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Cocaine-abusing Parturients Undergoing Cesarean Section

A Cohort Study

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Background: **Cocaine use in the United States is prevalent among pregnant women from inner city neighborhoods. To determine the anesthetic implications of cocaine use in parturients undergoing cesarean section delivery, the authors conducted a cohort study.**

Methods: **One thousand nine hundred seven women presenting for prenatal care were interviewed regarding substance abuse. Urine was analyzed for benzoylecgonine, tetrahydracannabinol, benzodiazepines, and opioids. Next all parturients who underwent cesarean section delivery were identified and their records reviewed for anesthetic and obstetric outcomes.**

Results: **Among the 51 women who were classified as cocaine abusers, the most frequent reasons for cesarean section were fetal distress (48%) and abruptio placenta (21%). In a multivariate model, cocaine abuse before delivery was shown to be an independent predictor of preoperative diastolic hypertension ($F = 10.6$, $P = 0.01$). Similarly, univariate analysis showed that immediately after intubation, diastolic blood pressure was significantly higher among parturients who used cocaine (99 ± 13 mmHg *v.* 87 ± 18 mmHg; $P = 0.02$). In contrast, epidural anesthesia was associated with hypotension significantly more often among cocaine-abusing parturients (44% *vs.* 10%; $P = 0.04$). A higher rate of perioperative wheezing was reported among patients who abused cocaine (16% *vs.* 6%; relative risk = 2.7); this finding, however, did not persist in multivariate analysis. Operative blood loss was similar in all groups (P = NS), and no ventricular dysrhythmias or cerebrovascular or coronary ischemic episodes were reported in any of the parturients.**

Conclusions: **Although cocaine-abusing parturients are at higher risk for interim peripartum events such as hypertension, hypotension, and wheezing episodes, there is no significant increase in rates of maternal morbidity or death. (Key words: Anesthesia: obstetric. Complications: hypertension; hypotension; wheezing. Drug abuse: cocaine. Surgery: cesarean section.)**

THE rate of cocaine use in the United States has remained high among women from inner city neighborhoods.# Based on recent reports, the rate of cocaine use among childbearing women ranges from 7.5% to 45%.[1] The serious medical and obstetric complications reported in association with cocaine use prompted a recent statement by the American College of Obstetricians and Gynecologists recommending frequent testing and counseling to the women at risk.[2]

Cocaine blocks the reuptake of catecholamines at nerve terminals, which increases circulating concentrations of catecholamines in the blood, resulting in vasoconstriction, tachycardia, hypertension, and uterine contractions.[3] Acute cocaine use during the third trimester may result in preterm labor, abruptio placenta, a greater incidence of premature membrane rupture, and an increased risk of meconium staining and precipitous delivery.[4-6] Cardiovascular and neurologic complications such as hypertension, myocardial ischemia, sudden death, dysrhythmias, subarachnoid hemorrhage, and seizures have been described among parturients who abuse cocaine.[1,4-6]

Because pregnant patients who use cocaine may re-

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#National Institute on Drug Abuse: Preliminary Estimates from the 1994 National Household Survey on Drug Abuse. Rockville, MD: Department of Health and Human Services, 1995 (Advance report number 10).

quire anesthesia more frequently than those who do not,[1] it is important to obtain data regarding anesthetic outcomes related to cocaine use. We began this investigation to examine the anesthetic implications of cocaine abuse in an inner city parturient population undergoing cesarean section delivery.

Materials and Methods

Women presenting for prenatal care at the obstetric clinic of Yale-New Haven Hospital underwent a voluntary drug-abuse screening consisting of a structured interview and urine toxicology analysis. All interviews were performed by experienced research associates trained in substance-abuse assessment and affiliated with the Mother's Project. The Mother's Project is a National Institute on Drug Abuse-funded investigation that studies inner-city cocaine-abusing parturients presenting for prenatal care and offers drug treatment for cocaine use. Drug exposure status was determined by self-report of use during pregnancy and by a urine analysis at the prenatal visit.

