patients.

Our first patient, admitted initially in the psychiatric ward with irritability, aggression and erethism, and high blood pressure, leading to seizure in our patient was observed, a finding similar to the Gewen study and others. Seizure without relapse after treatment of hypertension, with the presence of other symptoms, confirmed the hypertensive encephalopathy due to mercury toxicity.

Manifestations observed in this patient were in fact, a collection of all symptoms reported by other researchers (1-11).

Mercury poisoning should be considered in the differential diagnosis of mental disorders, disorder of GI system, skin lesions, renal disease and systemic diseases such as hypertension to prevent progression of lesions and the morbidity and mortality in these patients.

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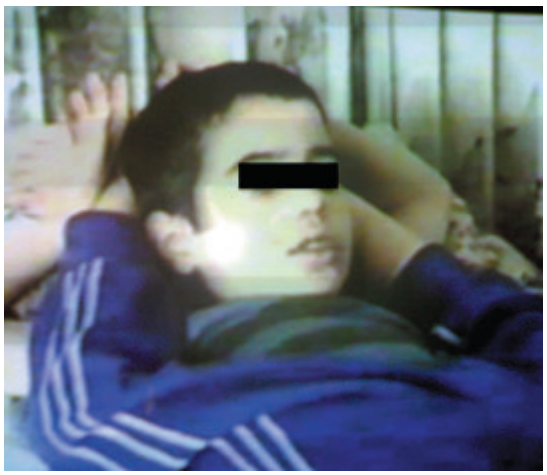

Fig 1: 10 - year old boy with hypotonia and behavioral changes

Fig 2: 10- year old boy with hypotonia and pruritus in hand and foot

Fig 3: 10- year old boy with hypotonia and severe pain

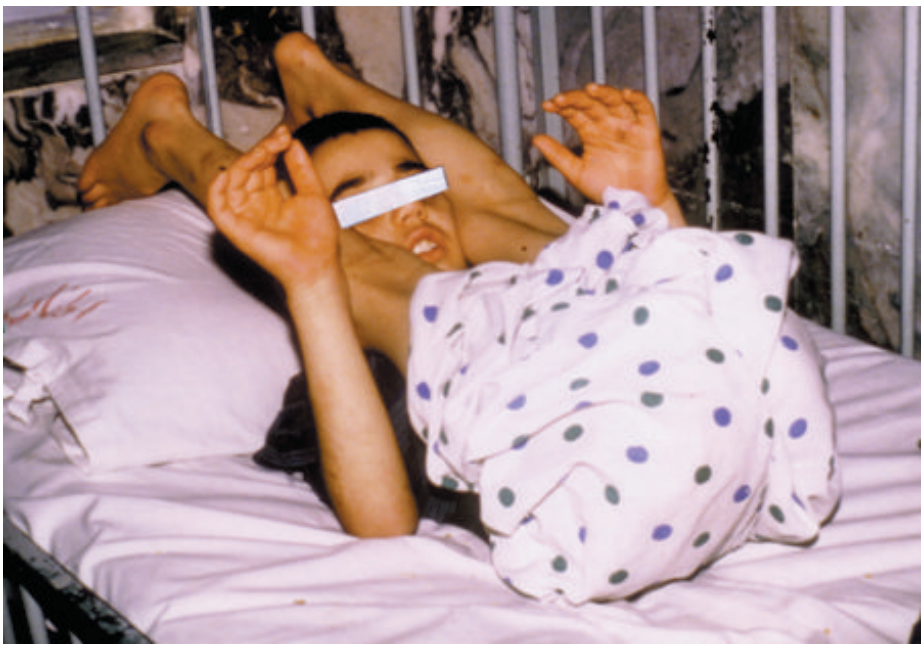

Fig 4: Severe hypotpnia in patient

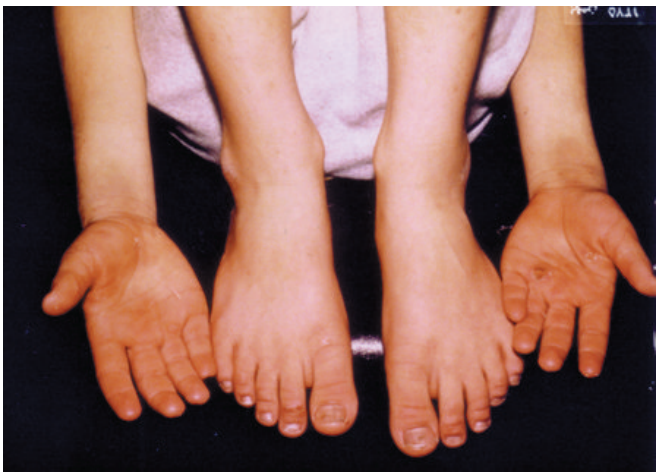

Fig 5: Red discoloration and pruritus in hands and feet (Pink disease)

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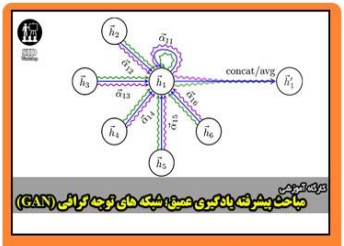

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