Management of Lead Poisoning From Ingested Fishing Sinkers

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Objective: To describe what is to our knowledge the first reported case of lead poisoning from ingested fishing sinkers in an 8-year-old boy for whom whole bowel irrigation and colonoscopy were required.

Literature Review: All relevant literature on plumbism from other swallowed foreign bodies, including curtain weights, bullets, shot, and other unusual sources, is reviewed and discussed.

Conclusions: Lead screening is advocated in any child presenting with a history of pica or foreign-body ingestion, especially presentations involving abdominal pain, weight loss, and emesis. Conservative management of retained foreign bodies containing lead is not recommended with persistently high lead levels. Medical and surgical intervention should be considered.


Although public health efforts have been successful in reducing the prevalence of childhood plumbism, lead from innocent sources may still pose a risk to children.1 Parental hobbies, such as hunting, antique refinishing, sewing, and ceramics involve lead-containing materials.2 Swallowed foreign bodies, including lead shot and curtain weights, have been linked to poisoning in children, including several fatalities. To our knowledge, plumbism from fishing sinkers has not been previously reported.3–11 We report an unusual case, discuss the difficulty posed by conservative standard treatment, and review other reports of pediatric plumbism from ingested foreign bodies.

PATIENT REPORT

An 8-year-old boy was referred for plumbism to the lead clinic at Tod Children’s Hospital, Youngstown, Ohio. The asymptomatic child had presented at a community emergency department because of ingestion of a nail. Evaluation included x-ray films that incidentally revealed multiple metallic foreign bodies resembling fishing sinkers. The boy admitted ingestion of an estimated 20 to 25 sinkers. A blood lead level of 2.6 μmol/L (53 μg/dL) was obtained. Although the nail was passed within 1 day, the sinkers were not and the boy was discharged and promptly referred to our lead clinic. Because of the persistently elevated lead level, the child was admitted to Tod Children’s Hospital 3 days after the ingestion of the sinkers.

Patient history was significant for pica, attention-deficit/hyperactivity disorder (ADHD), and learning disability. Maternal report indicated more hyperactivity than usual. No known history of ingesting any other object containing lead could be elicited from the family. Physical examination on admission to the hospital revealed a normal, alert, boy in no distress. The patient’s vital signs were as follows: temperature, 36.1°C; pulse rate, 92/min; respirations, 16 breaths/min; and blood pressure, 100/60 mm Hg. The patient was in the 50th percentile for weight (27.5 kg) and the 10th percentile for height (124 cm). Neurological and abdominal examination results and range of motion test results were normal.

The hemoglobin level was 130 g/L and the hematocrit was 39.0%. Leukocyte count and differential cell count were within normal limits. Radiography revealed multiple, rounded, metallic foreign bodies in the ileum. The child received 1 L of polyethylene glycol solution orally, 0.1 kg every 10 minutes, and a liquid diet. Serial abdominal radiographs were obtained.
On hospital day 1 only 2 sinkers were passed. An additional 2-L polyethylene glycol solution was given during the next 24 hours, with recovery of 5 additional sinkers. Administration of the polyethylene glycol solution was continued, with an increase in clear liquidy stool noted; however, no additional sinkers were passed. The patient reported some abdominal discomfort from the polyethylene glycol lavage. Multiple metallic foreign bodies remained in the ileum (Figure 1).

A nasogastric tube was placed on hospital day 3 to facilitate more aggressive bowel irrigation and a continuous infusion of 500 mL/h of polyethylene glycol solution during 24 hours was administered. Continuous passage of clear effluent was noted, and 10 additional sinkers were recovered. X-ray films showed 7 remaining sinkers after aggressive bowel irrigation. The round metallic foreign bodies were noted in the ileum and cecum, with the most distal one in the sigmoid colon. Scattered air fluid levels in the large and small bowel compatible with mild nonobstructive ileus were noted.

On hospital day 5, the pediatric gastroenterologist (I.H.) was consulted and a colonoscopy was performed. The mucosa appeared normal throughout; however, 4 sinkers in the sigmoid colon were visualized and easily removed with a snare (Figure 2). The sinkers were of different sizes, with the largest sinker being approximately 1 cm in diameter. Several sinkers showed evidence of a pitted, irregular surface. Three small sinkers in the distal small intestine, confirmed with fluoroscopy, were beyond the reach of the endoscope and the procedure was terminated.