Urine was analyzed for benzoylecgonine (cocaine metabolite), tetrahydracannabinol (THC, marijuana metabolite), benzodiazepines (oxazepam, clorodiazepoxide, diazepam), and opioids (morphine, codeine, hydromorphone, hydrocodone). Initial analysis was done using an enzyme-multiplied immunoassay technique (Graham-Massey, Bridgeport, CT). Reported sensitivity levels of the enzyme-multiplied immunoassay technique are 300 ng/ml for benzoylecgonine, 50 ng/ml for tetrahydracannabinol, 300 ng/ml for oxazepam, 3,000 ng/ml for clorodiazepoxide, 2,000 ng/ml for diazepam, 300 ng/ml for morphine, 1,000 ng/ml for codeine, 3,000 ng/ml for hydromorphone, and 1,000 ng/ml for hydrocodone. Positive drug assays were confirmed by either thin-layer chromatography (opiates and cocaine) or fluorescence polarization immunoassay (marijuana and benzodiazepines) (Graham-Massey).

In addition, a detailed history regarding use of other drugs was obtained, including an assessment of alcohol, opioids, marijuana, and other sedative or stimulant drug use. Participants were advised that their identities would be kept confidential and that the Mother's Project staff were not affiliated with the hospital or the prenatal clinic staff. In addition, there were no mandatory report requirements regarding drug use during pregnancy in Connecticut during the period of this study. Our institutional review board approved the study protocol, and oral informed consent was obtained from all participants.

Eighty-five percent of all women presenting for prenatal care between 5 February 1991 and 27 December 1993 were interviewed regarding substance abuse. One percent of women refused to be interviewed, 2.4% did not speak English, 11% were missed by interviewers secondary to logistical problems, and 0.6% had incomplete results of urine toxicology screening. Thus 1907 women were evaluated in the prenatal clinic by interview and urine toxicology. Next, a population of all women who were evaluated at the prenatal clinic and later underwent cesarean section at Yale New Haven hospital was identified and their delivery medical records reviewed (*i.e.*, the present study is limited to patients who had cesarean section deliveries).

Four study groups of participants were defined: group 1 (drug free) had a negative lifetime history of illicit drug abuse and negative results of prenatal urine drug analysis (n = 109). Group 2 (other drugs) consisted of parturients who had a negative history of cocaine abuse during pregnancy by self-report and urine toxicology (n = 36). These parturients, however, were positive for other illicit drug use either during pregnancy or during their lifetimes. Group 3 (cocaine-prenatal) consisted of 18 parturients who had tested positive for cocaine during the prenatal visit, had a "severity abuse score" of 3 or more, and were either negative for cocaine during the delivery or urine toxicology data during delivery were not available (n = 18). Group 4 (cocaine-delivery) consisted of parturients who were positive for cocaine at the prenatal visit and on admission to the labor and delivery ward (n = 33).

The "severity abuse" scoring system was based on three time-referenced measures: (1) a self-estimate of cocaine use during the 30 days immediately preceding the prenatal interview, (2) a self-estimate of cocaine use during the 30 days before the patient knew she was pregnant, and (3) a self-estimate of cocaine use based on the time when cocaine use was the highest ever. The score for each of the three time-referenced measures ranged from 0 to 2, where 0 = 1 to 4 days of cocaine use per month; 1 = 5 to 10 days of cocaine use per month; 2 = more than 10 days cocaine use per month. Next, a summary score of the three time-referenced measures was calculated.

Anesthetic and obstetric data were extracted from the medical records of all parturients. Perioperative obstetric data were reviewed to determine the indication for the cesarean section and mention of any obstetric com-

plications, such as preeclampsia, placenta previa, and premature rupture of membranes. Preoperative data were also reviewed regarding symptoms and physical findings that may be related to recent cocaine use, such as cardiovascular problems (dysrhythmias, myocardial ischemia, and cardiomyopathy), pulmonary problems (wheezing episodes, chronic cough, pulmonary edema, pneumothorax, and pulmonary hemorrhage), and neurologic problems (seizures and subarachnoid hemorrhage). Laboratory findings were reviewed with particular attention paid to the preoperative hematocrit concentration and platelet count and positive findings for hepatitis B, gonorrhea, chlamydia, or human immunodeficiency virus. Hemodynamic data such as systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate, and the rate of diastolic hypertension (>90 mmHg) were examined throughout the preoperative period; electrocardiograms (when available) were reviewed for rhythm disturbances and myocardial ischemia.

