Case Series

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Utilizing Toxidromal Approach in Managing Series of Botanically Related Medicolegal Emergencies

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Abstract

As with many other medicolegal dilemma in poisoning, in which whom to blame for the toxic exposure, and who should be punished. Since after the decriminalization of suicidal attempt under section 309 IPC, victim himself can't be held responsible for the harm caused to him/her by self. But abatement of suicide is still a crime, so if someone harasses another person physically or mentally or psychologically, and the victim consumes some toxic plant product under stress, than it becomes a medicolegal case to be reported to police, to protect the victim and restrain the accused for causing further harm. Bedside care of patients with toxic plant exposures should be managed primarily based on their clinical manifestations and responses to therapy and only secondarily on the basis of the toxin to which they are presumably exposed. The dictum has been and remains "Treat the patient, not the poison". But don't ignore the poison. We report few interesting cases reported in our ER: self-intoxication during voluntary ingestion of nutmeg-myristicinas aphrodisiac, self-overdose of Calotropis seeds as purgative by young female, Homicidal Atropa seeds toxicity in a child, Areca Nut aspiration by male Gutkha chewer, Opium intoxication in youth, Oriental Starfruit causing nephrotoxicity, Bottle gourd juice causing UGI Bleed, Cannabis abuse simulating Acute coronary syndrome. Toxidromal Approach simplified theapproach to differential diagnosis and emergency management of symptomatology and aetiology of intoxication, thus saving lives and improving quality of acute care.

Keywords: Toxidrome; Atropa; Nutmeg; myristicin; Calotropis; Intoxication; Overdose; Starfruit; Bottle gourd; Areca Nut; Cannabis; Opium; Aphrodisiac.

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Background

We studied botany before, and then we all studied medicine including Toxicology. Herbal remedies, on psychoactive and toxic plants, especially of the tropics. Initially, through stories of the indigenous lifestyle of Village peoples, and later by helping me undertake fieldwork in this region, it awoke in me a keen interest in the botany of useful plants that led me to become first an investigator and later a practitioner of botanical medicine. When I moved on to Medical College, We weredismayed to find that none of my teachers, even of pharmacology, had firsthand knowledge of the plant sources of drugs. Since then we have been continually struck by the lack of awareness of the medicinal and toxic properties of plants in our culture. Examples are unfounded fears of poisoning by common ornamentals such as the poinsettia, exaggerated

fears of herbal remedies such as Chinese ephedra, ignorance of the vast medicinal importance of such spices as turmeric and ginger, and lack of awareness of the toxic and psychoactive properties of other spices, for example, nutmeg and mace. Specific identification of a plant may guide management by revealing potential toxins, placing the risk in context, and providing a time frame for the development of clinical findings.

Care should be taken to avoid misidentification, a particular problem when plants are discussed by their common rather than by their botanical name. Although management of a patient with an identified exposure is generally preferable to managing a patient with an "exposure to an unknown plant," many plant-exposed cases are managed successfully without knowledge of the culprit plant. However, adverse events may result by the attempted management of a misidentified plant. Perhaps the greatest paradigm shift in recent years is thecurrent de-emphasis of aggressive gastrointestinal decontamination. Syrup of ipecac, for example, is almost never recommended, and orogastric lavage should be reserved for those patients with a reasonable likelihood of developing consequential poisoning.

This group should include the minority of patients exposed to plants. Although oral activated charcoal is effective at reducing the absorption of many chemicals, its benefit following the vast majority of plant exposures has never been specifically studied. However, given the extremely low risk of administration of oral activated charcoal to an awake patient who is able to drink spontaneously, its use should be considered in patients with plant exposures. ISTOLS (Indian Society of Toxicology Life Support Course) training include descriptions of the clinical findings and focused descriptions of management strategies for patients with plant poisonings via Toxidromal approach.

Although very few antidotes are available to treat the effects of the innumerable toxins available in plants, rarely are antidotes actually necessary. Much of our understanding of poisoning syndromes derives from toxicity associated with theuse of purified plant toxins as pharmaceuticals (e.g., morphine from Papaver somniferum).

