Musa Alfaifi et al. Saudi J Er Med. 2024;5(3):250-252
DOI: 10.24911/SJEMed.72-1706182286

CASE REPORT

Children's ingestion of blister beetles causing cantharidin poisoning: two pediatric cases in Saudi Arabia

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ABSTRACT

Background: Cantharidin, a toxic substance produced by Meloidae (Coleoptera family) beetles, poses serious health risks upon ingestion, including renal impairment, hematemesis, altered consciousness, electrolyte imbalances, and hematuria.

Case Report: This study presents two pediatric cases of cantharidin poisoning resulting from the biting of Meloid beetles. Case 1 involved a 2-year-old exhibiting hematuria and vomiting, while case 2, a 9-month-old, presented with agitation, lethargy, and hematuria. Both cases required intensive care and supportive management.

Conclusion: These cases highlight the clinical manifestations of cantharidin intoxication in children following exposure to Meloid beetles. Early recognition of symptoms, prompt medical intervention, and close monitoring are crucial in managing cantharidin poisoning, for which no specific antidote currently exists.

Keywords: Cantharidin, intoxication, meloidae, blister beetle, case report.

Introduction

The family Meloidae (Coleoptera) beetles produce a toxic substance called Cantharidin. The most well-known species is the Spanish fly. It has been discovered that Spanish flies and other meloid species secrete an anhydride of cantharic acid (with a chemical formula 3,6-epoxy-1,2-dimethylcyclohexane-1,2-dicarboxylic anhydride) called Cantharidin. Traditionally, this secretion has a medicinal effect as aphrodisiacs, skin irritants, vesicants, and abortifacients [1,2].

Cantharidin poisoning is predominantly observed in veterinary medicine in livestock, especially in horses that feed on forage or hay containing blister beetles, but it can also be poisonous to humans if taken internally or externally since cantharidin is a potent vesicant (blistering agent) and can cause severe chemical burns [3].

Ingesting cantharidin can initially cause severe damage to the lining of the gastrointestinal and urinary tracts and may also cause permanent renal damage. Also, it can be associated with blood in the urine, abdominal pain, rarely prolonged erections and neurological complications such as Guillain-Barré syndrome [4].

Cantharidin poisoning in pediatrics has been reported to have systemic/local manifestations in previous research, where the insect was either ingested or in direct contact with skin [5,6]. These case reports present clinical manifestations in two cases to increase awareness of signs and symptoms of direct mucosal contact with the blister beetle's insect among the medical community.

Case Report

Case 1

A Saudi child aged 2 years and 9 months who was otherwise healthy presented to the emergency department (ED) 2 days after chewing on a beetle that his family had removed from his mouth. Twelve hours before the presentation, the boy began suffering from gross hematuria with blood clots and repeated episodes of vomiting. He was unable to tolerate feeding orally.

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Received: 25 January 2024 | **Accepted**: 04 March 2024

There was no prior history of seizures, skin rashes, fever, coughing, or diarrhea.

Upon arrival at the ED, the patient looks ill and lethargic but conscious and alert with a Glasgow Coma Scale (GCS) 15/15. His heart rate was 118 beats/minute, oxygen saturation was 93% in room air, blood pressure was 111/77 mmHg, temperature was 36.6°C, and random blood sugar was 112 mg/dl. On physical examination, his respiratory, cardiovascular, and gastrointestinal systems were normal. Also, there were no skin lesions or musculoskeletal abnormalities and no lymphadenopathy. The patient had normal tone, power, and reflexes bilaterally.

Blood screening revealed a white cell count (WBC) of 14.48 [10^3/ µl], a red blood cell count (RBC) of 5.35 [10^6/ µl], a platelet count of 290 [10^3/µl], and hemoglobin of 13.6 g/dl. The chest X-ray was unremarkable. The rest of the laboratory findings can be found in Table 1.

The patient was treated conservatively and given intravenous fluid, antiemetics, and antibiotics.

He was admitted to the pediatric intensive care unit for observation, toxicology consultation, and internal medicine consultation.

Urine started to clear up the following day, and over the next 2 days, the child's condition rapidly improved with complete blood count and renal function returning to normal. He was discharged home after making a full recovery.

Case 2

A Saudi boy, age 9 months, who was otherwise healthy, arrived at the ED, Maternity and Children Hospital in Abha City, Saudi Arabia. Twenty hours after he had placed a Spanish fly in his mouth, which had been removed whole before being chewed or eaten, he began to vomit repeatedly, was agitated and lethargic, and developed repulsive hematuria 1 hour later. No history of fever, pallor, convulsions, losing consciousness, rashes, or diarrhea.

Upon arrival at the ED, the patient looks ill, drowsy, lethargic, and moderately dehydrated with GCS 15/15. His heart rate was 160 beats/minute, O_2 saturation was 96% in room air, blood pressure was 111/75 mmHg, temperature was 37.9°C, and random blood sugar was 157 mg/dl.

On physical examination, his respiratory, cardiovascular, and gastrointestinal systems were normal. There were no skin lesions or musculoskeletal abnormalities, no lymphadenopathy, with normal tone, power, or reflexes bilaterally. Mouth examination showed no rashes, ulcers, edema, or erythema.

Blood workup showed a raised WBC, serum creatinine, urea, PT, aPTT, and INR. It also showed decreased hemoglobin. His venous blood gases were reassuring and the urine dipstick showed blood 4+ and ketone +2 (Table 2).