Medical records were also reviewed with regard to drug use immediately before delivery; drug exposure status was determined either by self-report or by a positive urine analysis. On admission to the labor and delivery ward, self-reported data were available in 100% of medical records in all groups; toxicology results for urine screening were available for all patients in the cocaine-delivery group, 39% of the cocaine-prenatal group, 8% of the other-drug group, and 1% of the drug-free group.

Intraoperative information was extracted regarding anesthetic techniques, operative complications, and amount of blood loss. In addition, choice of anesthetic induction and maintenance agents, drug doses, and vital signs throughout surgery were recorded. Types of muscle relaxants and opioids administered during operation were also noted. If spinal or epidural anesthesia were used, the choices of agents and related complications were documented. Intraoperative SBP, DBP, and heart rate were reviewed; hypotension was defined as SBP < 100 mmHg or DBP < 50 or decrease of 25% from baseline; maximal and minimal SBP, DBP, and heart rate were defined as the maximal and minimal intraoperative values recorded for each parturient. All intraoperative complications were noted with particular attention paid to complications that could be caused by recent cocaine use (such as hyperthermia, myocardial ischemia, prolonged paralysis, pulmonary edema, and so on). Documentation of meconium staining of the newborn was noted as well.

Postanesthetic care unit and postoperative ward data were examined for complications such as hypertensive or hypotensive episodes, myocardial ischemia, and unexpected prolonged intubation. Pain management was assessed by reviewing intraoperative parental narcotic drugs, intrathecal and epidural agents, and postoperative anesthetic care unit and ward analgesic requirements. In addition, duration of postoperative patient-controlled analgesia and visual analogue scores for pain (on a scale of 1 to 10) were recorded.

Data are expressed as means ± standard deviations. One-way analysis of variance was used for simultaneous comparisons of more than two mean values, and a chi-squared test or Fisher's exact test were used to compare proportions. Relative risk and 95% confidence intervals were calculated when appropriate. To identify independent predictors for cocaine-related phenomena, we used multiple logistic and linear regression techniques with backward stepwise analysis. Data were analyzed using Statistical Analysis Software version 6 (SAS Institute, Cary, NC). Statistical significance was accepted at $P < 0.05$.

Results

Table 1 shows the baseline demographic characteristics of women in the four groups. Participants in the cocaine group used multiple drugs and had more previous pregnancies and had a significantly lower gestational age at delivery (table 1). Review of the preoperative laboratory data revealed that platelet count and hematocrit concentration were similar for all groups (table 1).

Preoperative Period

Most cocaine-delivery parturients who presented for cesarean section delivery had fetal distress or abruptio placenta (table 2). Failure to progress and repeat-cesarean section were the most common indications for cesarean section in the drug-free group (table 2).

Although SBP and heart rate did not differ significantly among the groups, the rate of diastolic hypertension in the cocaine-delivery group was 24%, compared with 0% in the cocaine-prenatal group, 3% in the other-drugs group, and 10% in the drug-free group ($P = 0.001$). To evaluate the independent effect of cocaine use on diastolic hypertension, a multivariate logistic regression model was developed. The outcome was diastolic hypertension and predictors included group assignment,