The amount of a toxin present in a plant is unpredictable, whereas the amount in a tablet is always defined. There is generally a lower concentration of "toxin" in the plant than there is of

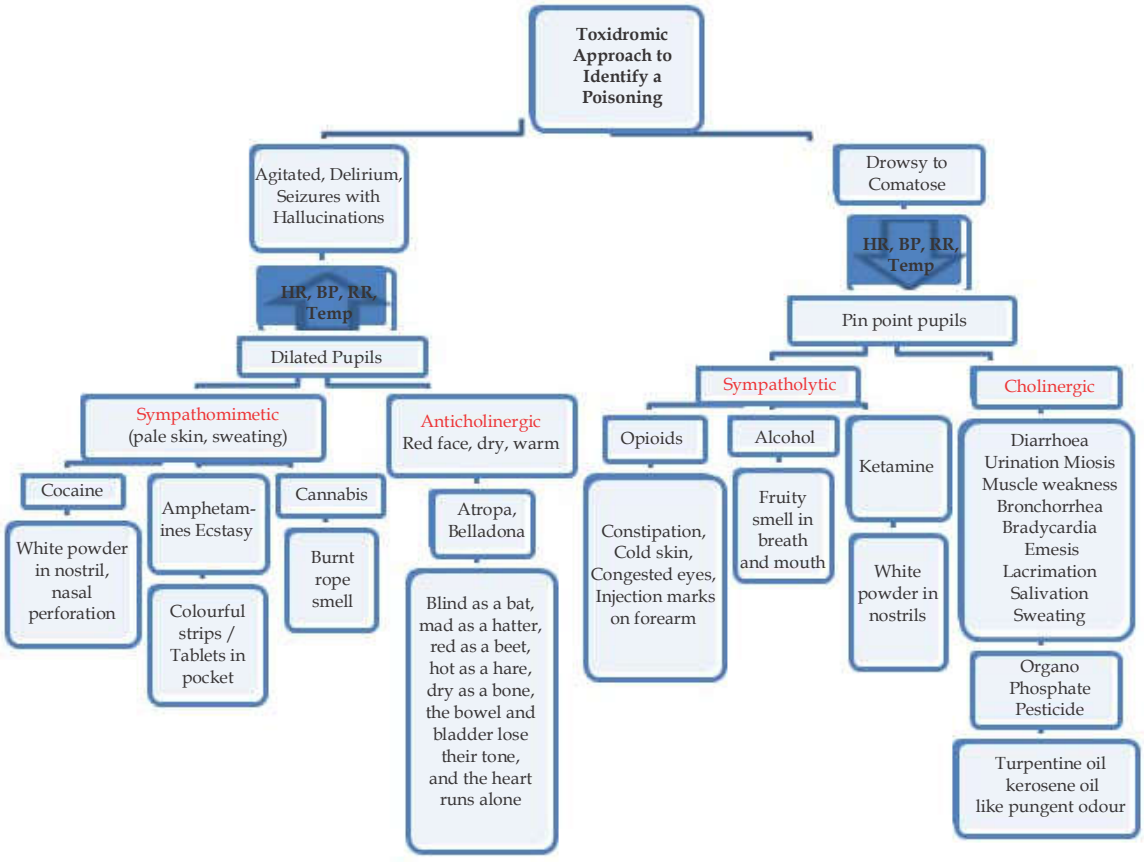

Fig. 1: Toxidromic Approach to Identify a Poisoning

"drug" in a tablet. However, this byno means should minimize the clinical concern following exposure to a plant containing a consequential toxin, such as Colchicum autumnale, which contains colchicine. The cost and effort associated with proving an exposure (e.g., toxin levels in blood) makes this task (unfortunately but appropriately) of low priority to the physician involved with the care of the exposed patient. As with many other clinical situations, bedside care of patients withtoxic plant exposures should be managed primarily based on their clinical manifestations and responses to therapy and only secondarily on the basis of thetoxin to which they are presumably exposed. The dictum has been and remains"Treat the patient, not the poison". But don't ignore the poison.

