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Management of Castor Bean Seed-Associated Intraventricular Hemorrhage with Fresh Frozen Plasma: A Case Report

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Abstract

Introduction: Castor bean seed is used to control some medical conditions including diabetes mellitus due to popular belief in its effectiveness. However it may cause severe poisoning in humans and animals and its components (ricin) might be used as a biological weapon. In the present case, a rare intra-ventricular hemorrhage followed by unconsciousness had occurred after poisoning with caster bean. Because there is no direct antidote or reversal agent for this condition, fresh frozen plasma (FFP) was prescribed to control the hemorrhage and good results were achieved.

Case Presentation: A 63-year-old female taking castor bean seed as a treatment for her diabetes was admitted to the emergency ward for a comatose state. A computed tomography image of her head demonstrated an intraventricular hemorrhage. Symptomatic and supporting care was prescribed. After two weeks without significant improvement, the patient was administered five units of FFP. However, the patient's neurological status dramatically improved and remained stable.

Conclusions: Intraventricular hemorrhage followed by comatose state is a rare finding of the castor bean seed ingestion. The patient's condition improved dramatically after FFP transfusion.

Keywords: Castor Bean, Cerebral Ventricles, Hemorrhage, Biological Warfare Agents, Blood Plasma

1. Introduction

The castor oil plant (Ricinus communis) is a flowering plant (1-3). The seed, oil or its components can induce toxic effect if ingested, inhaled or injected. The usage of castor bean is a traditional popular belief in many countries to control some diseases (4). In traditional medicine castor bean has been used for many conditions including treatment of constipation, bleeding piles, skin burns, sunburns, acne, pigmentation, minor cuts or abrasions, removing of warts, delivery induction, relieving pain and inflammation (4). In addition, the castor oil is used in some chemical industries (5). Therefore inhalation of ricin aerosol can be another source of poisoning in industrial conditions. The castor bean contains lectins named ricins, which are very dangerous toxic substances. The "2003 ricin letters" denote two letters loaded with ricin during year 2003. One letter was mailed to the White House and captured in an evaluation process; the other one was found with no address in South Carolina (6).

Onset of gastrointestinal symptoms appears in the first 10 hours after ingestion. The common symptoms are gastrointestinal irritation and hemorrhage including abdominal pain, vomiting, diarrhea, hematemesis and melena (1-3). However, the intraventricular hemorrhage of the brain has not been reported extensively in the cases of castor bean poisoning.

At present, no antidote or additional definite effective treatment is accessible for ricin poisoning (7). A hasty treatment with supportive care has been advised to control the poisoned patient (7).

The present report is a description of a diabetic patient poisoned with castor bean, who developed intraventricular hemorrhage of the brain. This condition is a rare complication of caster bean toxicity and was treated with supportive medical care following fresh frozen plasma (FFP) treatment. Fresh frozen plasma is the liquid part of human blood that is obtained by centrifugation and separation, and is preserved be freezing. The product is given to the patients to substitute coagulation factors of the blood plasma during extensive bleeding, transfusion and abnormal coagulation conditions (8, 9). Therefore, reporting on different cases of poisoning with castor bean can be helpful for clinical practitioners.

2. Case Presentation

The case was reported with the following obligations and agreement No: HSRC-94-108 during year 2015. The au-

thors were bound to protect the patient and the hospital identity, privacy and confidentiality. The authors guaranteed that no name or identity of the patient would be mentioned on the CT scan figure. The authors guarantied that the case report will not be used for degree purposes i.e. as material for a thesis.

