

Swamp stone a dangerous source of lead oxide poisoning: report of 5 cases in a family

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Abstract

This case series reports lead poisoning with “Swamp stone” powder in a family. Swamp stone contains heavy metals with poisoning potentials. The chelating agent had more efficiency in parents than their children in lowering the blood level lead. It is important to find sources for lead poisoning and educate population.

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Abstract

Introduction: Lead Poisoning is a global medical problem. Some dangerous and unusual sources of lead in traditional medicine have remained unknown.

Methods: In this case series, we report accidental lead poisoning with ”Swamp stone” powder, presentation of toxicity, and treatment outcome.

Results: All 5 cases (family members) had a toxic blood lead level, and all of them were symptomatic. Nausea, abdominal pain, diarrhea, fatigue, and generalized muscles weakness were the most common presentation that was seen in all cases. The mean blood lead levels (BLL) pre and post-treatment with the chelating drug were 45.90 and 37.16 $\mu\text{g}/\text{dl}$, respectively. The mean percentage reduction of BLL after treatment in adult and child cases was 29.7% and 3.9%, respectively.

Conclusion: Swamp stone contains many heavy metals with a high potential for severe to lethal poisoning. The chelating agent had more efficiency in parents than their children in lowering the blood level lead.

Keywords: Lead, poisoning, swamp stone

Key clinical message

It is important to find sources for lead poisoning and educate the population about the danger of this heavy metal. The epidemiologic studies for evaluating BLL can help develop a guideline for screening endangered populations and providing treatment.

Introduction

Contaminated water and soil are the primary sources of Lead poisoning. Color materials, cosmetics, kohl eye, fake lipstick, and contaminated opium are known as common sources. These are considered causes of lead poisoning [1]. Lead toxicity with "Swamp stone" or "Silver stone" rarely occurs [2]. In most Iranian perfumery stores, this material is sold under the name "Sang-e-Mordab." It is a yellow to brown powder, rubbed on the skin as a deodorant to remove the smell of underarm odor, sweaty feet, and reduce sweating. Swamp stone consists of nearly 70 percent heavy metals, mostly lead oxide (Pbo), and it also contains a low amount of other metals such as Chromium and Nickle. Skin, lungs, and GI tracts can absorb lead oxide. Excessive use or ingestion of this powder can result in lead poisoning. Such material is dangerous if used carelessly.

Lead can affect the central and peripheral nervous system, skin, kidneys, reproductive system, gastrointestinal system, and musculoskeletal system. Patients with high blood lead levels (BLL) may experience severe, intractable abdominal colic pain (very common), weakness, paralysis anemia, high blood pressure, and renal dysfunction [3]. Asymptomatic lead poisoning has become more common in children. High lead levels in children affect neurocognition and behavioral development that could be irreversible [4]. In adults, high blood lead level is associated with memory deficit and loss of attention [5].

Recently, United States experienced a lead poisoning disaster in Michigan. This public health disaster happened when Flint changed its water source and led leached into aging pipes' water supply. As a result, heavy metal levels in drinking water became significantly elevated [6].

Based on the World Health Organization declaration and the Centers for Disease Control and Prevention, there is no safe level of blood lead [7]. Some countries over the years have developed guidelines to manage lead intoxicated patients better, but there is no official organization in Iran for investigating and treating lead poisoning. The average lead level in the Iranian population is not well studied. Therefore, practitioners face many difficulties while diagnosing and treating these patients. This case report presents a family of five with different signs and symptoms but the same diagnosis.

Cases presentation

A family of five visited the lead poisoning clinic complaining of mostly fatigue and exhaustion. They were accidentally using swamp stone powder for over five months instead of Cinnamon in their food. Their demographic information is further explained in table one. All 5 cases present with the chief complaint of recurrent colicky abdominal pain and fatigue. Gastrointestinal upset (abdominal pain, nausea, and diarrhea) was seen in all 5 cases. Case 1 and 2 (both parents) were experiencing severe paresthesia in the upper and lower extremities. Case 2 (mother) had significantly severe loss of appetite associated with significant weight loss (more than 10% in recent three months), bilateral pitting edema in legs without renal impairment with normal thyroid function test and normal serum protein and albumin, unusual taste, joint and generalized muscles pain, weakness, and paresthesia due to consumption of more amounts of swamp stone powder as Sinnamon in her herbal tea by mistake [table 2]. She also was anemic (hypochromic-microcytic).