Table 1. Demographic Data

	Drug-free Group (n = 109)	Other-drug Group (n = 136)	Cocaine-prenatal Group (n = 18)	Cocaine-delivery Group (n = 33)	*P* Value
Age (yr)					
Mean ± SD	24 ± 6	25 ± 6	27 ± 4	27 ± 5	0.01
Parity					
Median (range)	1 (0–8)	1 (0–4)	1 (0–6)	2 (0–7)	0.03
Gravida					
Median (range)	2 (1–9)	3 (1–8)	4 (1–10)	5 (1–10)	0.01
Gestational age (wk)					
Mean ± SD	38 ± 4	38 ± 4	37 ± 4	34 ± 5	0.001
Preoperative platelet count					
$\times 10^9$/L	234 ± 95	222 ± 82	258 ± 72	211 ± 75	NS
Preoperative hematocrit	34 ± 5	35 ± 3	34 ± 3	32 ± 5	NS
% of cases					
Alcohol usage*	14	22	44	45	0.001
Cigarette usage†	13	28	50	55	0.001
Opioids‡	0	36	17	27	0.001
Marijuana§	0	6	6	15	0.01
Sedatives§	0	36	28	33	0.001
Stimulants§	0	17	17	18	0.001

NS = not significant.

* Defined as consuming more than 2 drinks per day during pregnancy.

† Defined as consuming more than 1/2 pack per day during pregnancy.

‡ Opioids tested included heroin, morphine, and codeine.

§ Drugs used during pregnancy.

cigarette use, and alcohol use. Abuse of cocaine before delivery persisted as a predictor of preoperative diastolic hypertension in the presence of the other variables ($F = 10.6$, $P = 0.01$). The rate of the diagnosis of preeclampsia was similar for the drug-free group and cocaine-delivery group (10% *vs.* 12%, P = NS). Four patients in the cocaine groups were diagnosed as preeclamptic based solely on the presence of new-onset hypertension and the fact that the alternative diagnosis of acute cocaine intoxication was not documented in the medical record (urine toxicology results were not available to the obstetric staff when the diagnosis was made). One of the four patients was administered $MgSO_4$ and all patients underwent the cesarean section delivery without complication.

Table 2. Main Indications for the Cesarean Section

Variable	Drug-free Group (%)	Other-drug Group (%)	Cocaine-prenatal Group (%)	Cocaine-delivery Group (%)
Repeat c-section	29	22	22	12
Failure to progress	26	19	11	3
Fetal distress	21	22	22	48
Maternal hypertension	3	6	6	6
Abruptio placenta	0	0	6	21
Placenta previa	1	0	6	3

A higher rate of wheezing was documented in the medical records of the cocaine-abusing participants (16%; cocaine prenatal plus cocaine delivery groups) compared with the drug-free group (6%) (relative risk = 2.7, 95% CI = 0.93 to 7.7). Wheezing episodes were transient and occurred during the preoperative period in seven of the eight patients. None of the patients was reported to be wheezing during operation, and one patient had one wheezing episode after operation. All patients responded to standard bronchodilator therapy, and no other respiratory complications such as pneumonia or aspiration were documented. Because of the significantly higher rate of tobacco use among the cocaine-using participants (55% *vs.* 13%, $P = 0.001$), the independent contribution of cocaine abuse on the occurrence of wheezing was evaluated. A multivariate logistic regression model was developed in which the outcome was wheezing and predictors included group assignment, age, cigarette use, and alcohol use. Cocaine use was not shown to be an independent predictor for the occurrence of wheezing ($P = 0.19$).

Table 3. Anesthetic Data of Parturients Undergoing Regional Anesthesia

	Drug-free Group	Other-drugs Group	Cocaine-prenatal Group	Cocaine-delivery Group	*P* Value
Spinal anesthetic	n = 42	n = 15	n = 7	n = 10	
Agents (%)					
Bupivacaine	98	100	100	90	NS
Tetracaine/procaine	2			10	
Meperidine	79	93	100	70	NS
Fentanyl	67	60	57	40	NS
Duramorph	29	27	28	40	NS
Methadone	9	11	0	0	NS
Hypotension* (%)	38	60	57	50	NS
Epidural anesthetic	n = 48	n = 14	n = 6	n = 3	
Agents (%)					
Lidocaine	98	93	100	100	NS
Bupivacaine	2	7			
Hypotension* (%)	10	14	50	33	0.04†

NS = not significant.

* Hypotension was defined as systolic blood pressure <100 mmHg or diastolic blood pressure <50 mmHg or decrease of 25% from baseline.

