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Jimsonweed: Toxicity and Treatment

Poison Center Call

A 16-year-old male was brought to the emergency department following the ingestion of two Jimsonweed seedpods. Upon presentation, his heart rate was 100 beats per minute. He was agitated and hallucinating and described as "picking things out of the air". He was given lorazepam with little effect. Approximately 10 hours later he was still extremely agitated with a blood pressure of 105/68 mm Hg and heart rate of 90 beats per minute. He continued to receive lorazepam with little effect. His heart rate decreased to 30-40 beats per minute approximately 24 hours after admission. No further lorazepam was given and he was discharged from the hospital approximately 36 hours after admission. His heart rate was 50 beats per minute upon discharge.

Overview of Jimsonweed

Jimsonweed (Datura stramonium) was initially called "Jamestown weed" because British soldiers in Jamestown Virginia were poisoned and suffered from delirium and hallucinations after eating a salad containing this plant in 1676.[1] This plant is also known by various other names, such as thornapple, stinkweed, devil's apple, devil's trumpet, mad apple, and "loco" weed. Jimsonweed is an annual herb that grows wild throughout the United States. It can grow up to 5 feet tall, and is commonly found in cultivated fields, waste areas, barnyards, abandoned pastures, roadsides, and feedlots. Jimsonweed leaves are green or purplish in color, with jagged edges. Its flowers, which bloom in the spring, are trumpet-shaped, and are either white or purple. The hard, spiny fruit, which ripens in the fall, splits apart when ripe and contains blackish-brown seeds.[2-3]

In the past, the Jimsonweed plant has been used for a variety of medicinal purposes. Pueblo Indians used the seeds for analgesia when setting bones. Its leaves have been boiled and used in teas for ailments such as the common cold, asthma, and other respiratory conditions. Today, Jimsonweed is more commonly abused for its hallucinogenic properties.[4]

In 1998, 1,025 exposures to anticholinergic plants were reported nationwide to the Toxic Exposure Surveillance System.[5] Over half of these exposures were a result of intentional abuse, 59.2% were treated in a health care facility, 40% were managed at home by poison centers and 36.2% resulted in major or moderate clinical effects. The majority of plants containing anticholinergic properties belong to the datura species.

Jimsonweed Toxicology and Pharmacology

Jimsonweed contains many toxic compounds, in particular the tropane alkaloids, including atropine, scopolamine, and hyoscyamine. The leaves, flowers, roots, stems and seeds are all poisonous. Leaves and seeds are the usual source of poisoning. The seeds are often ingested and the leaves are primarily used to make a tea. The total alkaloid content in the plant varies from 0.25 to 0.7%.[6] However the seeds contain the highest concentration with approximately 0.4% of alkaloids.[7]

The Jimsonweed alkaloids are rapidly absorbed following ingestion. Signs and symptoms may become apparent within a few minutes or delayed up to several hours. The clinical effects usually last from 12-48 hours. The alkaloids are primarily metabolized by hydrolysis in the liver, with the remainder being excreted unchanged by the kidney.[8]

Anticholinergic poisons produce their effects through antagonist activity at the acetylcholine muscarinic receptors. Symptoms following an ingestion of Jimsonweed are consistent with an overdose of an anticholinergic agent, producing both peripheral and central manifestations. Peripheral anticholinergic symptoms include nausea, vomiting, dry mouth, mydriasis, blurred vision, dry and warm skin, and reddening of the face and neck. Decreases in the amplitude and frequency of peristaltic contractions have been observed. Inhibition of the vagal effect on the SA node results in sinus tachycardia, with variable effects on the blood pressure. Peripheral symptoms commonly resolve within 24 hours, although mydriasis and cycloplegia have been reported to persist for several days.[4]

Anticholinergic agents can also produces dose-related effects on the CNS. At lower doses, CNS stimulation can produce restlessness, agita-

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tion, combativeness, disorientation, delirium and visual and auditory hallucinations. Bizarre behaviors, such as skin picking and grabbing at the air, have been reported. Higher doses produce CNS depression, ranging from drowsiness to coma. Psychosis and CNS effects usually resolve within 24 hours after exposure.[4,9]

Treatment Options

The management of anticholinergic poisoning is primarily symptomatic and supportive care, but a specific antidote is available. Gastrointestinal decontamination with activated charcoal is appropriate. It is most beneficial if given within one to two hours of ingestion. However, it may be considered later if there is the potential for delayed absorption. Hypertension is usually of short duration and rarely requires treatment. Hypotension may require vasopressor support with dopamine if fluid resuscitation is not successful.[4]

Physostigmine is an acetylcholinesterase inhibitor, which has been used successfully to reverse both peripheral and central manifestations of anticholinergic toxicity. By inhibiting acetylcholinesterase, physostigmine enables acetylcholine to accumulate at the neuroreceptor site. Physostigmine is considered the anticholinesterase drug of choice for CNS symptoms because it crosses the blood brain barrier. Physostigmine should be considered for the treatment of severe agitation, combativeness or hallucinations, supraventricular tachyarrhythmias, hypertension, and seizures.

