The Journal of Emergency Medicine, Vol. 23, No. 4, pp. 383–386, 2002

0736-4679/02 $–see front matter

PII S0736-4679(02)00576-0

Selected Topics: Toxicology

THE SURGICAL ABDOMEN ASSOCIATED WITH COCAINE ABUSE

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□ **Abstract—Cocaine use is common and is associated with gastrointestinal complications that can present as a surgical abdomen. We report a case of a previously healthy 25-year-old man who presented to the Emergency Department with severe abdominal pain and vomiting after using IV cocaine. Exploratory celiotomy revealed massive free intraperitoneal (IP) clotted blood with no evidence of underlying pathology. This unusual case underscores the possibility of life-threatening hemorrhage in cocaine consumers. © 2002 Elsevier Science Inc.**

□ **Keywords—abdominal pain; cocaine; hemorrhage**

INTRODUCTION

Abdominal complications caused by cocaine abuse are not well appreciated. Patients may present to the Emergency Department (ED) with a variety of typical and atypical complaints of abdominal pain after the use of cocaine. However, the abdominal examination of such a patient may offer a difficult and challenging problem in both diagnosis and treatment. Through its direct action on the brain, cocaine is capable of inducing clinically significant neurocognitive impairment, which may profoundly affect the likelihood of obtaining a reliable history and clinical examination. Successful treatment is predicated on understanding the pathophysiology of the drug's adverse effects. Proposed mechanisms responsible for the adverse effects induced by cocaine have included direct toxicity to the gut mucosa, and ischemic injury mediated by intense vasoconstriction and transient surges in systemic blood pressure (1-3). Clinicians should always seek a history of recent substance abuse in patients with unexplained abdominal pain and remain cognizant of the potentially life-threatening abdominal complications that can occur in cocaine users. These include hemorrhage, gastroduodenal perforation, and intestinal ischemia (4-9). The present report illustrates a case of severe abdominal pain following the use of cocaine and discusses the pathophysiology.

CASE REPORT

A 25-year-old man, previously healthy, presented to the ED with complaints of increasing abdominal pain over a 16-h period. The pain was described as sharp, constant and nonradiating. The patient stated that he had several episodes of retching and expulsive vomiting before the onset of his abdominal pain. Moreover, he acknowledged using IV cocaine approximately 4 h before the onset of these symptoms and denied any history of trauma. He also denied any history of gastrointestinal problems. Although he admitted to using cocaine and denied using an excessive amount preceding this event, he was not questioned as to his frequency of cocaine use (acute vs. chronic). However, he was questioned on his use of other drugs, which he denied except for alcohol and heroin, which he used to treat his abdominal pain before presentation. There was no history of previous surgeries.

On admission he was in no acute distress. The pulse was 130 beats/min and the blood pressure was 109/63

RECEIVED: 9 January 2002; FINAL SUBMISSION RECEIVED: 5 June 2002;
ACCEPTED: 24 June 2002

mm Hg. The abdomen was diffusely tender, nondistended, and soft. The rest of the examination was unremarkable. Laboratory analysis was also unremarkable except for a leukocytosis (17.6×10^3/U). A toxicological screening of urine detected the presence of cocaine and opiates but was negative for benzodiazepines, phencyclidine, salicylates, sympathomimetics, barbiturates, cannabis, and ethanol. Plain films of the abdomen and chest were normal. Two hours after admission, the systolic blood pressure fell sharply to 53 mm Hg. He was resuscitated with two liters of normal (0.9%) saline. Subsequent laboratory analysis revealed a significant drop in his hemoglobin, from 13.1 to 9.6 g/dL. A surgical consultation was obtained and the patient was taken to the operating room approximately 30 min later. An exploratory celiotomy revealed two liters of hemoperitoneum. The clotted blood was evacuated. Careful examination of all intra-abdominal organs revealed no underlying abnormalities. All organs appeared intact, no visceral arterial aneurysms were found, and no bleeding point was discovered. Despite extensive exploration, the source of hemorrhage was not identified. Postoperative laboratory analysis revealed a normal prothrombin time, platelet count and levels of coagulation factors VIII, XII, and XIII. However, the bleeding time was markedly elevated to greater than 15 min (normal 2-7.5 min). Hepatitis C antibody was positive and HIV test was negative. The remaining hospital course was uneventful. He never recalled any traumatic event and he was discharged on the sixth postoperative day.