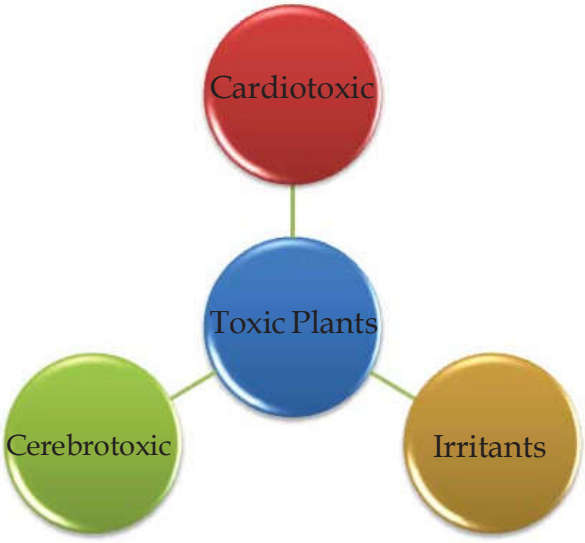

Fig. 2: Types of Toxic plants

Introduction

Poisonous Plants, Poisoning Syndromes, and Their Clinical Management:

General initial medical management strategies that are required for allplant-exposed patients include, but are not necessarily limited to, vital signassessment, consideration of the need for immediate interventions (e.g., ventilation and oxygenation, blood glucose), determination of the need for laboratory or other diagnostic testing, and the consideration of the need forgastrointestinal decontamination. Intervention at any point thatis deemed appropriate to correct or prevent progression of a clinical abnormalityis critical.

Toxidromic approach to management of plant poisoning:

Common poisonings may present with one or more of the following in the form of common Toxidromes, based on important diagnostic variables in the physical examination – sensorium and mental status, blood pressure, pulse rate, respiratory rate, oxygen saturation, body temperature, pupil size, profuse perspiration/ dry skin.

Types of Toxidrome

↑ Sympathomimetic ↑ Cholinergic - Parasympthomimetic

↓ Sympatholytic ↓ Anticholinergic- Parasympatholytic

Sympathomimetics act as antidote to sympatholytic overdose, and vice versa.

Cholinergics act as antidote to anticholinergic overdose, and vice versa.

Autonomic Nervous System (ANS) sustains the automatic functions of vital organs. Most of the fatal toxicants affect the ANS in one way or another, thus compromising the vital organs function, resulting in immediate death, if the toxicant was given in fatal dose.

Search for scene safety as per World Health Organization (WHO) protocol:

"Dr. ABCDE" Mnemonic. This follows the general principles of life support given below:

- Dr - ABCDE
- D - DANGER - scene safety
- R - RESPONSE- call for help
- A – AIRWAY secured and maintain patency/ Antidote
- B – BREATHING support
- C – CIRCULATION maintain access
- D - DISABILITY/ Decontamination - Whole body
- E – EXPOSE THE PATIENT completely - to find poisonous bites/stings
- F- Foley's catheterization for rapid excretion of toxic metabolites
- G-Gastric lavage for decontamination
- I- Isolation of patient & I-Intermittent rotation of Health Care provider to prevent further spread of toxicity to others (occupational hazards)

Anticholinergic Toxidrome

Tachycardia with mild hypertension is common,

and the body temperature is often elevated. Pupils are widely dilated. The skin is flushed, hot, and dry. Peristalsis is decreased, and urinary retention is common. Patients may have myoclonic jerking or choreoathetoid movements. Agitated delirium is frequently seen, and severe hyperthermia may occur. Examples: Atropa Belladona, Atropine, scopolamine, other naturally occurring anticholinergics, poisonous mushrooms. Deadly nightshade (Atropa belladona), Bittersweet (Solanumdulcamara), Black henbane (Hyoscyamusniger), Jimson weed (Dhatura species), Paneolinafoenisecii, Jerusalem cherry (Solanumpseudocapsicum), Potato (Solanumtuberosum).