† Drug-free group *versus* cocaine groups (combined).

Intraoperative Period

At the anesthetic preoperative interview, 36% of the parturients who denied drug abuse were found to be positive for cocaine either by self-report in the prenatal clinic or by the urine toxicology report. A regional technique was used for most parturients in the drug-free group, whereas a general anesthetic technique was used for most parturients in the cocaine-delivery group (tables 3 and 4). Meconium staining of the newborns ranged from 5% in the drug-free group to 9% in the cocaine-delivery group and 11% in the other-drug group (P = NS).

General Anesthesia. All patients received a primarily volatile agent-based anesthetic technique supplemented by opioids (table 4). Most anesthesia inductions were facilitated by administering thiopental (drug-free, 338 ± 75 mg *vs.* other-drug, 357 ± 47 mg *vs.* cocaine-prenatal, 332 ± 57 *vs.* cocaine-delivery, 346 ± 64; P = NS) and succinylcholine. Noninvasive techniques (oscillometric) were used to monitor intraoperative blood

Table 4. Anesthetic Data of Parturients Undergoing General Anesthesia

	Drug-free Group (n = 18)	Other-drugs Group (n = 7)	Cocaine-prenatal Group (n = 4)	Cocaine-delivery Group (n = 20)	*P* Value
Induction agents (%)					
Thiopental	100	86	100	95	NS
Etomidate/ketamine		14			
Ketamine				5	
Muscle relaxants (%)					
Succinylcholine	100	100	100	100	NS
Vecuronium	78	86	75	60	NS
Atracurium				5	
Mivacurium	8			5	
Narcotics (%)					
Fentanyl	100	100	100	100	NS
Volatile agents (%)					
Isoflurane	100	100	100	90	NS
Enflurane				10	

NS = not significant.

Table 5. Selected Preoperative and Intraoperative Hemodynamic Data

Variable	Drug-free Group (mean ± SD)	Other-drug Group (mean ± SD)	Cocaine-prenatal Group (mean ± SD)	Cocaine-delivery Group (mean ± SD)	*P* Value
Preoperative SBP	131 ± 19	124 ± 21	123 ± 15	130 ± 19	NS
Preoperative DBP	78 ± 13	73 ± 11	78 ± 7	85 ± 13	0.03
Preoperative HR	92 ± 16	88 ± 12	83 ± 6	86 ± 11	NS
Intubation DBP	87 ± 18	95 ± 7	96 ± 23	99 ± 13	0.02*
Intubation SBP	148 ± 28	170 ± 14	154 ± 27	155 ± 17	NS
Intubation HR	107 ± 19	117 ± 22	111 ± 16	99 ± 11	NS
Maximum DBP (GA)	94 ± 20	88 ± 16	85 ± 12	98 ± 15	NS
Maximum SBP (GA)	156 ± 26	159 ± 15	139 ± 16	158 ± 22	NS
Maximum HR (GA)	112 ± 21	118 ± 16	110 ± 13	103 ± 13	NS

SBP = systolic blood pressure; DBP = diastolic blood pressure; HR = heart rate; GA = general anesthesia; NS = not significant.

* Cocaine-delivery group *versus* drug-free group.

pressure in most participants. An arterial catheter was used in 6% of patients in the cocaine-delivery group and in 16% of patients in the drug-free group (P = NS). Immediately after intubation, DBP was higher in the cocaine-delivery group (99 ± 13 mmHg *vs.* 87 ± 18 mmHg; P = 0.02; Table 5). In a multivariate linear regression model, however, cocaine use before delivery did not persist to be an independent predictor for higher maximal DBP (F = 2.1, P = 0.14). In addition, maximum and minimum SBP, DBP, and heart rate did not differ significantly among the four groups.