The patient was discharged on hospital day 6 with a lead level of 2.17 µmol/L (45 µg/dL). Oral succimer was prescribed for chelation with a follow-up visit scheduled for 7 to 10 days. At the follow-up visit the patient's lead level, obtained almost 1 month after sinker ingestion, was normal, 0.14 µmol/L (3 µg/L). An x-ray film revealed no retained sinkers. On long-term follow-up, 1 year later, the patient's lead level was 0.68 µg/dL (14 µg/L). Subsequent environmental inspection using x-ray fluorescence of the child's home ruled out other potential lead sources. The rental property was shingled in asphalt composite with some exterior peeling paint in the eaves, soffit, and fascia of the home, an area inaccessible to the child. The interior of the home was clean and well kept with intact, stable paint surfaces and minimal lead risk. Inspection of the child's bedroom revealed intact paint on the walls, windows, and window wells.

**COMMENT**

To our knowledge, this case represents the first reported fishing sinker ingestion linked to lead poisoning and the first report of whole bowel irrigation for pediatric lead intoxication, albeit only partially successful. In the series of extant cases, several were either misdiagnosed or undetected until necropsy. Management of the ingested foreign body took priority over treatment for lead toxicity. Use of chelating agents prior to removal of foreign bodies in the gut may enhance lead absorption into soft tissues. While this patient's lead level on follow-up returned to normal, a slight rebound effect was noted at 1 year. We speculate that this rebound might have been due to mobilization of lead from bone stores after chelation.

Clinicians should be vigilant for the possibility of lead intoxication in children who have a history of pica or following ingestion of a foreign object. Venous lead
Pediatric Lead Poisoning From Ingested Foreign Bodies

<table>
<thead>
<tr>
<th>Source, y</th>
<th>Foreign Body Containing Lead</th>
<th>Sex/Age</th>
<th>Highest Lead Level, Source</th>
<th>Symptoms</th>
<th>Retention of Objects</th>
<th>Treatment*</th>
<th>Fatality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biehusen and Pulaski,1,† 1956</td>
<td>Key chain with emblem</td>
<td>M/23 mo</td>
<td>Unknown</td>
<td>Emesis, appetite loss, weight loss, gastritis, and irritability</td>
<td>Retained in stomach</td>
<td>Gastrostomy and calcium disodium versenate</td>
<td>No</td>
</tr>
<tr>
<td>Greensher et al,5 1974</td>
<td>Shot used as ballast in toy boat</td>
<td>M/4 y</td>
<td>3.1 µmol/L, (64 µg/dL), serum</td>
<td>Asymptomatic</td>
<td>Unknown</td>
<td>BAL and calcium EDTA</td>
<td>No</td>
</tr>
<tr>
<td>Enger et al,4 1980</td>
<td>Curtain weight</td>
<td>Unknown</td>
<td>2.4 µmol/L, (50.7 µg/dL), serum</td>
<td>Pica</td>
<td>Unknown</td>
<td>Gastrostomy</td>
<td>No</td>
</tr>
<tr>
<td>Blank and Howieson,10 1983</td>
<td>Curtain weight</td>
<td>F/23 mo</td>
<td>13.7 µmol/L, (283 µg/dL), serum</td>
<td>Gastroenteritis, anemia, emesis, agitation, seizures, and comatose</td>
<td>Retained in stomach</td>
<td>IV hydration, intubation, phenobarbital and dilantin, ampicillin, and chloramphenicol for suspected meningitis</td>
<td>Yes</td>
</tr>
<tr>
<td>Durback et al,8 1989</td>
<td>Civil War replica bullet</td>
<td>F/9 y</td>
<td>1.1 µmol/L, (22 µg/dL), serum</td>
<td>Asymptomatic</td>
<td>Passed object in 14 d</td>
<td>Monitor on follow-up, serial radiographs</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Muzzle ball</td>
<td>F/9 y</td>
<td>0.7 µmol/L, (15 µg/dL), serum</td>
<td>Abdominal cramps, lethargy, appetite loss, headache, and dysuria</td>
<td>Passed object in 11 d</td>
<td>Magnesium citrate, high-fiber diet, and Metamucil (3×/d)</td>
<td>No</td>
</tr>
<tr>
<td>Gellert et al,11 1993</td>
<td>.22-caliber bullet</td>
<td>F/5 y</td>
<td>1.3 µmol/L, (27 µg/dL), serum</td>
<td>Asymptomatic</td>
<td>Passed object in 2 d</td>
<td>Follow-up</td>
<td>No</td>
</tr>
<tr>
<td>Forsby et al,9 1967</td>
<td>Curtain weight</td>
<td>F/2 y</td>
<td>0.69, brain†; 5.4, liver†; and 3.0, kidney†</td>
<td>Emesis, pallor, and lethargy</td>
<td>Retained in stomach</td>
<td>Died &lt;24 h</td>
<td>Yes</td>
</tr>
<tr>
<td>Esernio-Jenssen et al,7 1996</td>
<td>Emblem on imported clothing</td>
<td>F/3 y</td>
<td>8.7 µmol/L, (180 µg/dL), serum</td>
<td>Anemia, irritability, and sluggish</td>
<td>Retained in stomach</td>
<td>Gastroscopy, BAL and EDTA, bowel irrigation, and serial radiographs</td>
<td>No</td>
</tr>
<tr>
<td>Movad et al,1998</td>
<td>Fishing sinkers</td>
<td>M/8 y</td>
<td>2.6 µmol/L, (53 µg/dL), serum</td>
<td>Asymptomatic</td>
<td>Retained in colon, cecum, and ileum; passed by 30th d</td>
<td>Bowel irrigation, colonoscopy, and succimer</td>
<td>No</td>
</tr>
</tbody>
</table>