The patient was a 63-year-old female, with a past medical history for diabetes mellitus, treated with metformin, who was found at her house with decreased level of consciousness and urinary incontinency shortly after taking 8-10 castor bean seed. The patient was advised to take castor bean seed in order to control her diabetes due to popular belief of effectiveness of the seed. Upon arrival to the emergency ward in a small town in the Fars province, she was in a comatose state. Initial laboratory studies showed a normal platelet count and coagulation profile. Emergent non-contrast Computerized-Tomography (CT) scan of the brain was prepared. The CT angiography and Magnetic Resonance Imaging (MRI) of the brain were not available. The CT scan showed intra-ventricular hemorrhage of the lateral ventricles (Figure 1). Social history was negative for smoking cigarettes. The family history for vascular malformations or intracranial hemorrhage was negative. Examination of the patient showed the following vital signs: temperature of 37.5°C, blood pressure 125/70 mmHg, heart rate 85, respiration frequency 20, oxygen saturation of more than 90% on 3 liters/minute nasal cannula, auscultation of the heart and lungs with no abnormal pattern, abdominal exam being soft, non-distended with no organomegaly, hyperactive bowel sounds, extremities exam with no edema. Neurologically, her Glasgow Coma Scale (GCS) was three (Table 1). She did not open her eyes to voice (E1), was disoriented to time, people and place (V1), and had no response to any painful stimulation (M1). She had no gaze preference. Her pupils were 4 mm, equal in size and equally showed sluggish reflex to light bilaterally. Her Babinski's sign was absent bilaterally. Laboratory findings are summarized in Table 1. Imaging findings were:

1) Brain non-contrast CT showed a bilateral intraventricular hemorrhage without midline shift.

2) Chest x-ray was clear.

The patient was intubated due to GCS of three without the need for mechanical ventilation at arrival. Over a period of two weeks, the patients GCS showed no improvement. The patient's family did not permit for transfer to an equipped center for more evaluation such as MRI, CT angiography, intracranial pressure measuring and electroencephalogram. Compression devices for preventing deep vein thrombosis were applied. Subcutaneous prophylactic dose of heparin during the hospital course was also prescribed. She had no improvement in neurological physical examination during first two weeks of admission. She was consulted by the neurosurgeon but the surgeon advised for surgery after improvement in her neurological state. Although the coagulation profile was normal, after two weeks, the patient developed gross hematuria and

Figure 1. Axial Plane of the CT Scan Showing the Intra-ventricular Hemorrhage of the Brain in the Diabetic Patient Poisoned With Castor Bean (The arrows indicate the hemorrhages in the ventricles of the brain)

Table 1. Laboratory Findings of the Studied Case After Taking 8-10 Castor Bean Seeds, on the First Day of Arrival at the Emergency Ward.

Test (Abbreviation)	Value
White blood cell count (WBC)	8.1 x 103/μL
Hemoglobin (Hb)	13.0 g/dL
Hematocrit (Hct)	39 %
Platelets	157 x 103/μL
Prothrombin time (PT)	13.5 sec
Partial thromboplastin time (PTT)	30 sec
International normalized ratio (INR)	1.01
Blood urea nitrogen (BUN)	20 mg/dL
Na+	139 mEq/L
K+	4.2 mEq/L
Creatinine	1.4 mg/dL
Glucose	170 mg/dL

clinically abnormal bleeding from the sites of blood sampling. Therefore, anticoagulant was stopped and five units of fresh frozen plasma and one bag of packed Red Blood Cell (RBC) were administrated. During 12 hours the patient showed dramatically improved response to the management. The patient's GCS went from 3 to 10, and after 24 hours to 15. The patient was awake, alert and oriented to time people and place. She had fluent speech. Her sensation and motor strength were intact. Her motor exam improved and upper and lower extremities strength returned to normal flexion and extension. However, urinary incontinency was sustained until release. After evaluation of swallowing, she was started on a soft diet. She was transferred to the floor on day 17 and was later discharged by her own release sheet.

3. Discussion

The present study reported on a case of castor bean poisoning treated with symptomatic therapy and FFP. Castor bean has been used by animals as food and by human beings as a traditional treatment , and as a biological weapon. The acceptable daily castor oil intake (for human) of 0 to 0.7 mg/kg body weight has been established by the food and agriculture organization/world health organization (8). Different human or animal cases of poisoning with castor bean have been reported (10, 11). The observational human case series study of Thornton et al. (2014) showed that because of the existence of ricin in the castor bean seed, serious outcomes after ingestions of the seeds of the castor bean plant might occur. However, they reported no serious morbidity or mortality in these cases (12). In a study by Aslani et al. (2007) different signs and symptoms were observed in a sheep flock, after intoxication with castor bean (13). They reported a wide range of pathological findings including gastroenteritis, cardiac hemorrhage, hepatic, renal and cardiac necrosis (13). A large number of deaths was also reported in the sheep flock.