Case Reports

Recent medicolegal Cases reported due to Poisonous Plants

Case Report 1: A previously well 28 year old male presented with complaints of palpitations, drowsiness, nausea, dizziness, thirst, and dry mouth. He was very anxious, restless, and agitated and described being "in a trance state". He specifically felt "like Jack in the box wanting to get out" but did not have hallucinations. He did not complain of urinary or abdominal discomfort and gave no history of seizures or migraine. He had an unremarkable medical and psychiatric history and denied any suicidal ideation. The patient on detailed historygave information regarding recreational drug use for prolonged sexual intercourse. This occurred with a newly-wed couple in an attempt for a low cost alternative to recreational drug use.

On examination the patient was agitated but alert, flushed but pyrexial, with a respiratory rate of 20/minute and saturation of 96% on room air. He was tachycardic at 102/minute with a blood pressure of 105/68. Cardiopulmonary examination was unremarkable. The abdomen was soft and non-tender. Cranial nerves were normal, while peripheral nervous system examination showed brisk, symmetrical deep tendon reflexes. There was no neck stiffness. Pupils were dilated to size 4 mm and were symmetrically brisk to light and accommodation.

A 12 lead ECG showed a fast sinus arrhythmia (rate 95–110/minute) with no ischaemic or hypertrophic changes. Serum urea, electrolytes, liver transaminases, full blood count, and serum catecholamines levels were normal. Serum and urine toxicology screens were negative.

In view of the complexity of his condition he was admitted in local hospital and five hours later referred to Medanta-the Medicity Hospital for having taken a large dose of nutmeg while trying to "get high". Some 30g of commercially available grated nutmeg were blended into a milkshake, the patient drankwhole of the amount. A feeling of elation was experienced in our patient, this was followed by his presenting symptoms 30 minutes after ingestion. The patient was kept for observation, offered reassurance, and rehydration. After symptoms had resolved he was allowed to return home 10 hours after presentation, 30 hours after ingestion.

Poisoning by Plants with Anticholinergic (Antimuscarinic) Poisons: Nutmeg poisoning is rare but probably underreported and should be considered in recreational substance users with acute psychotic symptoms as well as central nervous system neuromodulatory signs that may mimic in part an anticholinergic hyperstimulation.

Case Report 2: 12 yrs old male kid brought by his parents from nearby village for sudden onset abnormal behaviour, abusive, thus was harming self and others. On Examination, patient's pupils were dilated and reactive, and was restless, anxious, unable to sit, kicking the staff and doctors. Based on the typical toxidromal signs & symptoms of stimulant toxidrome of either anticholinergic intoxication or sympathomimetic toxidrome. Patient was calmed down with sympatholytic agents Benzodiapines and physically restrained, and we asked for history from the parents of the victim for any drug abuse or accidental exposure to any plant seeds, or any past history of similar episode, but nothing significant was found. MRI & EEG Brain were normal. We conducted urine for toxscreen, which revealed nil. Police intimation was done, who enquired all the family members, and patient's maternal grandfather confessed that he had deliberately intoxicated the patient with Atropa belladonna seeds containing atropine, to take revenge from his son-in- law (patient's father), for some property dispute in the village. Atropine neurotoxicity explained the typical toxidromal signs and symptoms of anticholinergic intoxication.

Sympathomimetic Toxidrome

The blood pressure and pulse rate are elevated, though with severe hypertension, reflex bradycardia may occur. The temperature is often elevated, pupils are dilated, and the skin is sweaty, though mucous membranes are dry. Patients are usually agitated, anxious, or frankly psychotic.

Examples: Magic mushrooms – Psilocybin, Ephedra plant-ephedrine and pseudoephedrine, Marijuana having Cannabinoids, Nux vomica seeds – Strychnine, Khat plant (Catha edulis) overdose.