DISCUSSION

Inhaled, injected, smoked, taken orally, or intranasally, cocaine affects almost all organ systems in the body. Although cocaine has a short (1.5 h) elimination half-life, its metabolites have a much longer (7.5 h) elimination half-life (10). In chronic users, the half-life of cocaine is even more protracted (3.8 h) (11). Importantly, symptomatology related to cocaine use may occur within minutes or up to several hours after its use (6,7). Failure to consider the gastrointestinal complications associated with cocaine use in the differential diagnosis of a young patient who presents with otherwise unexplained abdominal pain could result in high morbidity and mortality.

Hemoperitoneum is a rare and potentially fatal complication. The most common initial symptom reported in these patients is abdominal pain (12-17). The cause of this pain is not entirely clear but most likely results from a chemical peritonitis created by the breakdown of red cells within the peritoneal cavity (18,19).

Precipitating factors of hemoperitoneum such as trauma, ruptured aneurysms, liver tumors, and ectopic pregnancy have been described in the literature (13,14). Other authors have reported spontaneous, nontraumatic hemoperitoneum from undetermined causes (15-17). Interestingly, in these cases, the patient's history of cocaine or other illicit drug usage was not mentioned. In our case, the source of bleeding within the peritoneal cavity could not be identified. No vascular abnormalities or tumors were recognized and despite repeated questioning, no definite history of trauma was elicited. One diagnostic modality that was considered was an intraoperative angiogram under fluoroscopy. However, in this case, equipment and radiology availability would have precluded a quality examination, and therefore, it was not attempted.

It is possible that the true nature of this spontaneous hemoperitoneum centered on his IV cocaine abuse and vomiting. Indeed, review of the literature supports a strong relationship between cocaine use and hemorrhagic events. There have been several clinical reports of acute gastrointestinal, pulmonary, and intracerebral hemorrhages temporally related to cocaine use (4,20-24). Intracerebral hemorrhages have even been reported after a single dose of cocaine and in the absence of any vascular abnormalities (22-24).

Studies suggest that cocaine associated hemorrhage is the result of a direct toxicity of cocaine on the capillary endothelium and cocaine-induced hypertensive surges (3,21,22). Cocaine causes an accumulation of norepinephrine at the α-adrenergic receptors by preventing the reuptake of this neurotransmitter at the synaptic junction (25). The result is sustained receptor stimulation, vasoconstriction, and sudden transient increases in blood pressure. Interestingly, the venous blood pressure also increases dramatically in the abdominal cavity during the retching and explosive phases of vomiting (26). In our case, it is conceivable that cocaine's hypertensive actions, potentiated by the patient's emesis, placed increased stress on the splanchnic vessels resulting in spontaneous intra-abdominal hemorrhage. Coagulation abnormalities may have favored or aggravated this hemorrhagic event.

Under certain conditions, cocaine or its metabolites may negatively affect hemostasis by altering the function of circulating platelets. In vitro research has revealed a decrease in platelet aggregation in response to known agonists (adenosine diphosphate, arachidonic acid) when isolated human platelets were exposed to various concentrations of cocaine (27,28). This antiaggregatory effect was dose dependent. Further, in vivo data have also demonstrated this inhibitory effect on platelet aggregation two hours after a single intranasal dose of cocaine compared to controls (29). Interestingly, this outcome was not related to the serum level of the drug. In our patient, the bleeding time was significantly elevated. While such a disturbance in the bleeding time occasion-

ally may be associated with acute cocaine use, we believe that it more commonly reflects a pattern of chronic drug abuse.