Case 3 was complaining of shortness of breath and dyspnea as the initial symptom. The mother and the middle child complained of a depressed mood. Loss of appetite and weight loss was the most prominent complaint of the father. The mother and oldest daughter had joint pain, especially in their wrist. Their son had some macular red skin color changes on his hand and foot. Discoloration of gum, memory loss, seizure, constipation, and kidney dysfunction were not detected in any of them. The result of the initial blood lead level is available in table one. The summary of their signs and symptoms is explained in table 2. Although some symptoms such as abdominal pain, diarrhea, nausea, and muscle weakness were common and saw in all patients, other symptoms and signs had variability.

They all were admitted to the hospital to receive chelation therapy. All four adult family members were treated with intravenous Ethylenediamine tetra acetic acid (CaNa2 EDTA), two grams for three days. The youngest child received one gram (25mg/kg/day) of EDTA for three days. During their admission, daily calcium was tested, and the patients received daily doses of calcium supplements. Their thyroid hormone levels were tested, and the results came back normal. The Electromyography (EMG) and nerve conduction velocity (NCV) were normal in all five family members, and no signs of peripheral neuropathy were detected, despite experiencing paresthesia in all cases.

After completing the first chelation therapy session with intravenous CaNa2 EDTA, their well-being improved, but some symptoms such as finger numbness, generalized weakness, and muscle pain remained. The blood lead level (BLL) changes after therapy have been shown in table 1. We followed them with checking BLL two weeks after discharge.

Table 1: Demographic variables and level of blood lead

			Case 1	Case 2	Case 3	Case 4	Case 5
Gender	Gender	Gender	male	Female	Female	Female	male
Age (yrs)	Age (yrs)	Age (yrs)	50	45	25	17	8
Occupation	Occupation	Occupation	Clerk	housewife	student	student	student
BLL* ($\mu\gamma/\delta\lambda$)	Before	Before	51.2	63	41.8	37.6	35.9
	therapy	therapy					
	After	1th course	34.6	46	38.2	33.4	32.8
	Therapy	2 nd course	31	42.5	31.4	30	39.2
		3 rd course	-	31	-	-	33
Percentage	Percentage	Percentage	32.5	26.9	8.7	1.1	2.1
reduc-	reduc-	reduc-					
tion of	tion of	tion of					
BLL	BLL	BLL					

* BLL: Blood lead leve

Table 2: Presentation of Lead poisoning

Signs and symptoms	Case 1	Case 2	Case 3	Case 4	Case 5
Paresthesia	P*	P	A**	A	A
Arthralgia	A	P	A	A	A
Muscles Pain	P	p	A	P	A
Muscle cramp	A	P	A	A	A
General Weakness	P	P	P	P	P
Cognitive deficit	A	A	A	P	P
Fatigue	P	P	P	P	P
Memory loss	A	A	A	P	P
Abdominal pain	P	P	P	P	P
Nausea	P	P	P	P	P
Diarrhea	P	P	P	P	P
Loss of appetite	P	P	A	A	A
Anemia	A	P	A	P	A
Headache	P	P	P	A	A
Back pain	A	p	P	A	A

*Present **Absent

Discussion

Lead poisoning is one of the medical diagnoses usually forgotten, especially when there is no history of exposure. Many cases with lead poisoning were studied for other causes of abdominal pain and anemia with unknown causes. These patients underwent many unnecessary medical procedures such as endoscopy, colonoscopy, and bone marrow aspiration, in which lead poisoning can be confirmed with a high blood lead level. In the presented family, due to recurrent abdominal colic and other symptoms, they had been worked up for many causes of such symptoms. They attributed their signs and symptoms to mild coronavirus (COVID-19) infection considering the recent worldwide pandemic. During a few months, they visited many specialists due to chronic pain and muscle weakness. This situation postponed the correct diagnosis. Ultimately, the oldest child who bought the swamp stone powder suspected that they were using this powder by mistake in their food and explained the scenario to their physician. Their BLL was tested, and the results confirmed the diagnosis of lead poisoning. They were referred to our lead poisoning clinic for further evaluation and treatment.

In the presented cases, five people with the same exposure experienced different signs and symptoms. Their BLL was different. They even have different outcomes after receiving the treatment. The parents' response to treatment was significant comparing to children. All five cases remained symptomatic with toxic BLL and underwent a second course of therapy with an oral chelating agent (Succimer or di-mercaptosuccinic acid). Case 2 also received a ^{third} course of therapy with D-penicillamine till she became symptoms-free. The adult cases (parents) had higher BLL than children, but they showed better response to first chelating therapy to see a 32.5 and 26.2% reduction in BLL for parents. As table one shows, the mean reduction in BLL in children under 18 was 1.6%. The youngest patient with age 8 (case 5) had significant resistance to therapy and underwent a ^{third} course of oral chelating therapy.

