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Mercury intake by gastrointenstinal track and importance of blood level measurement method: a case report

Gastrointestinal yoldan cıva alımı ve kan düzeyi ölçüm metodunun önemi: olgu sunumu

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Abstract

Mercury is found in nature in liquid form at room temperature. Because it always freely moves in nature with natural distribution, it is found in trace amounts in all living organisms. Mercury exposure can occur by inhalation, gastrointenstinal absorption, or dermal contact. Forms of poisoning change according to occupations and living conditions. After exposure, the mercury-exposed patient can show cardiac symptoms like itchy rashes, burning sensation, arrhythmia, and hypertension along with neuropsychiatric symptoms ranging from personality changes to seizures. Mercury esposure can be seen in children. Children are exposed to mercury accidentally. As it is the case in many toxic substances, methods of analysis are of utmost importance in treatment and follow-ups of such cases. There may be distruptions while conducting these analyses and passing the results of these analyses to the practitioners that will decide on the treatment. It seems difficult to enable toxicological analyses in all hospitals. We believe that there must be regional hospitals with accredited laboratories capable of carrying out such analyses in similar cases of poisoning and that these cases should be promptly referred to these designated centres.

Keywords: Mercury; Intoxication; Minimata Disease.

Özet

Cıva doğada oda sıcaklığında sıvı halde bulunan tek metal elementidir. Doğal dağılımla sürekli serbest hale geçtiği için tüm canlılarda iz halinde bulunur. Cıva maruziyeti solunum yolu, gastrointestinal emilim ve deri teması yoluyla oluşabilir. Kişilerin çalışma sektörlerine ve yaşadıkları ortam koşullarına göre zehirlenme şekilleri görülür. Cıva maruziyeti, kaşıntılı döküntüler ve yanma hissi gibi dermatolojik etkiler; aritmi, hipertansiyon gibi kardiyolojik etkileri ve konvülziyondan kişilik değişikliklerine kadar değişen nöropsikiyatrik bulgular gösterebilir. Cıva maruziyeti günümüzde çocuk yaş grubunda görülebilmektedir. Çocuklar cıvaya genellikle kaza sonucu maruz kalırlar. Yapılan takip ve tedavi açısından analiz yöntemleri, çoğu toksik maddelerde olduğu gibi önem arz etmektedir. Bu analizlerin yapılması ve tedavi hakkında karar verecek olan doktora iletilmesi esnasında belirli aksaklıklar oluşabilir. Toksikolojik analizlerin bütün hastanelerde yapılması zor gibi görülmektedir. Bu gibi vakaların gerekli analizlerinin yapıldığı bölge hastanelerinde akredite edilmiş laboratuvarların sağlanmasının tıbbi bir gereklilik olduğu ve bu tür vakalarında zaman kaybetmeksizin belirlenen merkezlere sevkinin sağlanması gerektiği kanaatindeyiz.

Anahtar Kelimeler: Cıva; Toksikasyon; Minimata Hastalığı.

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INTRODUCTION

Mercury is the only metallic element in nature that is found in liquid form at room temperature. Because it always freely moves in nature with natural distribution, it is found in trace amounts in all living organisms. Basically mercury has three types: elemental mercury (also called metallic mercury), inorganic mercury, organic mercury (1, 2). Elemental mercury, which is particularly used in thermometers, is used in batteries, paper, plastic industry, leather processing, gold purification, and amalgam (fillings) making in dentistry (2-4). Mercury poisoning is called Minamata disease. Emerging simultaneously with the establishment of plastic factory in Minamata Gulf, the disease first appeared with neurotoxic symptoms particularly in those who consumed fish from this area regularly. Because it was fist observed in cats that fed on the marine products, it is also known as the cat dancing disease.

The disease can manifest itself in people with no clinical poisoning symptoms (especially after low-dose exposures to metallic mercury). In this case report, we aim to present the difficulties we came across and suggestions for solutions in a child patient who was referred to us for a forensic report including mercury level measurements after gastrointestinal mercury intake.