In adolescents and adults physostigmine is given as a slow IV push over 5-10 minutes. Rapid intravenous administration may result in bradycardia, seizures or hypersalivation. The initial dose is 0.5 – 1 mg and titrate every 20 minutes to a maximum dose of 5 mg. Doses of 0.02 mg/kg has been used in young children (maximum 0.5 mg). Dose should be titrated to resolution of delerium and agitation. The average response time is 10 minutes. The duration of effect is usually one to two hours and relapse occurs in up to 78%.[10] Patients should be on a cardiac monitor, and atropine should be kept at the bedside to reverse excessive muscarinic stimulation while physostigmine is administered.[4,9,11]

Because of the potential for toxic reactions with physostigmine, its use should be limited to serious intoxications with severe CNS effects or life-threatening manifestations. Toxic symptoms secondary to physostigmine include salivation, urination, excessive peristalsis with cramping, and diarrhea. Relative contraindications to physostigmine are asthma, cardiovascular disease, GI and urinary obstruction, and concurrent tricyclic antidepressant ingestion.[4,8]

Summary

Jimsonweed is commonly abused among adolescents. Patients present with profound anticholinergic symptoms that typically last 24 hours. Physostigmine may play a role in managing patients who have significant central or peripheral anticholinergic effects.

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Coricidin Abuse by Adolescents in Utah

Introduction

The abuse of "over-the-counter" (OTC) products by adolescents has been a problem in Utah and the nation for many years. Several years ago an epidemic of dextromethorphan abuse was experienced in Utah.[1] This was colloquially known as "row-bowing" because the primary product of abuse was Robitussin DM. The abuse of dextromethorphan has resurfaced except now the primary product is CORICIDIN HBPTM (Cough and Cold) tablets. It contains dextromethorphan hydrobromide 30 mg and chorpheniramine maleate 4 mg per tablet. It has been touted as "C+C+C" (Coricidin Cough and Cold) for the "trip of your life" on some Internet web sites. They are also known as "red devils" due to the color of the tablet. Other Coricidin preparations may contain acetaminophen and phenylpropanolamine.

The Utah Experience

Between January 1st and March 15th, 2000, the UPCC received 46 exposure calls involving abuse or misuse of dextromethorphan or CoricidinTM containing products. Thirty-two (70 %) of the patients were between 12 and 20 years old. Forty-one (89%) were treated in a health care facility and two (0.4%) required admission to an intensive care unit.

Clinical Toxicology and Treatment

From our experience with these exposures, the patient will typically take 10-15 CoricidinTM tablets in order to "get high". This results in a dose of 300-450 mg of dextromethorphan and 40-60 mg of chlorpheniramine. The onset of action is typically within an hour and lasts 6-24 hours.

Dextromethorphan is a stereoiosmer of levorphanol, a narcotic analgesic, but does not have addictive or analgesic effects when used appropriately as a cough suppressant. In overdose it may produce CNS

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New Pediatric Acetaminophen Overdose Referral Guidelines of the UPCC

The Utah Poison Control Center has recently updated its guideline for referring a child to the hospital for unintentional acetaminophen ingestion. This guideline is based on the most recently published data for these exposures and our experience.

In addition, since activated charcoal has little, if any, effect on acetaminophen absorption when given greater than one hour post-ingestion, the UPCC may delay referring patients until near the four-hour time threshold if they call us more than one hour post-ingestion. The UPCC may advise parents to induce emesis with ipecac at home as outlined below. Our guidelines are as follows:

1. Time to acetaminophen concentration determination:

Pharmacokinetics and clinical experience suggests that peak serum concentrations occur at 2 hours post-ingestion for liquid preparations. Therefore, it is reasonable to check a 2-hour rather than a 4-hour concentration in these patients. A two-hour concentration less than 50 mcg/mL is considered a nontoxic ingestion and no further concentration determinations are necessary. If the concentration is 50 mcg/mL or greater, a repeat serum concentration at 4-hours post-ingestion is recommended. Ingestion of tablets, capsules, or "extended-relief" products should still have a 4-hour post-ingestion concentration measured.

2. Dose is less than 150 mg/kg:

Observe at home. No GI decontamination recommended.

3. Dose is 150-200 mg/kg:

a. If greater than one hour post-ingestion, ipecac syrup is not recommended and refer the patient to a HCF for a 2-hour (liquid preparation only, optional) or 4-hour acetaminophen concentration.

b. If less than one hour post-ingestion, recommend ipecac syrup at home and observe there. No acetaminophen concentration is required if ipecac successfully induces emesis. This decontamination will be at least 30-50% effective and reduce the exposure to less than 150 mg/kg.

