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Abrin Poisoning in an 18-Month-Old Child

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Study Design A
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Statistical Analysis C
Data Interpretation D
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Patient: Male, 1
Final Diagnosis: Abrin poisoning
Symptoms: Abdominal pain • diarrhea • vomiting
Medication: —
Clinical Procedure: —
Specialty: Pediatrics and Neonatology

Objective: Rare disease

Background: When discussing known poisons and their clinical consequences, few physicians are aware of the deadly poison abrin. The common symptoms of abrin toxicity include nausea, vomiting, abdominal pain, and diarrhea with or without bloody stool. However, with an estimated fatal human dose of less than 1 microgram/kg, death due to complications such as liver failure, renal failure, and cerebral edema are possible.

Case Reports: An 18-month-old male presented to the emergency department with an abrupt onset of fever, vomiting, diarrhea, and dehydration. The parents had assumed the child was suffering from a severe gastroenteritis until they noticed 3 consecutive diapers containing colorful seeds that were identified by poison control as belonging to the *Abrus precatorius* plant. The child's gastrointestinal symptoms were consistent with reported cases of abrin poisoning, but the patient also had an isolated and significantly elevated alkaline phosphatase, with testing unable to reveal the responsible pathological process.

Conclusions: To reduce morbidity and possible mortality, parents and pediatricians alike should be conscious of the danger the *Abrus precatorius* seed poses to the pediatric population. Children are at a greater risk of ingesting these seeds due to their colorful appearance, and the consequences could be fatal. Through this case report we hope to raise public awareness regarding this toxin. This includes the management of known cases, as well as the possibility of encountering an isolated elevated alkaline phosphatase level as a laboratory finding if ingestion occurs.

MeSH Keywords: Abrin • Abrus • Alkaline Phosphatase • Child • Poisoning

Abbreviations: **ALP** – alkaline phosphatase; **BMP** – basic metabolic panel; **CBC** – complete blood count; **ED** – Emergency Department; **INR** – international normalized ration; **NPO** – nil per os; **PTT** – partial thromboplastin time; **PICU** – pediatric intensive care unit; **PT** – prothrombin time

Full-text PDF: http://www.amjcaserep.com/abstract/index/idArt/892917

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Background

Found in the seeds of the *Abrus precatorius* plant, the phytotoxin abrin is one of the deadliest poisons in the world. Known colloquially as Rosary peas, John Crow beads, and Crab's eye [1], these seeds are shiny and red, with a black circular tip. Abrin inhibits elongation factors EF-1 and EF-2, preventing protein synthesis and leading to cell death [2,3]. The majority of the literature to date involves case reports of attempted suicide by intentional ingestion of abrin seeds, as well as discussing the role of abrin as a potential bio-warfare agent.

We present the case of an 18-month-old male who was brought to the Emergency Department due to an abrupt onset of vomiting, diarrhea, and dehydration. The parents assumed the child had severe gastroenteritis until they noticed 3 consecutive diaper changes containing colorful seeds that were later identified as belonging to the *Abrus precatorius* plant.

The estimated fatal human dose of abrin is 0.1–1 microgram/kg, nearly half the amount of abrin's better known sister poison, ricin [4]. As with this 18-month-old case subject, abrin induces endothelial cell damage resulting in increased capillary permeability and consequent fluid leakage and tissue edema [4]. In addition to the child's gastrointestinal symptoms, there was a significant rise of alkaline phosphatase, reaching 3600 u/L (maximum expected for age 500 U/L) without other symptoms or test results indicating a responsible disease process. With close monitoring and supportive care, the child made a complete recovery.

Case Report

An 18-month-old male presented with decreased activity and 3 episodes of vomiting (non-bloody, non-bilious) per hour for 4 consecutive hours. Shortly after the vomiting resolved, watery diarrhea developed and continued into the next day. While changing his diaper, his parents noticed the presence of multiple seed-like objects, which were red in color with a circular black tip (Figure 1). Unaware of the origins of the seeds, they immediately contacted the child's daycare but they too were unable to identify the seeds in question. The parents then took pictures of the seeds, collected them in a plastic container, and then contacted the child's pediatrician. Poison Control later identified the seeds as those from the *Abrus precatorius* plant, advising the child be immediately taken to the Emergency Department (ED).

On arrival to the ED, the patient was alert and had age-appropriate vital signs with the exception of a temperature of 102.1°F (38.9°C). He complained of mild abdominal discomfort, with the physical exam revealing diffuse abdominal tenderness. In the ED, he received a bolus of normal saline (20 cc/kg) and was given

Figure 1. *Abrus precatorius* seeds retrieved from the diaper.

intravenous (IV) ondansetron for nausea. Blood tests sent included complete blood count (CBC), manual differential (MD), basic metabolic panel (BMP), prothrombin time (PT), partial thromboplastin time (PTT), and international normalized ratio (INR). Lab work revealed a CBC with leukocytosis (22.1 k/ul) and a MD pertinent for bands of 17%. Hemoglobin and hematocrit values were normal at 12.1 g/dL and 36.5%, respectively. His stool tested positive for occult blood, while the coagulation profile was normal with a PT of 11 seconds, INR of 1.0, and a PTT of 25 seconds. Albumin was 3.6 g/dL, bilirubin total was 0.6 mg/dL, and AST and ALT were 33 u/L and 24 u/L, respectively. The patient was then admitted to the Pediatric Intensive Care Unit (PICU) for further observation and management.