One theory is that because of higher bone density in children; they absorb more lead than adults. After chelation therapy, children have a higher lead body burden and excessive lead release in the bloodstream. This can explain the children's higher lead level, compared to the parents, after chelation therapy. The younger daughter and son were experiencing attention deficit and difficulty in concentration. One of the reasons for this finding could be that these children were students, and their families and teachers monitored their function at school. So any changes in their cognitive and intellectual function would be noticed.

These findings showed that every patient with vague complaints and suspicious exposure needs to be evaluated for lead poisoning. As clinicians, we should consider heavy metal poisoning as a proper differential diagnosis. Case 2 (mother) used more swamp stone powder and had more symptoms than the other cases. She remained symptomatic after the first session of therapy (2 gram intravenous CaNa₂ EDTA for five days). She received two following oral Succimer (dimercaptosuccinic acid) courses for 19 days and D-penicillamine 250mg QID for ten days.

After five-month exposure to swamp powder, all cases had a toxic BLL, and they became symptomatic. The high level of lead oxide in this product makes it a potential source for severe lead poisoning. It is important to find the source of the lead poisoning and report it to the responsible organization. Acknowledging the responsible organization can prevent many people from having exposure to lead sources. Physicians should keep in mind the source of the new or unusual ways of lead poisoning like traditional medicine. Many people believe that all herbal or traditional medicine is safe for them and may overuse it. Physicians should ask their patients about traditional medicine when making a diagnosis of lead poisoning with unknown origin. They should warn their patients about the use of dangerous traditional medicine like Swamp powder.

Conclusion

We suggest that the purchase of swamp stone powder become restricted. Only the drugstores and specific stores should be allowed to sell the product. Also, all products should have labels that explain the ingredients of swamp stone and the dangers of inappropriate consumption. This product should be kept out of reach

of children. The product should have a not-eatable sign on the label. The packaging and coloring of the product should be distinguishable from spices and other eatable materials. These cautions can help prevent accidental swamp stone poisoning.

It is important to find sources for lead poisoning and educate the population about the danger of this heavy metal. Also, the government should be aware of this critical matter and evaluate the food and water supplies. Population-based studies about normal lead levels and lead poisoning are neglected in undeveloped or developing countries. The epidemiologic studies for evaluating BLL can help develop a guideline for screening endangered populations and providing treatment. The importance of this matter comes to light when considering the younger generation. The best way to achieve early diagnosis is a proper screening schedule.

Declaration

Conflict of interest

The authors declare that they have no conflict of interests.

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No findings were used for writing this article.

Authors' contributions

Dr. Abbas Aghabiklooei was the chief of the forensic medicine department and in charge of the patient's treatment plan. Dr. Nazanin Zamani gathers the information and prepares the manuscript.

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Data availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to the fact that their containing information that could compromise the privacy of research participants.

Ethical statement

For publishing this case report, we asked Firoozgar hospital ethical committee for approval. We informed the patients about the process of publishing a case report and they signed the consent forms.

References

1. Karrari P, Mehrpour O, Abdolahi M. A systematic review on status of lead pollution and toxicity in Iran; Guidance for prevention measures, *Daru*. 2012;20(1):2. doi: 10.1186/1560-8115-20-2. Epub. 2012 Jul 19.
2. Bita Dadpour, Alireza Ghasemi Toussi, Zohreh Abbasian, Azam Shafahi. Case report toxicity of swamp stone. *Medical Journal of Mashhad University of Medical Sciences*. Doi: 10.22038/mjms. 2019.13929.
3. Shabani, M., et al., Lead poisoning; a neglected potential diagnosis in abdominal pain. 2020. 20(1): p. 134.
4. Mayans, L., Lead Poisoning in Children. *Am Fam Physician*, 2019. 100(1): p. 24-30.
5. Caito, S. and M. Aschner, Developmental Neurotoxicity of Lead. *Adv Neurobiol*, 2017. 18: p. 3-12.
6. Hanna-Attisha, M., B. Lanphear, and P. Landrigan, Lead Poisoning in the 21st Century: The Silent Epidemic Continues. *Am J Public Health*, 2018. 108(11): p. 1430.
7. Renfrew, D., Lead Poisoning and the Dangers of Pragmatism. *Int J Environ Res Public Health*, 2018. 15 (9).

Tables

Table 1: Demographic variables and level of blood lead

Table 2: Presentation of Lead poisoning