As mentioned before, no history of a traumatic event was elicited. Moreover, no external signs of trauma were noted. Nevertheless, patients with drug use frequently fail to remember events, including trauma around the time of substance abuse. Therefore, it is possible that some traumatic event secondary to his drug use may have precipitated the hemorrhage itself.

Taken together, these observations strongly support the hypothesis that cocaine is a causal factor for the occurrence of bleeding within the peritoneal cavity. Hemoperitoneum associated with cocaine use may result from the pharmacodynamic effects of cocaine and its metabolites, a possible traumatic event that occurs after the use of cocaine, or a combination of these two events. Therefore, spontaneous hemoperitoneum should be considered in the differential diagnosis of abdominal pain in cocaine abusers. Of note, at presentation our patient was hemodynamically stable. Cocaine has been shown to increase the heart rate by 30 beats/min and increase the blood pressure by 20/10 mm Hg (30). Moreover, in an animal model of hemorrhagic shock, investigators have shown that IV cocaine blunts the hypotensive response to acute blood loss (31). Thus, the presence of hemodynamic instability, after cocaine use, may be a late sign of hemorrhage and demands prompt surgical intervention with an emphasis on resuscitation.

Alternatively, a diagnosis of gastroduodenal perforation also should be excluded whenever a cocaine user presents with severe abdominal pain. Lee and colleagues report that these perforations are typically found in young males and occur, on average, 13 h after the use of cocaine (6). Again, optimal management relies heavily on prompt diagnosis. Therefore, when the clinical appearance of perforation is present after the use of cocaine, the best approach is immediate exploration regardless of the presence or absence of pneumoperitoneum. The pathophysiology of these perforations have not been clearly defined, but several authors believe that the vasoconstriction caused by cocaine results in local tissue ischemia and necrosis with the potential for perforation, especially in patients with pre-existing peptic ulcers (5,6).

Another well-recognized entity in cocaine users is intestinal ischemia. Investigators have reported that the onset of ischemia occurs, on average, 19 h after cocaine use and is heralded by the sudden onset of abdominal pain, which is typically diffuse (7). This pain may be followed by the passage of blood via the rectum, which is usually self-limiting (2,7,9). Diagnosis requires an aggressive search, especially when rhabdomyolysis and leukocytosis are present, in any patient with abdominal pain and a positive urine drug screen for cocaine (7-9). Some cases are transient and resolve with supportive medical management. However, others can progress to or present with perforation, and peritonitis requiring surgical intervention (7-9). The mechanism by which cocaine causes bowel ischemia is thought to be multifactorial. Some authors believe that it is secondary to a direct vasoconstrictive effect mediated by cocaine's enhancement of the flux of calcium across endothelial cell membranes (32). Other evidence suggests that it is a result of a spasm or poor perfusion of mucosal vessels mediated by the sympathomimetic effects of cocaine on the vasculature (25). Moreover, cocaine has a direct toxic effect on gut mucosa that may contribute to bowel ischemia (2).

In conclusion, cocaine abuse is associated with a wide variety of gastrointestinal complications that can lead to a surgical abdomen. In view of the peculiar hemodynamic and antiplatelet effects of cocaine, this illicit drug can play a substantial role in etiology of spontaneous hemoperitoneum occurring in the absence of obvious pathology. Cocaine related hospital visits are challenging. Patients may not always initially admit to cocaine use, and no pathognomonic features of cocaine abuse exist (33). Therefore, clinicians should remain vigilant and screen for its presence in any patient who presents with otherwise unexplained abdominal pain. Knowledge of the pathophysiology of the disease is crucial to minimize delays in diagnosis. If a history of recent cocaine usage has been elicited in a patient with ill-defined abdominal pain, it is prudent not to dismiss the pain as 'withdrawal symptoms,' but to rule out the life-threatening gastrointestinal complications such as hemorrhage that can occur with cocaine usage.

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