Cocaine Intoxication

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KEYWORDS

• Cocaine • Intracranial hemorrhage • Stroke • Chest pain
• Acute coronary syndrome • Rhabdomyolysis • Hyperthermia

KEY POINTS

- Cocaine is commonly abused by inhalation, nasal insufflation, and intravenous injection, resulting in many adverse effects that ensue from local anesthetic, vasoconstrictive, sympathomimetic, psychoactive, and prothrombotic mechanisms.
- Manifestations may include tachycardia, hypertension, hyperthermia, diaphoresis, tachypnea, mydriasis, euphoria, agitation, delirium, and psychosis.
- Knowledge of the spectrum of associated complications is essential to the clinical evaluation and management of cocaine intoxication.

Cocaine abuse and intoxication is a global problem leading to many medical complications that can result in significant morbidity and mortality. Current users of cocaine in the United States over the age of 12 years numbered 1.5 million in 2010, which is a decline from 2.4 million users in 2006.[1] In contrast, cocaine use is increasing in Europe, where it is second only to marijuana use. It is estimated that 4 million Europeans ages 15 to 64 used cocaine in 2009, with Spain, Italy, the United Kingdom, and Ireland having the highest prevalence.[2] Although cocaine abuse and intoxication is more common in young adults, older individuals are also affected. The rate of illicit drug use in the United States increased from 1.9% in 2002 to 4.1% in 2007 in the age group 50 to 59.[3] A recent review of patients ages 65 and older who had a drug screen performed in a suburban community hospital found 2.3% positive for cocaine.[4] These findings may represent continued drug use (aging of the baby boomer generation), new onset of use, or a return to use after a period of abstinence.

PHARMACOLOGY

Cocaine (benzoylmethylecgonine) is extracted from the leaves of the *Erythroxylon coca* plant by soaking leaves in organic solvents to form a thick paste sediment.

The author has nothing to disclose.
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The addition of hydrochloric acid to the paste results in the precipitation of cocaine hydrochloride salt. This water-soluble form of cocaine can be injected intravenously, snorted intranasally, or ingested orally. The hydrochloride salt of cocaine is converted into an alkaloid form that can be smoked by the addition of a base, such as sodium bicarbonate. This form of cocaine hardens to a rock-like state known as crack cocaine. The name is derived from the cracking noise made when the cocaine is heated. Most of the world supply of cocaine is produced in South America.

The time course of the physiologic effects of cocaine varies with the route of use, form of cocaine used, and concomitant use of other drugs.[5] The onset of effects occurs most rapidly with inhaled cocaine (3–5 seconds) followed by intravenous injection (10–60 seconds). The onset of effects is delayed with intranasal use (within 5 minutes) due to topical vasoconstriction. Conversely, the duration of effects is longest with intranasal cocaine use (60–90 minutes) and shortest with inhalation of crack cocaine (5–15 minutes). The short duration of effect with inhalation may lead to repetitive dosing to maintain desired effects.

Cocaine has a short half-life of 0.7 to 1.5 hours and is rapidly metabolized by plasma and liver cholinesterases to the major metabolites of benzoylecgonine and ecgonine methyl ester.[5] These water-soluble metabolites are excreted in the urine. The frequent concomitant use of cocaine and ethanol results in the hepatic formation of the active metabolite, cocaethylene, which has euphoric and sympathomimetic effects similar to cocaine but may also have greater toxicity.[6,7] The longer half-life of cocaethylene (2.5 hours) may prolong the euphoric effects of cocaine.

PATHOPHYSIOLOGY

Cocaine produces local anesthetic, vasoconstrictive and sympathomimetic effects.[5] Local anesthetic effects result from blockade of voltage-gated sodium channels in the neuronal membrane, resulting in inhibition of neural conduction. The vasoconstrictive effect of cocaine is primarily due to the stimulation of α-adrenergic receptors in arterial smooth muscle cells. Increased endothelin-1 and decreased nitric oxide blood concentrations may also contribute to cocaine's vasoconstrictive properties.[8] The major metabolites of cocaine, benzoylecgonine and ecgonine methyl ester, may persist in the body for more than 24 hours and contribute to delayed or recurrent coronary or cerebral vasoconstriction.

The major toxicities of cocaine use result from the sympathomimetic effects. Cocaine inhibits the presynaptic reuptake of biogenic amines, such as norepinephrine, dopamine, and serotonin, throughout the body, including the central nervous system (CNS). Systemic effects include an increase in heart rate and blood pressure with diffuse vasoconstriction. The CNS effects are most likely due to excess dopaminergic activity that produces profound euphoria and self-confidence at lower doses and agitation and delirium at higher doses.

Thrombogenic effects of cocaine have been ascribed to increases in plasminogen-activator inhibitor activity, platelet count, platelet activation, and platelet aggregation.[9] An inflammatory state characterized by elevated C-reactive protein, von Willebrand factor, and fibrinogen concentrations may also enhance thrombosis.[8]

DIAGNOSIS

Due to the short half-life of cocaine in the body, the presence of benzoylecgonine (half-life of approximately 6 hours) is used to detect cocaine exposure. For clinical purposes, urine is the most commonly used sample for detecting benzoylecgonine. After acute use of cocaine, urine testing is positive for 1 to 2 days. Chronic cocaine