Continuous cardiopulmonary monitoring was initiated in the PICU, and the child was placed on maintenance IV fluids (5% dextrose and 0.45% normal saline). His abdominal pain improved, but the continued diarrhea began to have visible blood streaks. After consultation with poison control experts, the patient was allowed nothing by mouth for the initial 8 hours of admission, after which he was hydrated with oral fluids. Repeat labs were sent the following morning with the addition of liver function tests (LFT), which were normal with the exception of ALP (2700 u/L). At this time the toddler was active, alert, and tolerating a liquid diet. Twelve hours after the first abnormal ALP result, repeat labs were sent with the addition of gamma-glutamyl transferase (GGT). Once again, all tests including the GGT were within normal range (11 u/L) apart from a second elevated ALP, which had increased to 3200 u/L. The child remained stable and was advanced to soft diet.

Pediatric Endocrinology and Gastroenterology services were consulted for the patient's isolated alkaline phosphatase elevation. Their combined recommendation was to repeat the test in 24 hours and to include a vitamin D level, phosphorus level, parathyroid hormone (PTH), and an alkaline phosphatase isoenzyme test. All test results were within normal limits (vitamin D 34.1 ng/ml and PTH 11pg/ml) and the alkaline phosphates

isoenzyme test revealed that 61% of the ALP was from bone and 39% was from the liver with an intestinal and macrohepatic isoenzyme level of 0.0%. A full-body bone scan and liver ultrasound was performed, also yielding normal results. Pediatric Hematology examined the peripheral blood smear, reporting no abnormalities or malignant cells. Blood tests sent on day 3 of admission revealed an improved WBC count of 11.9 K/uL, and an ALP that had further increased to 3600 u/L.

Although the patient continued to have mild diarrhea, his vital signs remained stable, he was playful, and tolerating a full diet. His pediatrician was made aware of the hospital course, and he was discharged on the third day of admission. Follow-up with the pediatrician occurred 5 days after discharge, during which the parents did not report any concerns and the physical exam was unremarkable. BMP and LFT labs were performed at this time, revealing a decreasing ALP of 1717 u/L, and a repeat at 3 weeks time showed a further reduction to 600 u/L.

Discussion

The symptoms experienced by this patient are common in oral abrin poisoning. Ingestion of the whole seed produces either no or mild symptoms due to the protection of the hard outer layer. Any break in this outer layer leads to the release of abrin, which is poorly absorbed in the gastrointestinal system, leading to the commonly reported symptoms of nausea, vomiting, abdominal pain, and diarrhea with or without bloody stool [5]. Easily mistaken for a viral gastroenteritis, the offending agent leading to this child's symptoms would not have been suspected if the abrin seeds had not been found in the diaper and later identified by Poison Control.

Management of abrin poisoning is mainly supportive. This includes adequate hydration and correction of electrolyte abnormalities, as vomiting and diarrhea may be severe enough to cause hypovolemic shock and death [6]. Life-threatening complications such as liver failure, renal failure, and cerebral edema warrant the testing of renal and liver function [7]. If there is a suspicion of unwitnessed abrin ingestion, confirmation is possible by the quantization of the L-abrin biomarker [8]. An interesting factor in this case was the isolated finding of an extremely elevated level of ALP, which has not been reported in other published case reports involving abrin poisoning. Our patient showed an elevated alkaline phosphatase level more than 7.2 times higher (3600 U/L) than the maximum age-appropriate level (500 U/L). We attribute this rise to abrin exposure, but a differential diagnosis of "transient hyperphosphatasemia of infancy and childhood" [9] may not be entirely excluded.

Conclusions

To reduce morbidity and possible mortality, parents and pediatricians alike should be conscious of the danger the A*brus precatorius* seed poses to the pediatric population. In this case the source of seeds remains unknown; however, it is important to note that these seeds may be easily purchased through the Internet in the form of beads or bracelets [10], and also as souvenirs from countries where they are sold without restriction. Children are at a greater risk of ingesting these seeds due to their colorful appearance and the consequences could be fatal. Although physicians managing a confirmed case may access information regarding abrin and its effects, the presence of an extremely elevated alkaline phosphatase level may lead to confusion and unnecessary testing. Our goal is to raise public awareness regarding the A*brus precatorius* seed and we also hope the reported relationship between abrin poisoning and the isolated elevated alkaline phosphatase level in this case study will benefit physicians who come across such findings.

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None of the authors have any financial relationships relevant to the article to disclose.

Conflict of interest

None of the authors have conflicts of interest to disclose.

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