Evaluation and Treatment of Wrist Drop in a Patient due to Lead Poisoning: Case Report

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Abstract: Lead (Pb) is widely used because of its useful properties and it is ubiquitous in human environment. There are various lead based industries and several workers who are working in these industries without the knowledge of the ill effects of lead and hence not taking proper precautions while handling lead. Many a times, these workers who have accumulated lead in their blood and body organs, are not properly diagnosed and might receive only symptomatic treatment. We describe a thirty-two-year old male, who was working in an unorganized lead based industry for 3 yr, developed severe lead poisoning leading to wrist drop. Since one year the patient received only symptomatic treatment for abdominal pain. His laboratory investigation showed elevated blood lead levels. The chelation therapy using D-Penicillamine brought down his blood lead levels and is on follow up presently. It is required to take proper history about the occupation of the patient, exposed to potentially hazardous levels of lead in the workplace and medically evaluate them.

Key words: Lead poisoning, Wrist drop, BPb levels, Chelation therapy, Occupational hazard

Introduction

Lead is a naturally occurring bluish grey metal found in small amount in the earth’s crust. History has recorded lead as one of the most useful metals used by man all over the world. It is a non-essential trace element for man with a toxic potential for biological systems. Human exposure to lead occurs from numerous sources and a myriad of pathways including air, food, dust, soil and water. The common sources of exposure are use of certain products containing lead such as lead soldered cans, traditional practices such as folk remedies, cosmetics, artisan ceramics, environmental emissions containing lead and very importantly through occupations such as production, use and recycling of lead, lead smelting, refining, alloying and casting, lead acid battery manufacture and breaking, printing, jewellery making etc.\(^1\)\(^\text{–}^7\).

Lead poisoning occurring in humans, either due to occupation or environment has become a great public problem, because lead in the body is associated with a wide variety of biological effects. It alters virtually all biochemical processes and organ systems.\(^8\)\(^\text{–}^10\). The symptoms of lead toxicity are very general and nonspecific. These include nausea, sluggishness, vomiting, painful gastrointestinal irritation, diarrhea, loss of appetite, weakness and dehydration. These symptoms are common to many disorders and can lead to inaccurate diagnosis. Severe cases of poisoning results in formation of a bluish line along the gums, known as the ‘Burton’s line’ and can cause convulsions, wrist drop or external limb paralysis, coma and ultimately death.\(^11\).

The majority of cases of all forms of lead intoxication, especially lead neuropathy, result from industrial expo-
The classic form of lead neuropathy, consists of weakness that primarily involves the wrist and finger extensors leading to wrist drop, also known as radial nerve palsy. It is a condition where a person cannot extend their wrist and it hangs flaccidly (12).

Lead toxicity is an uncommon cause of abdominal pain in adults. Studies have reported several cases of colic abdominal pain caused by lead poisoning (11, 13). Anemia that accompanies lead poisoning is primarily due to the interference with the heme synthesis. Lead inhibits 3 major enzymes: δ-aminolaevulinic acid dehydratase, coproporphyrinogen oxidase and ferrochelatase of the heme synthesis (14).

In this report we describe a case of worker, who suffered from colic abdominal pain. He was unaware of the ill effects of lead and was receiving only symptomatic treatment over one year.

Case Report

We present a case of thirty-two-year old male, referred by a local hospital to the National Referral Centre for Lead Poisoning in India (NRCLPI) with a presumptive diagnosis of lead poisoning. Written informed consent was obtained from the patient for publication of this case report. Colonoscopy and abdominal ultrasound which was done in the local hospital showed normal findings. His history revealed that, he worked in an unorganized battery industry for three years and suffered from acute abdominal pain since a year. With a subsequent weakness in the hand, he had paralysis of the extensor muscle of both hands leading to wrist drop.

History of the patient revealed that he had been working in an unorganized lead based industry since 3 yr. He was working without wearing proper respiratory protection, gloves and mask even though they were provided to him. The employer had failed to provide proper ventilators, exhaust and proper storage facilities for street clothes. There were no separate areas provided for the removal and storage of the lead-contaminated protective work clothing and equipment. He was unaware of the ill effects of lead and had not undergone any health check ups till he developed colic abdominal pain.

The investigations carried out during his initial visit to our center showed anemia with hemoglobin (Hb): 8.9 gm% (Normal range in males: 14–16 gm%); Total count: 4,000 C/cu m (Normal: 4,000–10,000 C/cu m); Differential count: Neutrophils 64% (Normal: 40–78%); Lymphocytes 36% (Normal: 20–45%); Platelets: 1.68 lac/cumm (Normal: 1.5–4.0 lac/cumm); Peripheral smear: RBC shows anisopoikilocytosis with normocytic hypochromic cells; Basophilic stippling is not seen. Blood urea: 44 mg/dl (Normal: 15–45 mg/dl), serum creatinine: 0.8 mg/dl (Normal in males: 0.6–1.2 mg/dl).