4. Dose is unknown, uncertain or greater than 200 mg/kg:

a. If greater than one hour post-ingestion, no ipecac syrup administration is recommended at home. Refer the patient for a 2-hour (liquid preparation only) or 4-hour acetaminophen concentration.

b. If less than one hour since ingestion recommend ipecac syrup at home or refer to HCF immediately for activated charcoal administration. Refer the patient for a 2-hour (liquid preparation only) or 4-hour acetaminophen concentration.

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depression, ataxia, slurred speech, dizziness, mydriasis, hallucinations, psychosis, nystagmus, and confusion.[2]

Chorpheniramine is an antihistamine with anticholinergic properties. Typical anticholingergic symptoms may be observed with abuse such as tachycardia, dry mouth, confusion, agitation, dilated pupils and hallucinations. While most recreational abuse doses result in moderate symptoms and require supportive care only, severe toxicity may occur with large ingestions and cause coma, seizures, hyperthermia, delirium, or combativeness requiring sedation and physical restraints.

Treatment consists of GI decontamination with activated charcoal if the patient presents with 1-2 hours of ingestion, IV access, cardiac monitoring, and seizure and airway precautions until symptomatic improvement occurs. Naloxone has been reported to reverse the effects of dextromethorphan inconsistently.[2] Checking a serum acetaminophen level in these patients is reasonable since some of the preparations may contain the analgesic. Patients with moderate to severe symptoms may require admission to the hospital for prolonged monitoring. Drug abuse counseling should occur once the toxicity is resolved and the patient is alert. Asymptomatic patients may be discharged from the emergency department after 4 hours of observation and psychiatric evaluation.

Martin Caravati MD, MPH

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Tox Abstracts

Burns MJ, Linden CH, Graudins A, et al. A comparison of physostigmine and benzodiazepines for the treatment of anticholinergic poisoning. Ann Emerg Med. 2000;35:374-381.

A retrospective study of 52 patients with anticholingeric-induced agitation and delirium was undertaken to compare to efficacy, side effects and complications of those treated with physostigmine (n=45) versus benzodiazepines (n=26). Physostigmine given in doses ranging from 0.5 to 6 mg controlled agitation in 96% and reversed delirium in 87% of patients. The mean response time was approximately 11 minutes and relapse occurred in 78% of patients after an average of 100 minutes. Benzodiazepines controlled agitation in only 24% and did not reverse delirium in any patient. The average initial doses were 12-mg diazepam, 3.6-mg lorazepam and 6-mg of midazolam with a response time of 7-8 minutes and 67% relapse rate. Patients treated with physostigmine had fewer complications (7% vs. 46%) and a shorter time to recovery (12 vs. 24 hours) compared to patients treated with benzodiazepines. These results suggest that physostigmine is more effective and safer than benzodiazepines for the treatment of isolated anticholinergic poisoning. Physostigmine is contraindicated for patients with a history of cyclic antidepressant ingestion, concurrent use of depolarizing neuromuscular blockers, or evidence of seizures, heart block, bradycardia, or asthma. It appears to be useful in pure

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*CSPI denotes Certified Specialist in Poison Information.

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central anticholinergic syndrome from drugs such as diphenhyramine or Jimson weed. The Utah Poison Control Center recommends that you read the entire abstracted article for details of this patient population and other related literature before using physostigmine as an antidote.

Caravati EM. Unintentional acetaminophen ingestion in children and the potential for hepatotoxicity. J Toxicol: Clin Toxicol 2000;38:291-296.

A prospective evaluation of all potentially toxic acetaminophen ingestions in children six years of age or younger was performed over a 69 month period by the Utah Poison Control Center in order to determine the potential for toxic serum concentrations. One thousand fifteen patients with an average age of 28 months were evaluated. The average dose ingested was 213 mg/kg (34-2500 mg/kg) and 81% received GI decontamination within 2 hours of ingestion. Only six patients (0.59%) developed potentially toxic blood concentrations according to the Rumack nomogram and all six had ingested greater than 200 mg/kg or an "unknown" amount. The formulation ingested by 5 of the 6 "toxic" patients was a 500-mg table or gelcap. It was concluded that children who ingest between 140-200 mg/kg and demonstrate ipecac-induced emesis within 60 minutes of exposure could be safely managed at home. Patients ingesting greater than 200 mg/kg or an "unknown" amount should have a serum acetaminophen concentration determined to assess the potential for hepatotoxicity.

Public Education Materials

If you would like to provide your patients with poison prevention public education materials including: brochures, telephone stickers, emergency action cards, quarterly public newsletters and more, call for a complete list and order form. (801) 581-7504.

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