The chest X-ray was unremarkable, but the KUB ultrasound (ultrasound of the kidney, ureters, and bladder) showed mild bilateral hydronephrosis. The treatment plan included intravenous fluids and antiemetics, in addition to admission to the pediatric ICU, where he received antibiotics and supportive management.

On the next day, the patient had one spike of fever at 38.1°C. His laboratory findings showed increased serum urea (24 mg/dl), blood urea nitrogen (25 mg/dl), normal serum creatinine (0.34 mg/dl), serum sodium

Table 1. *Laboratory findings of the patient.*

Variable	Frequency
Hemoglobin (g/dl)	13.6
Erythrocyte sedimentation rate (mm/hour)	8
Red blood cell (/µl)	5.35 * 10^6
White blood cell (/µl)	14.48 * 10^3
Platelet count (/µl)	290 * 10^3
PT (second)	10.9
aPTT (second)	23.5
INR	0.89
Blood urea nitrogen (mg/dl)	16.0
Serum creatinine (mg/dl)	0.38
pH	7.39
pCO_2 (mmHg)	28.8
Calcium (mg/dl)	9.6
HCO_3 (mmol/l)	18.7
Sodium (mmol/l)	136.1
Potassium (mmol/l)	4.8
Chloride (mmol/l)	111.2
Aspartate aminotransferase (units/l)	45
Alanine aminotransferase (units/l)	19.6
Total bilirubin (mg/dl)	0.7
Direct bilirubin (mg/dl)	0.2
Urine dipstick Blood Protein Glucose	 4+ 2+ 2+

Table 2. *Laboratory findings of the patient.*

Variable	Frequency
Hemoglobin (g/dl)	10.0
White blood cell (/µl)	22.0 * 10^3
Platelet count (/µl)	424 * 10^3
PT (second)	12.9
aPTT (second)	31.1
INR	1.07
Blood urea nitrogen (mg/dl)	46.0
Serum creatinine (mg/dl)	1.1
pH	7.35
pCO_2 (mmHg)	34.0
HCO_3 (mmol/l)	18.8
Sodium (mmol/l)	136.0
Potassium (mmol/l)	5.96
Chloride (mmol/l)	105.0
Urine dipstick Blood Ketone	 4+ 2+

(139 mmol/l), serum potassium (5.2 mmol/l), and serum chloride (103.9 mmol/l). Over the next few days, the patient vitally improved, tolerating orally with no fever, vomiting, or hematuria. His last laboratories were blood urea nitrogen: 24 mg/dl; serum creatinine: 0.2 mg/dl; K: 4.5 mmol/l. Then, he was discharged home.

Discussion

These cases demonstrate the clinical manifestation of Cantharidin intoxication resulting from ingestion of a blister beetle. Depending on the species, a single beetle can have 0.2 mg-0.7 mg of cantharidin [1]. Adults' fatal doses range from 10 mg to 80 mg; however, it is usually reported to be less than 60 mg [4].

Cantharidin can affect many organs in the human body, as reported before. The mechanism of toxicity may be related to binding at the cellular level, where protein phosphatase types 1 and 2A have been observed to be strongly inhibited by this substance [4]. Glomerular damage, acute tubular necrosis, and blister formation in the lower urinary tract are caused by the elimination of cantharidin, after binding to albumin [4].

Although delays of 10 minutes to 14 hours have been reported, symptoms of cantharidin poisoning usually appear 2-4 hours after intake [1,2,7]. Initially, these symptoms include burning and blistering of the mouth, tongue, oropharynx, dysphagia, abdominal cramping, vomiting, and hematemesis. Symptoms associated with the urinary system are dysuria, lumbar pain, and frequent urination, that may last for 15 days [4].

Other remarkable symptoms that begin on the first or second day of exposure are gross or microscopic hemorrhage with granular casts and serum electrolyte disturbances [1,2,6,8]. However, cardiac manifestation and convulsion are less commonly seen [5].

Regarding our cases, all two cases have a similar presentation initially, which is vomiting, and poor oral intake followed by gross hematuria. This is the typical initial presentation of the toxin [1,4,5]. Gross hematuria is a significant feature of cantharidin toxicity, as the toxin excreted by glomerular filtration results in tubular necrosis and glomerular engorgement with edema to the Bowman capsule, as shown in microscopic pathology previously [4]. Fever was present in the second case, as were other cases [1,5,9]. Leukocytosis was noticed in both cases.

Until now, there has been no antidote for cantharidin toxicity. The management is supportive of the obvious symptoms and laboratory findings, as well as close monitoring. In cases of renal failure, hemodialysis is not ideal given that the toxin is highly bound to albumin [2].

Acknowledgment
None.

List of Abbreviations

aPTT	Activated partial thromboplastin time
ED	Emergency department
GCS	The glasgow coma scale
HCO_3	Bicarbonate
INR	International normalized ratio
PT	Prothrombin time

Conflict of interests
The authors declare that there is no conflict of interest regarding the publication of this article.

Funding
None.

Consent for publication
Ethical statement: Patient confidentiality was maintained at all stages of preparation of this case series. No data that could lead to the identification of any patient have been included. Verbal consent was obtained from the authorized legal representatives of the patients (parents) for the publication of this case series.

Ethical approval
Ethical approval is not required at our institution to publish an anonymous case report.

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