Screening the patient for lead poisoning in our laboratory involved estimation of blood lead (BPb) levels and Zinc Protoporphyrin (ZPP). Results showed elevated levels of ZPP: 150 µg/dl and BPb: 106.5 µg/dl. The patient was subjected to three courses of oral chelation therapy using D-penicillamine capsules. Since the patient was not willing to get hospitalized during the course of therapy, oral D-penicillamine treatment was used instead of intravenous administration of calcium disodium ethylene diamine tetra-acetate (CaEDTA). The BPb measured immediately after the each course has decreased to 35 µg/dl, with an increase in Hb level and improvement in wrist drop and abdominal colic (Table 1).

### Table 1. BPb and ZPP levels before and after each course of chelation therapy

<table>
<thead>
<tr>
<th>Description</th>
<th>Before chelation</th>
<th>After 1st course of chelation</th>
<th>After 2nd course of chelation</th>
<th>After 3rd course of chelation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPP (µg/dl)</td>
<td>150.0</td>
<td>96.0</td>
<td>65.0</td>
<td>42.0</td>
</tr>
<tr>
<td>BPb (µg/dl)</td>
<td>106.5</td>
<td>80.3</td>
<td>54.2</td>
<td>35.0</td>
</tr>
<tr>
<td>Hb (gm%)</td>
<td>8.9</td>
<td>9.3</td>
<td>10.8</td>
<td>12.8</td>
</tr>
<tr>
<td>Wrist drop</td>
<td>Severe</td>
<td>Severe</td>
<td>Moderate</td>
<td>Mild</td>
</tr>
<tr>
<td>Abdominal colic</td>
<td>Severe</td>
<td>Moderate</td>
<td>Mild</td>
<td>Mild</td>
</tr>
</tbody>
</table>

Discussion

Lead is a significant occupational hazard in all lead based industries like battery industries, ceramic industries. The patient we reported here was unaware of the ill effects of lead and receiving only symptomatic treatment over one year for abdominal pain. When he was referred to NRCLPI, a thorough investigation was carried out which revealed elevated BPb level of 106.5 µg/dl, which had caused the wrist drop in the patient. Wrist drop also known as radial nerve palsy, is a condition where affected persons cannot extend their wrist and it hangs flaccidly. The patient was subjected to three courses of oral chelation therapy using D-penicillamine capsules. Since the patient was not willing to get hospitalized during the course of therapy, oral D-penicillamine treatment was used instead of intravenous administration of calcium disodium ethylene diamine tetra-acetate (CaEDTA). The BPb measured immediately after the each course has
shown a decline in the levels. He responded well to the chelation therapy and his B Pb declined to 35 µg/dl. There was an improvement in Hb level to 12.8 g/dl and the blood picture showed RBCs of normal size, shape, and color after the third course of chelation therapy. This was accompanied by improvement in wrist drop and abdominal colic and is on follow up presently.

B Pb levels of less than 10 µg/dl is seen in normal healthy Indian workers who have not been exposed to lead in their work place15. The B Pb levels after the third course of chelation therapy in the patient we reported was still higher than the levels seen in unexposed Indian workers. Since he was exposed to lead for 3 yr in work place, lead might have deposited in his soft and mineralizing tissues requiring a longer course of therapy to remove all the lead16.

There are many such workers working in this type of unorganized battery industries. These industries are neither registered nor visited by any regulating authorities. Some of these are as small as a family owned smelting industry. The lack of a safe workplace and proper awareness among workers in these unorganized industries has resulted in high B Pb levels of the workers. It may not be possible for proper diagnosis of lead poisoning based on the general symptoms. The specific symptoms of lead poisoning are not apparent unless the amount of blood lead level is extremely high, hence many cases of lead poisoning go undiagnosed and untreated or might receive only symptomatic treatment.

The primary management of lead poisoning is identification of source and cessation of further exposure17, 18. In the present study the chelation therapy was accompanied by aggressive environmental intervention, and the patient was not allowed to return to the same environmental exposure situation during the course of treatment.

This environmental health hazard can be prevented to some extent through proper awareness and education. In addition to this there should be proper measures to control lead exposure in the workplace. The workers need to follow safe work practices while handling lead by wearing protective measures such as gloves, head gear, masks, aprons, safety glasses. Washing hands and face before eating or drinking. Eating and drinking only in areas free of lead dust and fumes. Avoiding stirring up lead-containing dust by dry sweeping or blowing. Taking a shower at work before going home and not wearing the work clothes and shoes/boots home19.

Owing to insufficient controlling measures in work places, lead poisoning is still a common occupational health hazard in developing countries like India. Unorganized lead based industries must be banned and strict national and international policies need to be implemented. Detecting lead poisoning can be difficult because most of the cases have no visible symptoms, delaying the diagnoses. It is required to take proper history about the occupation of the patient, exposed to potentially hazardous levels of lead in the workplace and medically evaluate them.

References