* BAL indicates bronchoaveolar lavage; IV, intravenous. † Tissue samples expressed in milligrams per 100 g.

**Screening and x-ray films with appropriate follow-up are recommended for children presenting with a history of either pica or following ingestion of foreign objects.** Historically referred to as “lead colic,” symptoms include abdominal pain, anorexia, and vomiting. Irritability or increased agitation may also be observed or reported.

As demonstrated by this case, lead foreign body ingestion is challenging to manage. Conservative treatment is generally recommended.12,15-18 However, absorption of lead is increased from greater retention time of objects in the stomach and intestine. Even eventual nasogastric tube placement and continuous infusion of a polyethylene glycol solution until passage of clear effluent did not remove all of the sinkers. After colonoscopy, a few sinkers remained. Earlier use of aggressive whole bowel irrigation may have been beneficial because retention of small leaded objects in the cecum and appendix has been associated with lead colic and polyneuropathy in adults.19,20

Given the lower thresholds of lead levels advocated by the Center for Disease Control and Prevention, Atlanta, Ga, more aggressive management and close monitoring of retained foreign bodies is appropriate despite recommendations to the contrary.8 We advocate whole bowel irrigation with colonoscopy whenever retained, accessible objects pose a risk of chronic lead absorption. The failure of whole bowel irrigation alone in this patient may have broader implications for other toxic ingestions where whole bowel irrigation is a standard recommendation. Endoscopy for reachable objects or surgical intervention for retained objects that result in persistently high lead levels should be considered if other treatments fail.

No cases of plumblism from ingested fishing sinkers have been previously reported. We reviewed other cases of lead poisoning from ingested curtain weights, an automobile key-chain emblem, bullets, an imported clothing accessory, and lead shot used as ballast in a toy sailboat (Table). Patients ranged in age from 23 months to 9 years, with a male-to-female ratio of 1:2. Two fatalities are noteworthy in the small series of cases, both with unusually high lead levels. Also striking is the lack of identification of lead toxic reactions in several of the cases.
Symptoms prevalent among children with high lead levels include gastritis, emesis, irritability, and agitation. Lower lead levels typically presented asymptomatically. Retention of the lead object was common in the series. Aggressive management and careful monitoring of retained foreign objects containing lead is recommended.

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REFERENCES