Operative blood loss was similar for the four groups (drug-free, 800 ± 282 ml *vs.* other-drugs, 823 ± 266 *vs.* cocaine-prenatal, 786 ± 275 ml *vs.* cocaine-delivery, 798 ± 272 ml; P = NS). Our review revealed one case of prolonged neuromuscular blockade after administration of succinylcholine in the cocaine-delivery group. The parturient had two previous cesarean sections, with succinylcholine used without any complications. Postoperative tests revealed a pseudocholinesterase level of 69 IU (normal of laboratory, 559 to 1483 IU). In addition, a single case of intraoperative multiple premature atrial contractions was described in the cocaine-delivery group. These premature atrial contractions occurred immediately after induction, had no hemodynamic effects, and resolved spontaneously after 2 min. No similar complications were described in the drug-free group. Also, no sudden death, ventricular arrhythmia, cerebrovascular or coronary ischemic episodes were reported in any of the parturients.

Regional Anesthesia. The rate of spinal anesthesia-related hypotension was not significantly different in all groups (table 3). The rate of epidural anesthesia-related hypotension was 44% among cocaine-abusing patients and 10% among drug-free patients (P = 0.04). Maximum and minimum SBP, DBP, and heart rate did not differ significantly among the four groups. A case of pulmonary edema was reported in a parturient who reported the use of free-base cocaine ("crack") the day before the cesarean section delivery. This patient had a spinal anesthetic that was supplemented with intravenous ketamine. After treatment, the patient's condition improved and investigations into the cause of the pulmonary edema revealed no underlying cardiac or pulmonary disease. No similar complications were described in the drug-free group.

Postoperative Period

Intrathecal opioids were given in the operating room in high rates in all groups (table 3). In the postanesthesia care unit, similar doses of intravenous meperidine were administered to all groups (drug-free group, 79 ± 18 mg *vs.* other-drugs group, 100 ± 35 mg *vs.* cocaine-prenatal group, 75 ± 28 mg *vs.* cocaine-delivery group, 76 ± 34 mg; P = NS). On the second postoperative day, accumulative patient-controlled analgesia meperidine use was similar in all groups (drug-free group, 723 ± 432 mg *vs.* other-drugs group, 1066 ± 617 mg *vs.* cocaine-prenatal group, 708 ± 382 mg *vs.* cocaine-delivery group, 893 ± 423 mg; P = NS). Similarly, visual analogue scores for pain obtained during the first postoperative day were comparable in all groups (drug-free group, 2.9 ± 0.4 *vs.* other-drug group, 3.1 ± 1.2 *vs.* cocaine-prenatal group, 3 ± 2.6 *vs.* cocaine-delivery group, 3.2 ± 2.8; P = NS).

Finally, throughout the perioperative period no differences were observed between the cocaine-abusing participants and the drug-free participants with regard to

significant outcomes such as sudden death, ventricular dysrhythmias, coronary ischemic episodes, or cerebrovascular accidents.

Discussion

These results indicate that although cocaine-abusing parturients are at higher risk for interim peripartum events such as hypertension, hypotension, and wheezing episodes, there is no significant increase in rates of maternal morbidity or death. We also observed that most cocaine-abusing parturients who presented for cesarean section delivery had fetal distress or abruptio placenta.

These findings are consistent with the pathophysiologic characteristics of cocaine use during pregnancy and previous reports regarding an increased rate of abruptio placenta associated with cocaine use during pregnancy.[4-6] Cocaine blocks the reuptake of catecholamines at nerve terminals, which increases circulating levels of catecholamines in the blood, resulting in vasoconstriction, tachycardia, hypertension, and uterine contractions.[7] The vasoconstrictive effect of cocaine may cause a disruption in placental adherence to the uterine wall resulting in placental abruption. Abruptio placenta occurrence has been reported at a higher rate in cocaine-exposed pregnancies, even when the exposure is limited to the first trimester.[8]

Identifying the parturient who uses cocaine may be difficult. As can be seen from this and previous reports, self-reporting of drug abuse is notoriously unreliable, and in studies among pregnant patients who used cocaine, 35% to 55% denied cocaine use but had at least one positive result of urine assay.[1] At best, cocaine metabolites are detected in the urine for only 14 to 60 hours after use.[9] Therefore, many of the exposed parturients will not be identified either by self-report or by urine toxicology analysis. A history of smoking, alcohol use, positive syphilis serology, and use of other illicit drugs should alert the anesthesiologist to an increased risk of cocaine abuse.[1,10]