CASE REPORT

Our outpatient clinic at the Department of Forensic Medicine was asked to prepare a final report of a 6-year-old child, who was told to have taken mercury through gastrointestinal tract. Our case was a 6-year-old boy and was thought to have broken the thermometer apart at home and drunk the mercury within. The child was then taken the emergency services. In the X-ray evaluation of the abdominal radiograph, there was radiopacity that was reported to be mercury (Figure 1). After contacting 144 Poisoning Hotline and in accordance with their suggestions, the patient was then admitted to the intensive care service and was monitored for two days for blood mercury levels. Because the blood mercury levels could not be studied at that hospital, the research laboratories of our university were asked to provide assistance. It was reported that the blood mercury levels were 3.8ppm and urine mercury level was 9ppm; it was also reported that the Poisoning Hotline was contacted one more time, which suggested that the patient had to be discharged within 24 hours to be called back after a week for blood and urine mercury levels because the analysis results did not exceed the toxic doses. After contacting the Department of Medical Biochemistry, we learnt that the analysis was conducted by the Central Research Laboratory; upon this, we contacted this unit on 9 October 2013 and were informed that "the measurement was not among the routine procedures applied in this centre; that the analysis was carried out on a holiday as they were informed that it was an emergency case; that the measurement, which was not a non-routine measurement, was carried out within the possibilities; that the samples were studied on an Atomic Absorption Spectrometer (AAS) and the unit of measurement, though it was measured in micrograms/litre, was ppm." The results of these tests and the results with which the practitioner (who would make a decision on the treatment and the case) was informed only orally, as well as the hospital records were all in ppm. Furthermore, there was no record of any document of this measurement. Our case shows that the failure to carry out this measurement in the hospital could cause disruption in the treatment scheme despite the fact that the patient did not have significant clinical problems. It was observed that passing the results orally to the practitioner caused some disruptions; an example to this was the use of ppm as the unit of measurement although blood and urine mercury levels are measured in micrograms/dL and micrograms/L. This can lead to serious problems in the planning of treatment in serious poisoning cases.

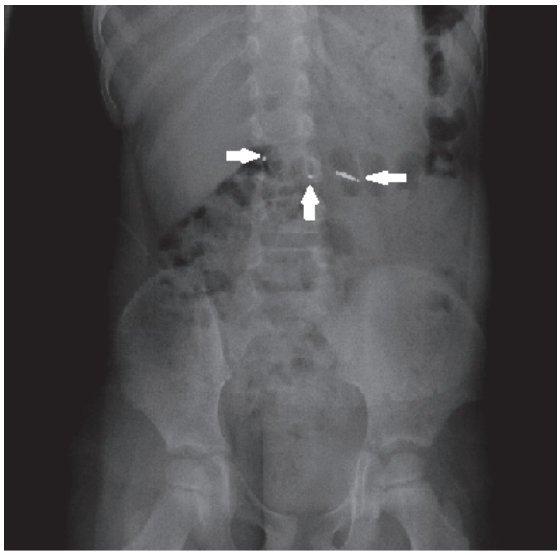

Figure 1. The image of the radiopacity in ambulatory abdominal radiograph reported to have been caused by mercury intake.

DISCUSSION

Mercury exposure is usually accidental and can be seen in all age groups. Mercury exposure can occur through inhalation, gastrointestinal absorption, and skin contact (3-7). The type of mercury as well as the work area and living conditions of people shape the type of mercury poisoning. Children are often exposed to mercury by accident. After exposure, the mercury-exposed patient can show cardiac symptoms like itchy rashes, burning sensation, arrhythmia, and hypertension along with neuropsychiatric symptoms ranging from personality changes to seizures. Meanwhile, in cases with oral mercury intake in limited doses when there is no lack of movement (constipation, etc.) in the gastrointestinal tract that would prolong absorption, mercury intoxication may not take place (5-8). Studies in the literature on toxic doses of mercury compounds report that the amount of life-threatening amount of metallic

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mercury vapour is 10 mg/m3. Studies also report that mercuric chloride is one of the most toxic inorganic mercury compounds and 0.5-2 g of oral intake could be lethal; the lethal amount of the organic mercury is 10 to 60 mg/kg while it is taken at a dose of 10 micrograms/kg/day chronically, it brings about toxic effects on the nervous system and reproductive system (9-15). The important point here is whether hospitals are capable of carrying out blood and urine mercury measurements. In poisoning-related cases with life-threatening clinic, it is a medical necessity to establish certain centres after evaluating accredited laboratories on a regional basis.

As can be seen, analysis methods, as in many toxic substances, are important in terms of the medical monitoring and treatment. It seems difficult to conduct these tests in all hospitals. Considering the financial burden this may cause to Turkey, it is not possible to establish accredited laboratories in each hospital for cases rare as these cases. However, as encountered in the case of this patient, certain failures are bound to surface during treatment and follow-up due to the lack of accredited laboratories. Besides, if the data are not based on standard methods of measuring and reports lack for specific rules, there will be disruptions in follow-up and treatment. As it has been explained in this case, there were difficulties because of disruptions in the method of measurement during the treatment, follow-up, and preparation of the forensic report. For instance, one of the evaluation criteria for life-threatening poisoning cases under "Evaluation of Poisoning Injury Severity" in the "Forensic Medicinal Evaluation of Criminal Wounding Acts of the Turkish Penal Law" scale, which is often used as basis while preparing forensic reports, dictates that "substance blood levels should be within toxic doses if toxic dose is well-defined and based on reliable data" and this statement is of importance in terms of preparing such reports. Hence, it can be seen that measuring blood levels of toxic substances such as mercury is significant in terms of Forensic science and that these measurements should be conducted by accredited forensic laboratories.

This is why it is a requisite that there must be regional hospitals with accredited laboratories capable of carrying out such analyses in similar cases of poisoning and that these cases should be promptly referred to these designated centres.

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