Opioid Withdrawal - Sympathetic nervous system over-activity

Case Report 3: Interesting case of Medical Emergency associated with Chronic Cannabis toxicity. 24-year-old medical intern, who was discovered in a deeply comatose non-reactive state by his roommates in Boy's Medical college Hostel. Patient was shifted in ambulance and had 3 episodes of abnormal tonic clonic movements with frothing of mouth and received antiepileptic on way. According to the patient's roommates and attendants, patient had been a regular Marijuana smoker (up to 5-6 Marijuana cigarettes a day) for one year, and had increased smoking more than 15–16 Marijuana loaded cigarettes since last few days. Differential diagnosis:

- S-Stroke, or
- S-Seizure, or
- S-Sinus Thrombosis, or
- S-Sympathomimetic toxidrome.

By perusal of clinical findings and investigations by Toxidromal approach, We concluded that the patient had developed Cerbral Venous Thrombosis (CVT) with hemorrhagic cerebral infarcts due to chronic cannabis toxidrome, causing seizure (Fig. 3). Cannabis was the incriminated element in the cause of the thrombosis of our patient. Detailed workup of CVT was done which showed:-ANA-Antinuclear Antibody negative, Anti Cardiolipin antibody negative, IgG & Ig M Beta 2 Glycoprotein negative, Protein C and S Normal, Homocysteine within normal limits.

MRI scan of his brain revealed left sigmoid sinus thrombosis with acute venous hemorrhagic infarct involving left temporal lobe, posteroinferiorly

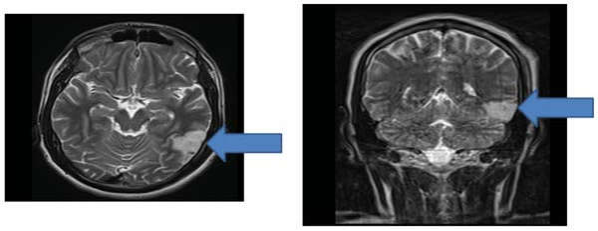

Fig. 3: Cannabis Toxicity

Discussion

Neurotoxic poisoning in the presence of associated injuries is commonly seen associated with trauma, and can result in devastating outcomes, if left unrecognized. Adequate information by doctors, who are mostly the first independent witnesses in poisoned victims, helps the police and court in investigation the suspected cases of trauma or toxicology, which can help in getting timely justice to the victims, and punishment to the culprits. As most exposures result in little or no toxicity, the initial management of most incidents involving patients who are asymptomatic should be expectant. This approach includes observation, at home or in the hospital as appropriate, depending on the nature of the exposure, and supportive care. For example, patients with several episodes of vomiting may benefit from an antiemetic agentand oral rehydration or, occasionally, intravenous fluids. At the root of this problem is the distance that exists between plant scientists and health scientists. Because I am trained in both worlds, I have been very conscious of it all my professional life. This intellectual gap creates difficulties for botanists who want to learn the medical significance of plants with pharmacological effects and for physicians, nurses, and pharmacists who want to learn how plants influence health, whether for good or ill. By bringing together specialists from both sides of this divide, the present article does a great service. It gives different perspectives on poisonous and injurious plants while remaining grounded in the integrative science of modern ethnobotany. Because of our background in botany, was often asked questions about the harmful potentials of plants and products derived from them. We meet many people who imagine that most wild plants are dangerous, who think that if you pick and eat plants at random in the backyard or woods you will die. In fact, the percentage of plants that are really harmful is quite small, as is the percentage that are really beneficial. If you wish to get toknow plants, a good place to start is to learn about those that can kill or cause serious harm.

Conclusion

The easy availability of environmental poisons like poisonous plants and their products commercially determines the choice of their use in society. Medicolegal Importance of neurotoxic plant poisons in homicidal, suicidal and accidental exposure is that they are fatal and hazardous to vulnerable population of society- especially kids, youth and young persons just after marriage. The effects are often fatal immediately after exposure and deprive them of those whom they know and

love. We described few cases of plant poisoning reported in Medanta Hospital Emergency, to understand the important role of doctors in giving logic and reasoning as expert opinion expressed for administration of justice and utilizing the Toxidromal approach of ISTOLS in better diagnosis and management, in the best interests of the patient.

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Conflict of Interest: Nil.

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