Neurotoxic Emergencies

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• Poisoning • Emergency • Overdose • Neurology • Toxicology • Neurotoxins
• Seizures • Antidepressants

COMMENTARY ON NEUROTOXINS FOR PSYCHIATRIC PRACTICE

In this article, we highlight causative agents of neurotoxic emergencies, many of which are easily mistaken for acute psychiatric disorders. Understanding the wide variety of agents responsible for neurotoxic emergencies and the neurotransmitter interactions involved will help the psychiatrist identify and treat this challenging population.

The initial evaluation of a psychiatric patient hinges on identifying alternate causative medical, organic and toxic etiologies complicating the patient's presentation. The evaluation of psychiatric patients in the emergency environment is especially challenging due to the uncontrolled setting, uncertain history and the wide variety of potential organic and toxic etiologies that could be contributing to the patient's clinical presentation.

Medical treatment using pharmaceuticals includes a risk-benefit analysis, weighing anticipated benefit with the potential for harm. Acute or chronic toxicity from pharmaceuticals may manifest as an amplification of expected adverse drug reactions (ADR) or may have a distinct toxic syndrome. Treating clinicians primarily focus on beneficial and adverse effects of pharmaceuticals in therapeutic doses whereas medical toxicologists focus on toxicologic effects in acute or chronic overdose.

It is important to understand the side effect profile, ADRs, and drug-drug interactions for medications prescribed however, an understanding of how these xenobiotics manifest in overdose can also be useful for treating clinicians. Clinicians cannot predict or prevent intentional overdose, or control illicit drug use however; a reasonable

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risk-benefit analysis can be used when making treatment decisions recognizing that some pharmaceuticals are much more toxic in overdose than others.

We hope this article provides useful information to treating clinicians and furthers an understanding of acute care considerations for neurotoxic emergencies.

KEY POINTS

- Multiple xenobiotics producing acute excited mental status interact with the central biogenic amines, leading to a variety of toxic syndromes.
- Neurotoxic xenobiotics can alter GABA homeostasis, leading to acute depressed mental status in a variety of ways.
- Neuroleptic malignant syndrome is usually associated with rapid escalation of an antipsychotic or sudden discontinuation of anti-Parkinson medications. Symptoms develop over a period of 1 to 3 days, usually in sequential fashion, beginning with AMS and muscle rigidity.
- Cannabinoids have a linear dose-response relationship for inducing neuropsychiatric effects. At moderate doses, cannabinoids cause CNS depressant effects, including analgesia, euphoria, sedation, anxiolysis, and impairment of cognitive and psychomotor performance. Large doses can lead to adverse psychological effects primarily manifested by anxiety, panic attacks, agitation, acute psychosis, and paranoia.
- Acetylcholine antagonism produces the collection of symptoms commonly referred to as the anticholinergic syndrome: hyperthermia, tachycardia, flushed skin, anhydrosis, mydriasis, hypoactive bowel sounds, urinary retention, delirium, agitation, picking movements, hallucinations, and coma.

The symptoms and effects delineating a neurotoxic emergency vary depending on the viewpoint of the clinician. In general, agents causing acute life-threatening conditions have rapid mechanisms that severely disrupt major organ systems. This article focuses on agents causing rapid decompensation to a potentially life-threatening condition. The majority of these agents affect the central nervous system (CNS), thus the article is structured based on CNS effects: drug-induced and toxin-induced seizures, acute depressed mental status, and acute excited mental status. The final section highlights selected agents with primarily peripheral effects that meet the same criteria for an acute life-threatening condition.

A wide variety of poisons, toxins, drugs, chemicals, industrial agents, pesticides, and environmental agents have the potential to cause emergent neurotoxic effects. To avoid confusion, the authors use the term "xenobiotic" when discussing the various causative neurotoxic agents. A xenobiotic is a pharmacologically, endocrinologically, or toxicologically active substance not endogenously produced and therefore foreign to the organism.[1]

Neurotoxic xenobiotics produce symptoms in the victim through a wide array of different mechanisms, as shown in **Table 1**. Neurotoxic emergencies frequently affect the CNS through effects on neurotransmitters; therefore, much of this discussion focuses on the actions of specific neurotransmitters.

DRUG-INDUCED AND TOXIN-INDUCED SEIZURES

Seizures are a manifestation of many drug and toxin exposures or withdrawal syndromes. Some overdoses may include seizure amongst a myriad of other organ system toxicities, whereas others induce seizures as the primary manifestation of toxicity.