In our study, four cocaine-abusing parturients were diagnosed with preeclampsia although they presented only with hypertension. Because treatment strategies may differ based on the cause of hypertension, it is important to distinguish between cocaine-induced hypertension and the hypertension associated with preeclampsia. Generally, cocaine-induced hypertension is characterized by acute onset, lack of peripheral edema, or proteinuria and it may present at any time during pregnancy. However, severe cocaine-induced hypertension can cause the kidneys to excrete excessive quantities of protein and may be associated with edema, headache, and blurred vision.[11,12] Because obstetric patients may not admit cocaine use, the anesthesiologist should have a high index of suspicion in cases of new-onset hypertension. Although cocaine administration results in immediate transient elevation of maternal blood pressure, an association between cocaine abuse and pregnancy-induced hypertension has not been clearly demonstrated.[1,13] As shown in our study, rapid-sequence induction and laryngoscopy are associated with hypertension and tachycardia more frequently among cocaine users. This phenomenon may be related either to the hypertensive effects of cocaine or to increased anesthetic requirements after acute cocaine exposure, as demonstrated by a dose-dependent increase of halothane median alveolar concentration in the dog.[14]

We identified several cases of cocaine-abusing parturients who had pulmonary complications such as bronchospasm and pulmonary edema. Similarly, Rubin and Neugarten[15] described six patients who were hospitalized with acute exacerbations of asthma provoked by inhalation of free-base cocaine. Bronchospasm may be a result of inflammation of the respiratory epithelium secondary to use of either cocaine or adulterants.[16] The increased rate of bronchospasm among cocaine users may reflect their significantly higher rate of cigarette smoking. Most patients with cocaine-induced bronchospasm respond to standard bronchodilator therapy and steroids. Pulmonary edema has been reported as a complication of cocaine abuse,[17] and Murphy[18] reported recently a case of pulmonary edema in a parturient who presented 12 hours after delivery for elective tubal ligation under a spinal anesthetic. The pathogenesis of cocaine-induced pulmonary edema is unclear and may be related to damaged pulmonary endothelium or transient left ventricular dysfunction secondary to ischemia or peripheral vasoconstriction.[17,18] Administration of ketamine to our patient may have contributed to the development of the pulmonary edema. Ketamine is a potent sympathomimetic that has been linked to pulmonary hypertension and pulmonary edema.[19] In a patient whose pulmonary vasculature is rendered hyperactive by chronic cocaine use, such an effect may be more common. We recommend that ketamine should be used with caution in patients suspected of cocaine use because it can markedly potentiate the cocaine's cardiovascular toxicity.

A prolonged response to succinylcholine was observed in a parturient who abused cocaine chronically and was documented to have a normal dibucaine number but low levels of pseudocholinesterase. Cocaine, which undergoes metabolism by pseudocholinesterase, may compete with succinylcholine, resulting in decreased metabolism of both drugs.[9] The practicing anesthesiologist should be aware that patients with low levels of pseudocholinesterase who abuse cocaine may have an abnormally prolonged response to anesthetic drugs such as succinylcholine, mivacurium, and ester local anesthetics. In addition, cocaine users with a low dibucaine number can have slower cocaine metabolism and may be even more susceptible to cocaine toxicity.[20]

It is important to note an important methodologic issue related to this report. Cocaine is an illegal drug that is rapidly metabolized and is detected in the urine for only 14 to 60 h after use.[9] As a result, studies involving cocaine abuse in the parturient are hampered by problems of determining drug use.[21] In the first part of this investigation, all women were evaluated in the prenatal clinic by interview and urine toxicology screening. However, because the second part of the study was based on medical records data, problems with identifying exposure and outcome data are evident.

We conclude that parturients who use cocaine and require cesarean section delivery are not at increased risk for significant maternal morbidity. Interim perioperative events such as hypertension, hypotension, and wheezing episodes are more common, however, among these patients.

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