Toxicity with the bean results from a variety of mechanisms including inhibition of protein synthesis, apoptosis process, cell membrane injury, and release of inflammatory mediators (1-3). However, up to now, symptomatic and supportive care including fluid therapy and charcoal administration has been suggested for these cases. Mabley et al. (2009) also showed that organ damage including kidney and liver failure could be diminished by activation of the cholinergic anti-inflammatory pathway using nicotine administration in mice (14). They showed that this management could delay mortality and increase survival rate (14). However, no certain antidote has been suggested to treat the patients. Since the ricin might be used as biological weapons, some efforts have been made to make a vaccine or antidote for ricin (15, 16). It has been explained that ricin is a lectin (a carbohydrate-binding protein) and formed in the seeds of the castor oil plant. Researchers have evaluated ricin of the castor bean as vaccine candidate for safety of humans and animals against this compound in the United Kingdom and United States (15, 16).

Although gastrointestinal or alveolar hemorrhages in poisoned human or animal cases have been reported, intraventricular hemorrhage has not been explained extensively. Intraventricular hemorrhage is bleeding into the ventricular system of the brain (17). Ricin like some snake venom, is a member of class of cytolytic toxins. It causes dissolving of the endothelial cells of the capillaries and other small vessels of the internal organs. This condition is followed by the extravasation of blood into the injured tissues (17). Ricin is relatively resilient to digestion by peptidases. After ingestion, it causes injuries to many organs (17). Histopathological examination of the intestinal mucosa of poisoned dogs has revealed congestion, hemorrhage of the capillaries, erosion, distraction of villi, infiltration by inflammatory cells and necrotic epithelial cells (17). Degeneration and necrosis of the renal tubules, glomerulonephritis and deposits of fibrin was also observed. The study of the Alipour et al. (2013) also revealed that administration of a dose of 90 μg/kg of ricin in rats result in upsurges of the oxidant response and inflammatory response in the liver and lungs (18). Therefore, intraventricular hemorrhage, which was seen in the present case, might be due to capillaries cytolytsis, inflammation and injury of choroid plexus of the brain ventricles.

The rational for prescription of FFP in this case was controlling the hematuria. However, it should be noted that FFP has been used in different cases of brain hemorrhage. Dani et al., (2009) reported that an early FFP treatment could reduce the risk of intra-ventricular hemorrhage in some preterm infants (19). In addition, Sillesen et al., (2013) induced a traumatic brain hemorrhages in an animal model (the swines) and showed that resuscitation with FFP diminishes circulating nucleosome levels and prevents deoxyribonuclease-1 depletion. These factors may play a role in the neuroprotective effects observed during early resuscitation with FFP (20).

The dramatic change observed in the patient conditions after FFP therapy, might be due to resuscitation with FFP, which attenuates both lesion size and fluid extravasation in the brain tissue, as it has been reported by Sillesen et al. (2014) (21).

Explaining definite reasons for the ventricular hemorrhage and also effectiveness of FFP on this type of poisoning needs further evaluations in the future.

3.1. Conclusion

In this case report, a rare neurological symptom of the diabetic patient after exposure to castor bean seeds was explained. In addition to common symptoms, the main finding was ventricular hemorrhage revealed by the CT scan. The neurological symptoms were alleviated using treatment with fresh frozen plasma. This case and the treatment could be considered and evaluated by the other clinicians.

Footnote

Authors' Contribution: Management of the patient, collection and interpretation of data: Najmeh Hosseini; Study supervision and review: Leila Hosseini; Drafting and preparation of the manuscript: Ali Noorafshan.

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